Predictive Factors of Diabetes Distress Among Indonesian Older Persons With Type 2 Diabetes Mellitus

Muhammad Ischaq Nabil Asshiddiqi

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Nursing Science in Adult and Gerontological Nursing (International Program)

Prince of Songkla University

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I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

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ABSTRACT

This cross-sectional study aimed to identify the level and factors predicting diabetes distress (DD) in older persons suffering from type 2 diabetes mellitus. One hundred ninety eight participants from Central General Hospital of Dr. Soeradji Tirtonegoro Klaten, Indonesia were purposively selected. Information regarding the demographic and clinical data of the participants was collected using the Personal Characteristic Questionnaire. Data related to family support, self-efficacy, spirituality and DD were collected using the Diabetes Family Behavior Checklist (DFBC), Diabetes Management Self-Efficacy Scale (DMSES), Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being (FACIT-Sp) expanded version, and Diabetes Distress Scale (DDS), respectively.

Content validity of DFBC, DMSES and FACIT-Sp-Ex was examined by three experts. The S-CVI values of these tools were 0.87, 0.91 and 1, respectively. In addition, reliability test showed the Cronbach's alpha coefficient of these tools were 0.72, 0.88, and 0.91, respectively. Data analysis was performed using descriptive statistics, Pearson correlation coefficient, and stepwise regression. The findings showed that the level of DD of the participants was at the low level ($M = 1.14$, $SD = 0.19$). The study demonstrated non-supportive family behavior ($\beta = 0.14$, $p = 0.04$),

self-efficacy (β = -0.29, p = .00), and spirituality (β = -0.14, p = .04) as variables that could statistically predict DD in older persons with type 2 diabetes mellitus. In addition, self-efficacy was found to be the strongest predictor of DD. The total variance of the significant factors of DD was 16.3%. Therefore, it is recommended that nurses design interventions to enhance patients' self-efficacy and spirituality and reduce non-supportive behavior in the family. This will serve to decrease the level of DD in older persons with type 2 diabetes mellitus.

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Muhammad Ischaq Nabil Asshiddiqi

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Chapter 1

Introduction

This chapter presents the background and significance of the problem, objectives of the study, research questions, conceptual framework, research hypothesis, definition of terms, scope of the study, and significance of the study.

Background and Significance of the Problem

Diabetes Mellitus (DM) is one of the most prevalent global health issues of this century. There are 425 million people with diabetes worldwide and five million deaths in 2017 (International Diabetes Federation [IDF], 2017). In the last ten years, diabetes has increased by almost 50% and is expected to grow 165% by 2050 (American Diabetes Association [ADA], 2017). Prevalence of diabetes in Indonesia was sixth in the world with 10.3 million people in 2017. It was estimated to increase to 16.7 million people by 2045 (IDF, 2017).

Diabetes in older persons is increasing more rapidly, and is predicted to reach more than 200 million by 2040 (Lau, 2016). Moreover, the epidemiology of diabetes in older persons is shifting towards old age due to increased life expectancy. As a result, diabetes mellitus is increasingly becoming a disease of older age rather than middle age. Care for older persons with diabetes presents unique challenges. Increased prevalence of co-morbidities associated with ageing combined with the increased prevalence of geriatric syndromes contribute to the complexity of managing diabetes in the older persons (Abdelhafiz & Sinclair, 2013).

More than 80% of deaths from diabetes occur in low and middle income countries. The World Health Organization (WHO) projected that deaths from diabetes will increase by two-thirds between 2008 and 2030 (Islam et al., 2013). In 2014, 6.7% of deaths in Indonesia were caused by diabetes. This number is the third largest after stroke (21.1%) and cardiovascular disease (12.9%). One year after, around 185,000 deaths in Indonesia were caused by diabetes (McCall, 2016). It is a chronic and progressive disease that causes abnormal glucose metabolism (IDF, 2017). Therefore, living with diabetes requires a lifetime of daily self-management. Diabetics or persons living with diabetes have an obligation to change their daily lifestyle as the disease may have a negative impact on their psychological state and may contribute to diabetes distress (Fisher, Hessler, Polonsky, & Mullan, 2012).

Diabetes distress is an emotional state that arises from living with diabetes and the burden of self-management wherein diabetics experience extraordinary feelings such as stress, guilt, or rejection (Kreider, 2017). Diabetes distress consists of four domains that include: (1) distress associated with a diabetic regimen (struggling with involvement in self-management behavior such as regular blood glucose monitoring), (2) interpersonal problems (feeling unsupported in self-management efforts or not feeling understood), (3) relationship with physician (feelings about care and information provided) and (4) emotional baggage (feelings such as failure or despair when thinking about illness) (Fisher et al., 2012).

Diabetes distress is common and can be experienced by up to 40% of patients with diabetes worldwide and the incidence is increasing over time (Berry et al., 2015). Moreover, several studies showed prevalence of diabetes distress among patients with T2DM occurred among 49.2% of T2DM patients in Malaysia (Chew et al., 2016),

48.5% in Bangladesh (Islam et al., 2014), and 35% in Iran (Baradaran et al., 2012). In addition, a cross national study showed diabetes distress was reported by 44.6% of the participant with diabetes (Nicolucci et al., 2013). Furthermore, In Indonesia, prevalence of diabetes distress was found to be higher than in other countries. Diabetes distress was reported by more than half (53.5%) of individuals with T2DM in Indonesia (Arifin et al., 2018). Additionally, Indonesian people with diabetes distress were mostly (69%) older persons.

ADA (2018) highlighted the importance of screening and management of diabetes distress to achieve optimal results, including increased blood glucose control. High level of diabetes distress significantly impacts medication-taking behaviors, and negatively affects dietary, and exercise behaviors. Previous research conducted among patients with T2DM in the USA found that diabetes distress through such behaviors led to higher hemoglobin A1C (HbA1C) levels and high rates of complications (Fisher et al., 2012). Moreover, a study conducted in Indonesian patients with T2DM explained that high diabetes distress degraded quality of life (Faridah et al., 2017).

Several studies have revealed the factors related to diabetes distress in patients with type 2 diabetes mellitus. However, several studies showed inconsistent findings. These factors include personal factors such as treatment regimen (Spollet, 2012), and diabetes duration (Islam et al., 2014). A previous study found that patients treated with insulin plus oral medication reported the highest diabetes distress score (Zhou et al., 2017). Whereas, another study reported patients with high doses of oral medication also experienced higher levels of diabetes distress (Rothschild, 2010). Furthemore, when comparing diabetes duration, a prior study showed that diabetes distress occurred higher

among those diagnosed with diabetes for more than 10 years (Islam et al., 2014). In contrast, another study found diabetes distress was more prevalent in the first year of diagnosis (Hood, 2012).

Another factor related to diabetes distress is family support (Baek, Tanenbaum, & Gonzales, 2014; Karlsen & Bru, 2014). Support from family members has been considered vital for people with T2DM because it enhances the patient's physical and emotional functioning (Karlsen & Bru, 2014). Some people with diabetes may reflect a negative perception of their own self-management that can lead to diabetes distress. Such people need to be convinced that they can achieve appropriate self-regulation and need to be encouraged to maintain their positive efforts in self-care. Conversely, when family members behave negatively, for example by nagging or criticizing certain health behaviors, people with T2DM may respond to problems by feeling higher levels of diabetes distress (Karlsen, Oftedal, & Bru, 2012). A qualitative study conducted in Indonesia revealed that family support is one of most significant factors reducing diabetes distress. Family members as the closest persons, help T2DM patients to optimize T2DM treatment management by showing affection, reminding them to take medicine, and helping them stick to their diet program (Arifin, 2018). Moreover, family support significantly moderated the negative relationship with diabetes distress (r = -0.20, $p < 0.05$) (Baek et al., 2014).

Moreover, prevous studies also found diabetes distress was associated with self efficacy (Wang et al., 2017; Wardian & Sun, 2014; Zhou et al., 2017). Self-efficacy is defined as self-confidence in the ability to take an action in accordance with the desired results. Diabetics who have this confidence can determine their own way of life, avoid despair and have less diabetes distress (Kim, Shim, Ford, & Baker,

2015). Psychologically self-efficacy contributes to maintaining good long-term control of the disease (Kanbara et al., 2008). The results of a previous study in patients with T2DM showed a significant negative relationship between diabetes distress and self-efficacy (r = -0.53, $p < 0.01$) (Wardian & Sun, 2014).

In addition, previous research shows that spirituality has been associated with diabetes distress in patients with T2DM. This correlation is negative significant which means that the patients with higher level of spirituality have lower diabetes distress (r = -0.40, $p < 0.01$) (Newlin et al., 2008). It was found that participation in religious acts reduced stress levels. Spirituality is a source of emotional support that protects people against negative feelings, ways of life and behavior by strengthening individuals to deal with daily challenges caused by their illness in a more effective way (Darvyri et al., 2018). It has been shown in a previous study in Indonesia that spirituality is one of the most common coping mechanisms to reduce diabetes distress. It has strong positive relationship with coping with chronic disease including diabetes (Arifin, 2018). It helps sufferers accept personal responsibility through self-management, and gives them the strength and support to make appropriate daily decisions regarding disease management (Darvyri et al., 2018).

Literature shows a relationship between family support, self-efficacy, spirituality and diabetes distress. Among Indonesian patients with type 2 diabetes mellitus, qualitative studies found that family support (Arifin et al., 2018; Badriah & Sahar, 2018), self-efficacy, and spirituality (Arifin et al., 2018) are potential approaches to overcome distress. However, these studies did not propose to explain the predictive value of those factors over diabetes distress. Moreover, it is rare that a study is conducted with the purpose of showing the prevalence of diabetes distress

and its factors in Indonesia. In addition, studies conducted on the aforementioned variables are rarely conducted in older persons. Globally, Indonesia has the fifth-largest older persons' population in the world. The prevalence of older persons in Indonesia was 23.66 million people in 2017 (9.03%) (Ministry of Health Republic of Indonesia, 2017).

To see the underlying problem, it is crucial to find predictive factors that could affect diabetes distress among older persons. Predictive factors of diabetes distress in older persons might be different from another age group due to age-related factors. Similarly, age-related factors could possibly affect diabetes distress among older persons with T2DM in Indonesia. Therefore, exploring these predictive factors would help nurses provide appropriate nursing care to possibly reduce diabetes distress specific to older persons with T2DM. Thus, the investigation of diabetes distress level and its predictors among older persons with T2DM is acutely needed. Hence, the purpose of this research study is to explore the levels and predictive factors of diabetes distress among Indonesian older persons with T2DM.

Objectives of the Study

The objectives of this study were as follows:

1. To examine the level of diabetes distress among Indonesian older persons with type 2 diabetes mellitus.

2. To examine the predictive factors of diabetes distress among Indonesian older persons with type 2 diabetes mellitus.

Research Questions

The research questions of the study were:

1. What is the level of diabetes distress among Indonesian older persons with type 2 diabetes mellitus?

2. Will family support, self-efficacy, and spirituality predict diabetes distress among Indonesian older persons with type 2 diabetes mellitus?

Conceptual Framework

The conceptual framework of this study was derived from data retrieved from the literature review. There are three predictive factors, namely family support, self-efficacy, and spirituality.

Diabetes distress. According to Fisher et al., (2019) diabetes distress refers to the worries, concerns, fears and threats that are associated with struggling with a demanding chronic disease like diabetes over time, including its management, threats of complications, potential loss of functioning and concerns about access to care.

Diabetes distress consists of four domains namely, emotional burden (feeling overwhelmed by diabetes), physician-related distress (worries about access, trust, and care), regimen related distress (concerns about diet, physical activity, medications), and interpersonal distress (not receiving understanding and appropriate support from others) (Fisher et al., 2008).

Family support. Family support is a way of promoting healthy relationships in families and preventing dysfunctional relationships from getting worse (McKeown, Haase, & Pratschke, 2001). Among older persons, family is an important source of psychosocial support and deeply rooted cultural norms, its role being an important

source of support for older persons. Therefore, effective family support is a key

component of the well-being of older persons. The ability to cope with changes in

health, income, social activities and others, in their old age largely depends on the

support they get from their family members (Kaur, Kaur, & Venkateashan, 2015).

Degenerative changes and various chronic diseases make older persons unable to be

independent. Daily basic needs of the older persons are met by their family members.

This highlights the importance of family support to improve life satisfaction of older

persons (Kaur, Kaur, & Venkateashan, 2015).

Among diabetic patients, greater family support moderates' diabetes distress.

Family members represent particularly important sources of support for individuals

with diabetes. Support from family members may facilitate better self-management

and glycemic control (Lee et al., 2018). Furthermore, it can improve diabetes specific

self-management activities such as physical activity, diabetes meal plan adherence,

testing blood glucose, and checking feet adherence (Rosland et al., 2008). Previous

studies found that diabetic patients who received support from family have good

blood glucose control (Choi, 2009; Shawon et al., 2016). In addition, lack of support

from family members led to poor management of diabetes which is mediated by less

adherence to treatment (Shawon et al., 2016).

Self-efficacy. Self-efficacy is belief in a person's capabilities to organize and

perform the course of action required to manage prospective situations. It influences

how people think, feel, motivate themselves, and act (Bandura, 1997a). Self-efficacy

beliefs are composed of four principal sources of information: enactive mastery

experiences that serve as indicators of capability; vicarious experiences that alter

efficacy beliefs through transmission of competencies and comparison with the

attainments of others; verbal persuasion and allied types of social influences that one possesses certain capabilities; and physiological and affective states from which people partly judge their capableness, strength, and vulnerability to dysfunction (Bandura, 1997b).

Previous studies revealed that self-efficacy has a negative association with diabetes distress. Higher diabetes distress tends to decrease self-efficacy (Chung, 2014; Fisher et al., 2012; Lin et al., 2017). Diabetics with a higher level of self-efficacy are able to perform better diabetes self-care practices. In addition, a high level of self-efficacy is linked with better self-autonomy, good confidence, more initiative and persistence in dealing with the daily needs of diabetes care. Individuals with a high level of self-efficacy have confidence in their capabilities in looking at difficulties as challenges to be overcome rather than a problem to be avoided (Devarajooh & Chinna, 2017).

Spirituality. Spirituality is the essence of being that transcends and connects us to the Divine and other living organisms which involves relationships and feelings. It differs from religion, which consists of human-created structures, rituals, symbolism, and rules for relating to the Divine. Religion is a significant expression of spirituality; however highly spiritual individuals may not identify with a specific religion (Eliopoulus, 2018).

There are three dimensions of spirituality. The first-dimension is focused on the individual's feelings and relates to their self as a human being. This dimension consists of an individual's reflection, in that the person gains a sense of self and purpose. In the second dimension, the individual uses their core values as standards to guide behaviors and relationships with other people. This can be through personal

contact in which the client provides attention and respect to others during conversations with them, in contrast to impersonal contact in which how the client chooses to treat property that belongs to someone else is observed. The individual decides their own standards to apply in dealings with other people. The third dimension is focused on the relationship between the individual and a greater entity or power (Allah, God, and others). This dimension relies strongly on the individual's faith and confidence in self within the context of a bigger picture that transcends life on earth as we know it, viewing life's purpose in an even larger context (Mauk, 2018).

All humans have spiritual needs, regardless of whether they realize or acknowledge them. Some of these needs become particularly relevant in later life when the high prevalence of chronic illness and reality of death are evident; these needs can include love, purpose, hope, dignity, forgiveness, gratitude, transcendence, and faith (Eliopoulus, 2018).

A past study revealed that spirituality has a positive impact on T2DM management (Darvyri et al., 2018). Spiritual practice makes patients believe that efforts to deal with their illness are helped by God. This has an impact on improving social ties and social support, while prayer stabilizes the patient's symptoms (Polzer & Miles, 2007). In another study, spirituality was considered by T2DM patients as a source of hope/ strength in order to cope with the disease (Gupta & Anandarajah, 2014). Spirituality has also been reported as having hope, seeking religious support, prayer, faith in God, and putting their health in God's hands (Namageyo-Funa, Muilenburg, & Wilson, 2015).

Predictive Factors of Diabetes distress	→	Diabetes distress
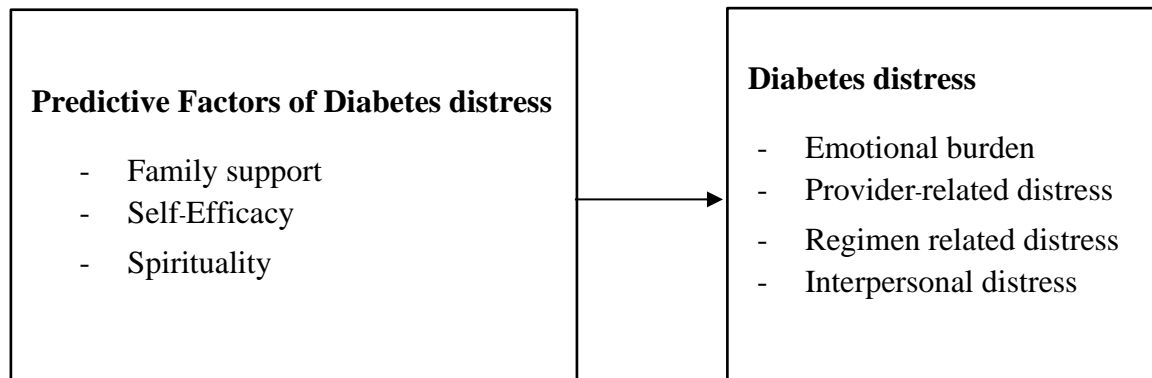
Figure 1. Conceptual framework

Research Hypothesis

Family support, self-efficacy, and spirituality can predict diabetes distress among Indonesian older persons with type 2 diabetes mellitus.

Definition of the Terms

Diabetes distress. Diabetes distress refers to an emotional response in the form of worries, frustration and burden related to diabetes that poses a variety of complications and exposes someone to major changes in their life in the form of self-management demands such as restriction of food consumption, physical activity, blood glucose monitoring and taking medicine obligations. Diabetes distress was measured with Diabetes distress Scale (DDS) Indonesian version, translated, revised and validated by Arifin et al., (2017). A higher score of DDS indicates the higher level of diabetes distress in the participants.

Family support. Family support refers to a series of family activities aimed at promoting and protecting health, well-being and rights, and special attention given to older persons with T2DM as members of their family. Family support was measured with the Diabetes Family Behavior Checklist developed by Schafer and colleagues (1986). The tool consists of two subscales namely supportive and non-supportive family behavior. A higher score on each subscale indicates the level of family support.

Self-efficacy. Self-efficacy refers to an individuals' confidence in their ability to regulate and carry out the actions needed to manage their T2DM. Self-efficacy was measured with the Diabetes Management Self-Efficacy Scale developed by Bijl, Poelgeest-Eeltink, and Shortridge-Baggett (1999). A higher score on the scale indicates a higher level of self-efficacy.

Spirituality. Spirituality refers to the essence of being that transcends and connects to the Divine and other living organisms which involves peace, faith, and the relationship of the individual with T2DM. Spirituality was measured with The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp) developed by Bredle, Salsman, Debb, Arnold, and Cella, (2011). A higher score indicates a higher level of spirituality.

Scope of the Study

This study examined the predictive factors of diabetes distress among Indonesian older persons with T2DM. The participants were persons aged 60 years or older diagnosed with T2DM recruited from the outpatient department, Geriatric Clinic, Central General Hospital Dr. Soeradji Tirtonegoro, Klaten, Indonesia from April to May 2019.

Significance of the Study

The results of this research provide basic information concerning the level and predictors of diabetes distress among Indonesian older persons with T2DM. This information can be used as evidence to guide the future management of diabetes distress for older persons with T2DM and those who provide care. In addition, this study can contribute to evolving nursing practice on enhancing patients' self-efficacy and spirituality and reducing non-supportive behavior of the family to reduce diabetes distress among older persons with T2DM.

Chapter 2

Literature Review

This chapter presents the literature review regarding type 2 diabetes mellitus in older persons, health care system for older persons with type 2 diabetes mellitus in Indonesia, diabetes distress among older persons with type 2 diabetes mellitus, factors related to diabetes distress among older persons with type 2 diabetes mellitus, and summary.

1. Type 2 diabetes mellitus in older persons

    1.1 Definition and pathogenesis of type 2 diabetes mellitus in older persons

    1.2 Signs and symptoms of type 2 diabetes mellitus in older persons

    1.3 Complications of type 2 diabetes mellitus in older persons

    1.4 Therapies and strategies to control type 2 diabetes mellitus in older persons

    1.5 Consequences of type 2 diabetes mellitus in older persons

2. Health care system for Indonesian older persons with type 2 diabetes mellitus

3. Diabetes distress among older persons with type 2 diabetes mellitus

    3.1. Definition of diabetes distress

    3.2. Dimensions of diabetes distress

    3.3. The consequences of diabetes distress

    3.4. Factors related to diabetes distress among older persons with type 2 diabetes mellitus

4. Instruments related to the study variables

5. Summary of literature review

Overview of Type 2 Diabetes Mellitus

This section includes definition and pathogenesis, signs and symptoms, complications of diabetes mellitus, therapies and strategies to control type 2 diabetes mellitus, and impact of type 2 diabetes mellitus combined with therapy in older persons.

Definition and pathogenesis of type 2 diabetes mellitus in older persons. Diabetes mellitus is a chronic condition that occurs when there are raised levels of glucose in the blood because the body cannot produce any or enough of the hormone insulin or use insulin effectively (IDF, 2017). There are two main types of diabetes, type 1 and type 2 diabetes. Type 1 diabetes mellitus (T1DM) occurs because the pancreas is unable to produce insulin. Whereas, T2DM occurs when the pancreas does not produce enough insulin or when the body does not effectively use the insulin that is produced (Punthakee, Goldenberg, & Katz, 2018). ADA (2018) mentioned that T2DM encompasses individuals who have relative insulin deficiency and peripheral insulin resistance.

T2DM can occur due to a combination of insulin resistance and the relative deficiency of insulin production (Coope, Torsoni, & Velloso, 2016). It develops when cells in the body do not use insulin properly which can increase the body's need for insulin while the pancreas's ability to produce insulin decreases. Insulin serves as the main source for breaking down sugar and starch from food into glucose when the body does not function properly, and glucose is not sent to cells (ADA, 2018). Moreover, T2DM can be caused by several factors such as genetic defects, sedentary lifestyles, food factors, endocrine disruptors, inflammation (Coope et al., 2016), short

or disturbed sleep, and stress (Kolb & Martin, 2017; Spruijt-Metz, O'Reilly, Cook, Page, & Quinn, 2014).

In older persons, insulin resistance can develop due to increased adiposity and decreased physical activity. An increased risk of insulin resistance also occurs due to loss of muscle mass or sarcopenia associated with aging where muscle tissue is the main place for glucose consumption. Apart from insulin resistance, this also causes the risk of developing increased glucose intolerance. Another factor is the reduction of incretin hormone secretion. This hormone causes a decrease in blood glucose levels by inducing glucose-dependent insulin release and inhibition of glucagon secretion (Abdelhafiz & Sinclair, 2013). Several factors contribute to diabetes in older persons such as genetic factors, age-related changes in carbohydrate metabolism, age-related insulin resistance, age-related decreased insulin secretion, increased adiposity, coexisting illness, drugs, inflammation, decreased physical activity (Dunning et al., 2017), and obesity (Imamura et al., 2013; Reddy et al., 2013).

Moreover, diagnostic criteria of diabetes for older persons is not different to that in other people (Abdelhafiz & Sinclair, 2015; Chentli, Azzoug, & Mahgoun, 2015), it remains constant across all ages (Milanesi & Weinreb, 2017). Diabetes may be diagnosed by measuring glucose in a blood sample taken while the patient is in a fasting state (FPG), or 2 hours after a 75 g oral load of glucose (2-h PG) has been taken. It can also be diagnosed by measuring the glycated haemoglobin (HbA1c), even if the patient is not in a fasting state. HbA1c reflects the average blood glucose concentration over the past few weeks, rather than the blood glucose concentration at that moment. However, the test is more costly than blood glucose measurement (WHO, 2016). Patients can be diagnosed with diabetes if they have FPG $\geq$ 126 mg/dL

(7.0 mmol/L) or 2-h PG $\geq$ 200 mg/dL (11.1 mmol/L) or HbA1c $\geq$ 6.5% (48

mmol/mol) (ADA, 2018; IDF, 2017; Punthakee, Goldenberg, & Katz, 2018). In

addition, there are also special considerations for the diagnosis of diabetes and

assessment in parents. Examination results of fasting glucose in the early stages of

diabetes can show normal values, and a two-hour glucose tolerance test appears to

describe undiagnosed cases (Abdelhafiz & Sinclair, 2015).

Signs and symptoms of type 2 diabetes mellitus in older persons. T2DM

develops slowly and often occurs over an extended period time where the disease is

present but not detected (WHO, 2016). This often occurs in older persons and is often

undiagnosed. Subsequent undiagnosed, diabetes can produce symptoms, resulting in

complications and exacerbating existing comorbidities. T2DM has a long

asymptomatic preclinical phase that is often undetectable and complications are

usually present at the time of diagnosis. The usual risk factors for undiagnosed

diabetes include an increase in body weight, and ethnicity (IDF, 2013).

Diabetes can be asymptomatic in up to 50% of older persons. However,

symptoms that appear non-specific can be associated with aging. Non-specific

symptoms, such as fatigue, or lethargy, are common manifestations of diabetes in old

age. Geriatric syndrome can be the first manifestation of diabetes, such as falls and

urinary incontinence. Symptoms can also be atypical, such as anorexia (Abdelhafiz &

Sinclair, 2013).

Classic symptoms (polyuria, polydipsia and polyphagia). The classic

symptoms of diabetes are usually less prominent because of an increase in the kidney

threshold for glucose which can reduce the intensity of polyuria and induce a

disturbing thirst sensation that can reduce the intensity of polydipsia (Abdelhafiz &

Sinclair, 2013). These classic symptoms are less sensitive because the kidney threshold to remove blood glucose is higher in older persons than in adult patients (Dunning et al., 2017).

Hyperglycemia. Hyperglycemia in type 2 diabetes develops when there is an imbalance between glucose production and glucose intake. Several factors related to imbalance of glucose regulation in older persons include genetic risk, lifestyle changes in the form of decreased physical activity, obesity, various kinds of comorbidities, and inflammation. In addition, current evidence has found that the direct effect of aging on the pathophysiology of diabetes is through disruption of the function of b-cells causing a decrease in insulin secretion (Lee & Halter, 2017).

According to Umpierrez and Pasquel (2017) hyperglycemia occurs due to metabolic and hormonal changes associated with increased counter-regulatory hormones such as cortisol, catecholamines, growth hormones, and glucagon and proinflammatory cytokines that disrupt carbohydrate metabolism. This results in excessive hepatic glucose production and reduces glucose uptake in peripheral tissues. In addition, physiological changes in older persons contribute to the increased prevalence of hyperglycemia and decreased insulin release due to glucose-induced aging and increased insulin resistance in peripheral tissues, especially in muscle and adipose tissue. Increasing age also tends to be associated with abdominal obesity and increased circulation of free fatty acids and inflammatory markers, specifically tumor necrosis factor α and interleukin 6, which can lead to increased insulin resistance in the older persons.

Fatigue. Fatigue is a symptom which is commonly troublesome among diabetics. It is defined as a subjective perception of a decreased capacity to perform

physical and/or mental tasks due to one or a combination of physiological, psychological or lifestyle phenomena-including altered glucose control, diabetes symptoms, diabetes emotional distress, depression, physical inactivity and body mass index (BMI) (Hernandez, 2017).

Fatigue normally occurs after mental or physical exertion, inadequate sleep, or other temporary phenomena. Sometimes called acute or healthy, such fatigue is usually temporary and alleviated with rest. Acute fatigue serves as a protective mechanism by signaling the body's need for rest. Chronic, or pathologic fatigue, however, occurs after modest effort and continues despite rest. In addition, it can be a barrier to efforts to improve health, such as participating in self-care regiments, planning healthy eating or regular exercise (Fritschi & Quinn, 2010). A previous study mentioned that fatigue is also associated with decreased physical function and management of daily routine activities. Patients are absent from work or refrain from other activities because of fatigue (Nijrolder, van der Windt, & van der Horst, 2008).

In people with diabetes fatigue occurs due to changes in blood glucose levels that cause acute and chronic hyperglycemia, hypoglycemia, or fluctuating blood glucose. Furthermore, the presence of diabetes complications and their symptoms, including hypo or hyperglycemia, cardiac disease, neuropathy, or retinopathy, has also been associated with increased fatigue (Fritschi & Quinn, 2010).

According to Hernandez (2017), 75% older persons with T2DM described being fatigued and tired. Fatigue and tiredness were exacerbated by disrupted sleep patterns. Many patients stated this inability to sleep made them frustrated. Symptoms of fatigue impede physical activity and tend to result in sedentary behavior. Moreover, some patients at various times experienced fatigue and tiredness precipitated by blood

glucose elevations, chronic pain, lack of sleep, or a result of the strain of coping with both diabetes and comorbidities.

Complications of type 2 diabetes mellitus in older persons. The complications of T2DM in older persons are generally grouped into acute and chronic complications.

Acute complications. The most serious acute complications of diabetes are diabetic ketoacidosis and the hyperosmolar hyperglycemic state (Fowler, 2009; Kitabchi, Umpierrez, Miles, & Fisher, 2009; Kitabchi, Umpierrez, Murphy, & Kreisberg, 2006).

Hyperosmolar Hyperglycemic State (HHS), also known as non-ketotic hyperglycemic hyperosmolar syndrome (NKHS), is characterized by profound hyperglycemia indicated by a glucose level more than 600 mg/dL, hyperosmolality indicated by effective serum osmolality $\geq$ 320 mOsm/kg, and volume depletion in the absence of significant ketoacidosis (pH > 7.3 and HCO3 > 15 mEq/L). The most common precipitating factor of HHS is infection, mostly reported from urinary tract infection and pneumonia. In older persons, being bed-ridden and having an altered thirst response compromise access to water and water intake, leading to severe dehydration and HHS. Other conditions that can lead to HHS are acute illnesses such as stroke, myocardial infarction, or trauma that provokes the release of counter-regulatory hormones (catecholamines, glucagon, cortisol, and growth hormone) and/or compromises water intake. In addition, endocrine disorders, such as hyperthyroidism and acromegaly can also lead to HHS (Parsian & Umpierrez, 2018).

Diabetic ketoacidosis (DKA). DKA is characterized by the triad of uncontrolled hyperglycemia, metabolic acidosis, and increased total body ketone

concentration (Kitabchi et al., 2009). In DKA, there is a reduction in the net effective concentration of circulating insulin along with an elevation of counter-regulatory hormones (glucagon, cortisol, and growth hormone). This condition leads to extreme manifestations of metabolic derangements that can occur in diabetes. The most common precipitating factors are inadequate insulin therapy or infection (Gosmanov, 2018). Most patients with DKA have autoimmune type 1 diabetes; however, patients with type 2 diabetes are also at risk during the catabolic stress of acute illness such as trauma, surgery, or infections (Kitabchi et al., 2009).

Moreover, both HHS and DKA have a classic clinical picture that includes a history of polyuria, polydipsia, weight loss, vomiting, dehydration, weakness, and alteration of mental status. In patients with HHS, mental status can vary from full alertness to profound lethargy or coma (Kitabchi et al., 2009).

Chronic complications. Generally chronic complications of diabetes are divided into macrovascular and microvascular complications as follows:

Macrovascular complications. Among older persons with T2DM, macrovascular complication can occur such as coronary heart disease, cerebrovascular disease, and peripheral vascular disease (Tracey et al., 2016).

Coronary Heart Disease (CHD). The prevalence of CHD is higher in older persons with diabetes. In Italy, the prevalence of myocardial infarction (MI) among patients with diabetes occurs in 11.3% of patients aged 65-84 years. CHD among older diabetic patients is the leading cause of death. Patients with diabetes who are treated have an increased risk of mortality associated with CHD (Corriere, Rooparinesingh, & Kalyani, 2013).

Cerebrovascular Disease (CVD). The risk of morbidity and mortality due to CVD in older persons with diabetes is very high. Excessive anxiety is related to diabetes symptoms, dietary restrictions, medication satisfaction, and medication and having a lower sense of well-being increases the risk of CVD being higher in the elderly. Therefore, psychosocial factors influence the incidence of stroke in older persons with diabetes (Corriere et al., 2013).

Peripheral Vascular Disease (PVD). In older persons with diabetes PVD is a common complication. The prevalence of PVD in older patients with diabetes is twice as high as for those without diabetes. In addition, other diabetes-related complications increase the risk of PVD in older persons. Moreover, aging and decreasing GFR also increase risk factors for PVD (Corriere et al., 2013)

Microvascular complications. These complications can occur in older persons with T2DM as diabetic neuropathy, retinopathy, nephropathy, and diabetic foot (Abdelhafiz & Sinclair, 2013; Tracey et al., 2016; van Wijngaarden et al., 2017).

Neuropathy. Neuropathy refers to damage to nerves or nerve groups (s) characterized by loss of sensation, movement, and / or nerve function (s). Individuals with neuropathy can experience painful tingling, and / or numbness in their legs / extremities (Jones, 2014). According to Schoenberg and Drungle (2001) in a sample of insulin-free older persons who had been diagnosed with diabetes, it was found that disabilities such as neuropathy affect many participants' ability to exercise, regulate their appointments with health care providers, and check their feet regularly. Moreover, older persons living with diabetes want to be involved in self-management behavior but cannot do it efficiently because of their limited mobility. One can see how experiencing pain and losing independence because of neuropathy may have a

very good impact on the level of stress and mood of an individual (Stanković, Jašović-Gašić, & Zamaklar, 2011).

Peripheral neuropathy is the most common form of diabetic neuropathy. This often causes the hands and feet to feel deep and painful pain. In addition, lower extremities that do not receive adequate perfusion suffer interferences in tissue oxygen, nutrients and antibiotics, and waste disposal interfered. This increases risk disorders of wound healing and gangrene (Fritschi & Quinn, 2010).

Diabetic cardiovascular autonomic neuropathy (DCAN). DCAN is a complication that contributes to high morbidity and mortality and decreased quality of life of diabetic patients. Clinical manifestations of DCAN can be resting tachycardia, severe orthostatic hypotension, syncope, ischemia and asymptomatic myocardial infarction, systolic and diastolic left ventricular dysfunction, increased risk of CKD, stroke, hypo-responsiveness to hypoglycemia, and sudden cardiac death. Mortality increased up to 53% in diabetic patients with autonomic neuropathy. DCAN can occur between 21 and 73% in diabetics. DCAN is associated with CKD, albuminuria, and decreased kidney function in patients with T2DM (Pecoits-Filho et al., 2016).

Diabetic genitourinary autonomic neuropathy (DGAN). DGAN can occur in half of DM patients. This condition causes various disorders, including decreased bladder sensitivity, decreased perceptual emptying, and changes in contractility, increased bladder capacity, urinary retention, increased frequency of urinary tract infections, lithiasis, and kidney failure (Pecoits-Filho et al., 2016).

Erectile dysfunction. Erectile dysfunction occurs in 35-75% of patients with diabetes, 10-15 years earlier than non-diabetics. In addition, the condition of diabetes accompanied by CKD is the most common cause of erectile dysfunction.

This is caused by vascular abnormalities and neuropathy. The initial treatment approach for erectile dysfunction in diabetic patients must be glycemic and metabolic control of other related complications (Pecoits-Filho et al., 2016).

Diabetic retinopathy (DR). DR is a condition that can occur in patients with type 1 and type 2 diabetes. The duration of DM increases the prevalence of this complication. This condition is experienced by more than 60% of patients with T2DM after 20 years of illness. DR is the most common cause of blindness in people aged 20-74 years. The pathogenesis of DR is directly related to chronic hyperglycemia, and diabetic kidney disease is an important factor for an increased risk of the incidence of DR. DR and diabetic nephropathy are the two most common micro vascular complications in patients with DM (Pecoits-Filho et al., 2016).

Diabetic nephropathy (DN). According to Lim (2014), DN is a syndrome in people with diabetes characterized by pathological excretion of urine albumin, diabetic glomerular lesions, and loss of glomerular filtration rate (GFR). Moreover, it is also characterized by an increase in excretion of urinary albumin, together with increasing blood pressure (Min, Stephens, Kumar, & Chudleigh, 2012).

Incipient nephropathy is the initial presence of a low but abnormal amount of urine albumin, referred to as microalbuminuria (persistent albuminuria at the level of 30-299 mg / 24 hours). In addition, overt nephropathy or macroalbuminuria (persistent albuminuria at the level of $\geq$ 300 mg / 24 hours) can be present at the time of diagnosis of type 2 diabetes. Patients who develop macroalbuminuria are more likely to develop ESRD (Gall, Hougaard, Borch-Johnsen, & Parving, 1997).

The pathological changes of DN in patients include glomerulosclerosis, non-specific chronic damage related to vascular changes and glomerular disease superimposed on, or even unrelated to diabetic glomerulosclerosis (Min et al., 2012). Worsening hyperglycemia occurs due to a maximum capacity for renal tubular glucose reabsorption in patients with diabetes. 20% of total body glucose comes from the renal area through glucose tubular reabsorption and gluconeogenesis. Poor glycemic control increases the progression of kidney failure (Pecoits-Filho et al., 2016).

Diabetic foot. Diabetic foot ulcers pioneered amputation in more than 80% of patients and the possibility of having a second amputation was almost doubled in patients with diabetes. The three main factors that contribute to diabetic foot disease are poor circulation, diabetic neuropathy, and trauma, often complicated by infection. Other factors that contribute to foot ulcers include deformities, reduced joint mobility, trauma, and metabolic control. The presence of reduced deformity and mobility is generally associated with neuropathy and this increases the likelihood of injury and ulceration (Dunning et al., 2017).

Therapies and strategies to control type 2 diabetes mellitus in older persons. The main challenge for T2DM sufferers is the attainment and maintenance of good blood glucose control in order to prevent diabetes complications (Davila, 2010). However, around 50 percent of diabetics fail to achieve the target level (Jeong, 2017). Diabetes is considered under control if the sufferer maintains ideal body weight and enjoys good health, and normal blood glucose level (White, Duncan, & Baumle, 2013).

Older persons with diabetes often experience fluctuations in glucose levels when their clinical, functional or social circumstances change. Moreover, accompanying chronic conditions such as impaired cognitive function, depression, physical disability, and polypharmacy can be a barrier to their blood glucose control (Munshi, et al., 2013). Older persons are a unique and heterogeneous group that poses challenges in the management of diabetes and its complications making the clinical management of diabetes increasingly difficult, despite the most advanced and high-quality healthcare system (Sherifali, 2016).

Generally, there are two main strategies to control T2DM among older persons, pharmacological and non-pharmacological strategy.

Pharmacological strategy.

Insulin therapy. Insulin therapy is indicated when symptomatic hyperglycemia with weight loss, nocturia, polydipsia, and fatigue occurs or signs of severe insulin deficiency, such as ketosis, are present despite the use of several non-insulin hypoglycemic agents. Insulin initiation is indicated when fasting plasma glucose levels are often > 14 mmol/l, and random glucose levels are consistently > 17 mmol/l, or HbA1c above 10%. Other indications include concomitant medical conditions or acute medical illnesses (Dunning et al., 2017).

Insulin treats hyperglycemia by having a strong anabolic effect, limiting muscle waste and sarcopenia. Older patients with poor glycemic control and weight loss will benefit from insulin therapy because it is usually associated with weight gain. The main side effects of insulin therapy are discomfort from frequent injections and monitoring of blood glucose, and the risk of hypoglycemia, which may be significant in older persons (Dunning et al., 2017).

Glucose lowering drugs. In people with T2DM, metformin is the most widely used oral agent. This drug has a bioavailability of around 50-60% and is absorbed mainly in the small intestine. If lifestyle modification alone is not enough to achieve glycemic goals, metformin (dimethylbiguanide) is the first-line therapy option. The low risk of hypoglycemia and the cost combined with high efficacy add to the benefits of this drug (Dunning et al., 2017).

Thiazolidinediones are drugs that fight insulin resistance in skeletal muscle. Thiazolidinediones have the effect of increasing insulin-mediated glucose absorption in skeletal muscle (Dunning et al., 2017).

Non-pharmacological strategy.

Physical exercise management. Physical exercise has a beneficial effect on glycemic control in individuals with diabetes. Mechanisms for increasing glucose metabolism include increased insulin sensitivity and increased available glucose storage capacity. Furthermore, this contributes to the cleansing of glucose from the circulation, a reduction in the level of visceral fat, which is a major cause of insulin resistance, and an increase in muscle mass, which is a major tissue in glucose metabolism (Dunning et al., 2017).

Among older persons, exercise interventions must consist of at least 150 minutes of exercise per week, divided into two or three consecutive days. Moreover, exercise of more than 150 minutes per week has an effect on improving glycemic control. Endurance training is done at least twice a week for all muscle groups. The intensity and volume must be carried out carefully and increase periodically (Dunning et al., 2017). Endurance training is conducted at least three times per week, with each

session lasting at least 30 minutes. Endurance training can be done either by walking or cycling (Dunning et al., 2017).

Nutrition management. Previous studies showed that several diet modification strategies were effective to control T2DM among older persons. These are a replacement diet with khorasan wheat product (Whittaker, et al., 2017), eating glutinous brown rice (Terashima, et al., 2017), and a low carbohydrate and calorie restricted diet (Sato, et al., 2017).

A replacement diet with an ancient organic khorasan grain product is effective in improving blood insulin. A replacement diet with khorasan wheat product could be suggested to reduce blood glucose level among older persons with T2DM. A replacement diet with organic ancient khorasan wheat products was effective in improving blood insulin that may provide added protection in reducing hyperglycemia (Whittaker, et al., 2017).

In addition, diet replacement with glutinous brown rice reduced the whole-day glucose profile in patients with T2DM, mainly by modifying postprandial glucose excursion. It may be worth adding GBR to the diet of patients with T2DM. Moreover, low carbohydrate and calorie restricted diet decreased HbA1c and may be easy implemented (Terashima, et al., 2017). However, the availability of khorasan wheat, and glutinous brown rice also should be considered in different settings/areas.

Education. Diabetes education has a variety of different characters, including differences in settings, materials and methods provided. Some studies undertook education in individual settings that were more effective than group settings. This was influenced by several factors such as character differences, diabetes complications, and gender as each individual is not the same (Fan, et al., 2016; Thongsai, et al., 2013;

Browning, et al., 2016; Beverly, et al., 2013; Munshi, et al., 2013; Wichit, et al.,
2017).

Individual diabetes education tailored to the patient's personality may decrease
fasting and post-prandial blood glucose. These results indicate that individual
educational programs taking into account the patient's personality are associated with
better management outcomes than group education (Fan, et al., 2016). In addition,
supervision is also an important factor that influenced education in older persons with
type 2 diabetes mellitus (Lim, et al., 2011; Qi, et al., 2015). Therefore, further
research is suggested to focus on relevant factors and continue supervision in
providing diabetes education in older person patients with type 2 diabetes mellitus.

Psychosocial support. Psychosocial support effectively improves glycemic
control in patients with unstable diabetes. In older persons, psychosocial support can
also increase parents' confidence in their ability to perform self-care tasks.
Psychosocial support can give priority to groups of patients with poor glycemic
control. In addition, a support program to explore the long-term effectiveness of
glycemic control is also needed (Qi, et al., 2015).

Consequences of type 2 diabetes mellitus in older persons. T2DM in older
persons can lead to several problems such as symptomatic hypoglycemia, frailty, pain,
muscle weakness (sarcopenia), fall and fracture, hearing impairment, cognitive
dysfunction, depression, and diabetes distress.

Symptomatic hypoglycemia (SH). This is a very common phenomenon that
occurs in two thirds of older persons with T2DM. SH can increase the risk of heart
events, fractures, cognitive impairments, and death. The frequency of SH increases
with the duration of insulin therapy among patients treated with insulin. On the other

hand, SH symptoms that can often affect daily activities, and negatively affect quality of life, are associated with higher diabetes distress, fear of hypoglycemia, and poor psychological well-being. This has emerged as a major concern for diabetic patients and their families. The presence of recurrent hypoglycemia can be an indicator of other problems such as weakness, instability of blood glucose control, and responsibility for others, and makes individuals more vulnerable (Nicolucci et al., 2015).

Previous studies explained that the experience of hypoglycemia is considered frightening by most patients. This can affect adherence to glucose-lowering treatments, for fear of episodes. Generally, hypoglycemia in someone with diabetes can affect significant changes in cognitive and physical functions, as well as lifestyle such as food, driving, sports, domestic and social life, holidays and travel. This has relevant consequences in terms of personal independence and for other important aspects of life (Nicolucci et al., 2015). According to Hernandez (2017), efforts to improve blood sugar control, increase blood sugar intensity, reduce drugs, and consume snacks or skip meals, increase the likelihood of experiencing hypoglycemia. Some participants reported the incidence of severe hypoglycemia which caused a decrease in the level of consciousness.

Frailty. Frailty is a recognized condition and accounts for up to 25% of older persons with diabetes. It is characterized by a combination of significant fatigue, recent weight loss, severe restriction in mobility and strength, increased tendency to falls, and increased risk of institutionalization. Minimal numbers of frail older persons with diabetes may be relatively independent but in time dependency develops (IDF, 2013). Yanase and colleagues (2018) reported that DM patients with frailty had a

higher mortality rate than non-frail DM patients. Moreover, the presence of frailty was an independent risk factor for mortality. According to Strain et al. (2018), frailty is the most important prognostic indicator. Many of the diagnostic elements of fragility can also be a side effect of interventions for diabetes. These include iatrogenic weight loss, decreased cognitive hypoglycemia, or depression associated with diabetes polypharmacy. Therefore, a rational approach must be used to ensure that while symptoms are under control, overly aggressive pharmacotherapy does not reduce functional ability. Long-term protection is no longer a concern, because the prognosis is very weak. Hence, it is desirable to review and reduce treatment that does not function to improve the quality of life of the older persons with diabetes.

Frailty can be identified by the presence of three or more components: 1) unintentional weight loss of ≥ 4.5 kg in the past year, 2) weakness which can be marked by hand-grip strength in the lowest 20% quintile at baseline, adjusted for sex and body mass index, 3) exhaustion characterized by poor endurance and energy, 4) slowness, walking speed under the lowest quintile, 5) low physical activity level, lowest quintile of kilocalories of physical activity during the past week (Sinclair & Rodriguez-Mañas, 2016).

The presence of frailty depends on deterioration in muscle and nerve function. Diabetes tends to cause impairment in each of these systems, thus leading to loss of homeostasis and vulnerability to various stressors. It may be affected by general loss of self-management ability in diabetic patients. In T2DM patients, insulin resistance causes impairment of muscle strength and performance by increasing the rate of protein synthesis and decreasing protein degradation in muscle. In addition, frailty can be caused by several components such as hormones, inflammation, neurologic factors,

nutrition and activity components. The majority of older persons do not have sufficient dietary intakes or protein intakes, resulting in a reduction in lean body mass and increased functional disability which contribute to frailty (Yanase et al., 2018).

Pain. Pain was reported due to managing diabetes as a chronic condition which needs frequent blood glucose monitoring with frequent finger sticks. The experience of pain significantly diminished participants' quality of life. The chronicity of the pain experience generated a sense of tiredness and resulted in difficulties with ambulation and sleep. Despite pain medication interventions resulting in complicated treatment regimens, they did not always relieve the pain. In addition, neuropathic pain was reported by older patients who described tingling, burning, numbness, aches and pains like the flu. Its symptoms were described as crawling sensations on their lower extremities with the feeling of electricity or bugs. For some patients, the pain and discomfort became more pronounced at night and disrupted their sleep. Many of the older patients were taking pain medications as part of their treatment regimen but the medications did not resolve the pain. They said that living with the pain was mentally and physically tiring (Hernandez, 2017).

Muscle weakness (Sarcopenia). Older persons with T2DM have altered body composition, low skeletal muscle strength, and decreased muscle quality. In addition, older persons with T2DM have increased loss of lower extremity strength and muscle quality, as well as skeletal muscle mass. This impaired muscle function is an important contributor to physical limitations associated with diabetes in older persons (Kim et al., 2012). Decrease in muscle mass is associated with metabolic deregulation, which includes a reduction in insulin sensitivity, impaired oxidative defense and decreased mitochondrial function. The main effect of the loss of muscle

mass is reduced muscle strength and power which are important factors in maintaining stability and gait and are necessary to the performance of the activities of daily living (Sinclair & Rodriguez-Mañas, 2016).

Fall and fracture. Previous study conducted among older persons explained that loss of balance and falling diminished safety and limited ambulation. They experienced persistent instability that significantly affected their diabetes. Moreover, falling often occurred quickly and with no warning. Some noticed more difficulties at night or when first getting out of bed in the morning. Some patients noted that their medication caused dizziness. In addition, many of the patients became fearful of ambulation because of their experiences with falling and lack of balance (Hernandez, 2017).

Falling is a common occurrence in older persons and often results in serious injury and loss of independent life. Previous research has shown that older persons with diabetes report an increased risk of repeated falls. The risk of fracture also increases with increasing incidence of falls in older persons with diabetes. An increased risk of fracture in T2DM can occur because people with T2DM usually have abnormal bone mineral density. Changes in body composition and microvascular complications, including retinopathy, peripheral and autonomic neuropathy, hypoglycemia, and drug use, especially thiazolidinedione, all increase the risk of fractures in older persons with diabetes (Kim et al., 2012).

Hearing impairment. Sensory disorders must be considered when educating older persons and supporting their self-care. Hearing damage involving high and low / medium frequency sounds is about twice as common in people with diabetes, and may be related to both vascular disease and neuropathy (Kirkman et al., 2012).

Cognitive dysfunction. Progressive cognitive decline and dementia are commonly observed in older persons with diabetes (Kim et al., 2012). There is an association between hyperglycemia and cognitive dysfunction. Moreover, hypoglycemia is associated with bidirectional cognitive dysfunction: cognitive impairment increases the risk of hypoglycemia and a history of severe hypoglycemia is associated with the incidence of dementia. The high level of cognitive deficits in the older persons shows that it is important to periodically screen cognitive dysfunction. Such dysfunction makes it difficult for patients to carry out complex self-care tasks such as monitoring glucose, changing the dose of insulin, or precisely maintaining the time and content of diet. In older patients with cognitive dysfunction, the regimen must be simplified, caregivers involved, and hypoglycemia carefully assessed (Kirkman et al., 2012)

Depression. Depression is very common in older persons with diabetes. About 30% of diabetic patients experience symptoms of depression, and older persons with diabetes have double the likelihood of higher depression compared to individuals without diabetes (Kim et al., 2012). The prevalence of depression in people with T2DM is high; this is not the case in the newly diagnosed. This shows that the ongoing experience of T2DM can play an important part in the onset of symptoms of depression (Perrin, 2017).

Depression has a negative impact on self-care behaviors such as reduced adherence to treatment, decreased knowledge of diabetes or no interest in finding appropriate knowledge, and non-compliance with preventive health practices such as healthy nutrition and regular physical activity. Self-care behaviors, such as healthy eating, are often a challenge for people with depression. They are less likely to

include fruits and vegetables in their diets, the main risk reduction factor for depression and T2DM. Similarly, physical activity and sedentary behavior are more common in people with depression, increasing the risk of T2DM. It can also increase the risk of chronic complications and outcomes associated with diabetes that are worse, and cause further psychological effects as a result of complications, such as worsening of glycemic control, risk factors for cardiovascular disease (CVD), more severe burden of symptoms, reduced health related quality of life (QOL), disability and functional disorders, and increased mortality (Perrin, 2017).

Another symptom of depression is a change in sleep pattern, either sleeping too much or too little, thus disrupting a person's circadian rhythm. Sleep disturbances, such as disorders that occur in patients with depression have an important role in changing one's metabolism and increasing insulin resistance, and subsequent risk of developing complications of T2DM. The biological mechanisms associated with depression have also been shown to increase the risk of developing T2DM through its effects on glucose metabolism. Depression is related to hyperactivity of the HPA axis and sensory nervous system (SNS), which can cause an increase in cortisol levels, a stress hormone that serves to increase glucose production and reduce insulin sensitivity. Continual increase in cortisol levels can cause metabolic syndrome, a syndrome characterized by central adipose and insulin resistance, which in turn increases the likelihood of developing T2DM (Perrin, 2017).

Diabetes distress. Diabetes distress is a psychological reaction in the form of emotional distress to the threat of diabetes when someone who is diagnosed with diabetes considers they are inadequate to manage the threats of diabetes. Diabetes distress includes four domains related to diabetic regimens, namely; blood glucose

monitoring; diet control, increasing physical activity; interpersonal or relational problems, referring to conflicts with carers, partners, and friends; and the emotional burden of feeling loss of motivation, not being supported emotionally, being misunderstood and worrying about future complications (Berry, Lockhart, Davies, Lindsay, & Dempster, 2015).

Living with diabetes can be difficult. In the face of complex, demanding, and often confusing self-care directives, patients can become frustrated, angry, overwhelmed, and /-or discouraged. Diabetes-related conflicts with loved ones can develop, and relationships with health care providers can become tense (Polonsky et al., 2005). People who have a high level of diabetes distress will have difficulty maintaining blood glucose levels and will struggle to perform self-care activities such as taking medication, monitoring blood glucose levels, and managing their food intake and physical activity (Sturt, 2016). A previous study in the USA conducted among 898 T2DM patients in the community revealed that 54.2% of participants were experiencing diabetes distress (Fisher et al., 2012). In addition, other studies conducted in Malaysia, Bangladesh, and China found that 49.2%, 48.5%, and 43% of T2DM patients, respectively, had diabetes distress (Chew, Vos, Mohd-Sidik, & Rutten, 2016; Islam, Karim, Habib, & Yesmin, 2013; Zhou et al., 2017).

Health Care System for Indonesian Older Persons with Type 2 Diabetes Mellitus

Indonesia is one of the largest diabetes populations in the world. Genetics, aging, urbanization, and sedentary lifestyles are the main determinants of diabetes in developing countries, including Southeast Asian countries. They are the cause of the diabetes population escalation in Indonesia. The prevalence of diabetes mellitus in

Indonesia is over 10% of the total adult population and is increasing over time. The number of subjects with pre-diabetes also increased (Subekti, 2018).

In general, diabetics in Indonesia tend to know about their illness when it is too late. They usually come to the hospital with problems that turn out to be complications from advanced diabetes, often kidney failure or vision problems. However, in recent years, this picture has begun to change. The public health system in Indonesia is undergoing dramatic reform. The Indonesian government has health care targets for all citizens by 2019 and among the main diseases are diabetes, especially T2DM (McCall, 2016).

A study on the analysis of determinants of diabetes mellitus in Indonesia stated that the proportion of diabetes mellitus increases with age. Most diabetes participants were found in the age group 65-74 years. The proportion of diabetes mellitus in women is significantly higher than in men. Divorced participants have the highest proportion of diabetes mellitus, compared to those who are married and have never married. The highest proportion of diabetes mellitus is also found in the low education group. The proportion of diabetes mellitus is significantly higher in those who are unemployed than those who work, and in those who live in rural areas than those who live in urban areas. The highest proportion of diabetes mellitus is found in the Java-Bali region. The results also showed that age, sex, marital status, level of education, employment status, residence, regional status, hypertension, obesity, smoking habits, and dyslipidemia were all significantly associated with the prevalence of diabetes mellitus (Idris, Hasyim, & Utama, 2018).

The prevalence of complications in Indonesian diabetic patients shows that the most frequent diabetes complications are: neuropathy, followed by albuminuria

(77.7%), microvascular complications (53%), decreased glomeral filtration rate (43.7%), retinopathy (42.6%), nephropathy (26%), macrovascular complications (20%), and diabetic foot (24%) (Soewondo, Ferrario, & Tahapary, 2013).

Access to preventive and curative services is further challenged by disparities in health service provision, distribution of human resources, and availability of care. This gap seems to be strengthened by the establishment of a national archipelago which is conducive to uneven distribution of services and tends to favor urban areas rather than rural and remote areas. In adding this problem, the Ministry's plan to reach universal health coverage is an opportunity to strengthen access to health care and the number and quality of services offered at the primary care level (Soewondo et al., 2013). Therefore, health services for Indonesian T2DM outpatients are managed in a tiered system, where they will receive initial care in primary care settings, especially, *puskesmas /* community health centers (PHCs) or family doctors / GPs. The patient can only receive advice from a resident consultant in secondary care in an emergency situation or when indicated by certain clinical symptoms (Arifin, 2018).

Indonesian diabetes country profiles published by WHO (2016) mentioned that regarding the national response to diabetes, Indonesia does not have an operational policy/strategy/action plan for diabetes or to reduce overweight and obesity as the primary diabetes risk factors. Moreover, availability of medicines, basic technologies and procedures in the public health sector remain incomplete. Insulin is not generally available in primary care facilities. Moreover, several basic technologies such as oral glucose tolerance test, HbA1c test, dilated fundus examination, foot vibration perception by tuning fork, foot vascular status by doppler, and urine strips for glucose and ketone measurement are still not generally available.

In Indonesia, some health care providers are responsible for treating diabetics. This includes doctors, nurses, pharmacists, dietitians, and diabetes educators. Doctors consist of general practitioners (general practitioners) and specialist doctors such as internists, endocrinologists, infectious disease specialists, vascular surgeons, plastic surgeons, cardiologists and orthopedic surgeons. Instead, nurses are hardly seen in the context of literature related to diabetes in Indonesia.

Generally, the role of nurses in diabetes management in Indonesia is explained more in terms of treatment of specific complications, such as diabetic foot ulcers. The role that wound care nurses perform to assess diabetic foot ulcer, mostly occurs in private clinic settings. Predominately, assessing diabetic foot ulcer is performed by a doctor or nurse. However, nurses are employed in wound care clinics that do not provide medical care. The nurses work independently, providing care for high standard injury assessments. and a collaborative working relationship exists between nurses and doctors (dermatologists) (Ligita, Wicking, Harvey, & Mills, 2018). In another study, nurses had the role of provision of information for diabetic patients and their families. The nurses provided health education regarding DM management including diet, physical exercise, and diabetes treatment. Moreover, they also provided wound care for diabetic patients with gangrene (Megawati, Al Rasyid, Finasim, Dalimunte, & Hasan, 2015).

Diabetes Distress Among Older Persons with Type 2 Diabetes Mellitus

This section includes the definition, dimension, effects, and measurement of diabetes distress.

Definition of diabetes distress. Diabetes distress is the burden related to having diabetes that requires daily self-management that can lead to burdensome complications (Chew, Vos, Pouwer, & Rutten, 2018). It is not attributable to other causes of overall emotional distress or mental health problems (Nanayakkara et al., 2018). Moreover, Kasteleyn and colleagues (2015) explained that diabetes distress is an expected response to people's perceptions of health threats balanced against an appraisal of available coping resources which is mostly related to diabetes and its management.

Diabetes distress is an important condition distinct from depression and is non-psychiatric distress. It is abroad affective reaction to the stress of living with this chronic and complex disease (Beverly, Ivanov, Court, & Fredricks, 2017). It is more strongly linked with diabetes-related behavioral and biological variables (Fisher et al., 2009). When an individual receives a diagnosis of diabetes, they are faced with huge changes to daily life: they may experience worry and stress in their ability to manage the illness and may also feel at odds or frustrated with close family and friends (Lee et al., 2018).

People with diabetes distress often experience frustration with the ongoing obligations of diet which has restrictions on food and eating, physical activity, blood glucose monitoring and taking medicine (Islam, et al., 2014). In addition, they might present loss of control, feeling of failure and lower self-efficacy (Kasteleyn et al., 2015). For patients with T2DM, diabetes distress centers around 4 main issues, (1)

frustration with the demands of self-care, (2) apprehension about the future and the possibility of developing serious complications, (3) concern about both the quality and the cost of required medical care; and (4) perceived lack of support from family and/or friends. This condition contributes to worsening glycemic control and increasing morbidity (Beverly et al., 2017).

Dimensions of diabetes distress. Diabetes distress consist of four domains encompassing (1) emotional burden, (2) physician-related distress, (3) regimen related distress, and (4) interpersonal distress.

Emotional burden. This domain may include feelings of anger, worry, fear, and demotivation feeling unsupported emotionally, misunderstood and worrying about future complications, failure or hopelessness when thinking about diabetes, and the extraordinary feeling that diabetes controls the lives of patients. Furthermore, this distress can be thought of as existing on a severity continuum (low, mild, moderate to severe), emanating from various sources, including: 1) distress from living with diabetes, 2) distress as a result of life stressors that are unrelated to diabetes (work, financial), and 3) distress from other causes such as personal characteristics or genetics (Fisher et al., 2008).

Physician-related distress. Patients experience numerous feelings about care and information provided. They may feel they have no knowledge of illness or are not confident in their treatment plan. In addition, lack of empathy or unclear instructions from health care providers and feeling difficulty accessing health services contribute to this distress. In addition, stress about the physician-patient relationship may also occur. To minimize and prevent the source of this distress. Nurses must be able to

practice self-reflection on attitudes towards diabetes as well as diabetes management skills (Martinez, Lockhart, Davies, Lindsay, & Dempster, 2018).

Regimen related distress. This domain includes issues around daily diabetes management, such as diet, physical activity, glucose testing, and treatment regimens. Patients may struggle to engage in self-management behaviors such as regular blood glucose monitoring. They often require insulin support to control their blood glucose as the disease progresses. However, people have many myths related to insulin and consider insulin a symbol of failure. Patients' fears and worries about insulin must be exploited by nurses, including the potential, avoidance, and treatment of hypoglycemia. Moreover, oral and injection combinations are needed by many patients, this is often combined with glucose monitoring which can be psychologically and financially overwhelming (Fisher et al., 2008).

Interpersonal distress. This domain focuses on support from friends and family as well as a lack of understanding of the difficulties of living with diabetes. Problems often occur due to unsolicited offers of goodwill, advice about food choices and the level of activity of loved ones. Patients and their support systems can be helped by discussing the level of supervision and unsolicited advice. This can also help set boundaries and expectations (Fisher et al., 2008; Martinez et al., 2018).

The consequences of diabetes distress. Diabetes distress was reported to affect some conditions such as:

Poor glycemic control. Greater diabetes distress was significantly associated with poor glycemic control (Asuzu, Walker, Williams, & Egede, 2017a; Khan & Choudhary, 2018; Lee et al., 2018; Perrin, 2017). The prevalence of diabetes distress was directly linked to HbA1c with a distinct and significant rise in prevalence as the

blood glucose level rose (Perrin, 2017). The negative consequences of poor glycemic control can include liver problems, kidney diseases and retinopathy (Turek, 2017). Glycemic control requires an individual to maintain an ongoing regimen of self-care tasks to control their blood sugar on a daily basis through means of medication, exercise, and nutrition. It can be measured by HbA1c level (Chung, 2014). Persons with diabetes are recommended to check their HbA1c at least twice a year as part of proper diabetes management. It provides information on treatment effectiveness and can be compared to daily blood glucose readings for accuracy (ADA, 2018).

Reduced self-management. High diabetes distress is caused by poorer self-management. The lack of self-management results in higher HbA1c. Previous studies revealed that patients with high diabetes distress have a lower number of boluses per day, less frequent set changes, suboptimal bolus wizard usage, and reduced contact with health care teams (Khan & Choudhary, 2018), poor adherence to meal planning and report unhealthy eating habits, are more likely to be physically inactive and have low frequency of self-monitoring blood glucose (SMBG) (Aikens, 2012; Khan & Choudhary, 2018; Wardian & Sun, 2014). In addition, people with diabetes distress are less likely to take medications to decrease blood glucose and are more likely to experience hyperglycemia (Aikens, 2012; Hernandez, 2017; Wardian & Sun, 2014). According to Khan and Choudhary (2018), people with high level of diabetes distress have poorer self-management caused by their perceived increased burden of diabetes management.

Poor self-care. Higher diabetes distress can cause decreased self-care (Asuzu, Walker, Williams, & Egede, 2017b). Diabetic patients need self-care behavioral changes that require them to adapt changes in their daily live. Self-care is arguably

one of the most critical components in effectively managing diabetes (Chung, 2014).

The management of diabetes requires making behavioral changes in the self-care area

of nutrition, physical exercise, medication management, and glucose testing (ADA,

2018). Previous studies showed that increased self-care management can led to

increased glycemic control (Sousa, Zauszniewski, Musil, Lea, & Davis, 2005).

Factors Related to Diabetes Distress Among Older Persons with Type 2 Diabetes Mellitus.

Previous studies revealed that diabetes distress was associated with several

factors including treatment regimen, self-management, neighborhood, diabetes

duration, sleep dysfunction, family support, self-efficacy, and spirituality.

Treatment regimen. A cross-sectional study conducted among T2DM

patients in the USA revealed that diabetic patients who receive insulin regimen

therapy experience greater diabetes distress than those who use oral medication or diet

and exercise alone. However, other evidence suggests that diabetic patients with high

doses of oral agents can also report the same level of distress as in the insulin

regimen. This happens because of the patient's awareness that insulin injection

therapy will be determined later, if blood glucose levels remain high, or also because

of the complexity of the regimen itself (Rothschild, 2010). Insulin injection is

relatively complicated compared with oral medication and more difficult for older

persons. In addition, patients treated with insulin have been found to be in poor

glycemic control and have longer duration diabetes with complication. Another cross-

sectional study also reported that treatment regimen among T2DM patients in China

was associated with diabetes distress (r= 0.14, p=<0.01). Patients' treated with insulin

plus oral medication reported highest diabetes distress scores. They needed to spend more energy and had higher medicine expenses, which could cause greater distress (Zhou et al., 2017)

Self-management. Patients with type 2 diabetes mellitus face demands for changes in their routine to optimize blood glucose control. Managing a person's blood glucose is a complex daily regimen of self-management behavior which includes monitoring and decision-making related to diet, exercise, hyperglycemia and hypoglycemia recognition, endogenous insulin administration / oral medication, and management, testing and recording of blood glucose levels (Elliott, Shewchuk, Miller, & Richards, 2001). Changes in health status or adjustments to manage diabetes-related symptoms can cause fear related to disease progression and development of complications. Diabetic patients reported worries about the future and development of additional complications as the main source of diabetes distress. A previous study in the USA showed that diabetes self-management was associated with diabetes distress (r= -0.23, p= 0.01) (Rothschild, 2010).

Neighborhood. A cross-sectional study among 941 people with T2DM revealed that attributes of the social environment can also affect health. The social environment sets standards for social norms, degree of closeness between neighbors and social stressors, all of which may facilitate the transmission of behavior and or buffer diabetes distress. Several neighborhood characteristics (order, culture and access) were associated with global diabetes distress (r= -0.31, p<0.001) (Kane, 2017). Moreover, a study among 578 community-based T2DM patients conducted in Canada showed that patients that report living in an area that they perceive as unsafe or threatening could be referred to safer perceived neighboring community centers for

the practice of physical activity. Living in a neighborhood with limited access to healthy food and safe places to exercise can be an important barrier for diabetes self-care and may be a source of diabetes distress. A lack of community resources and support may also limit a person's ability to manage and function with their diabetes (Gariepy et al., 2013).

Diabetes duration. A previous mixed methods study among urban African American with T2DM in the USA reported that diabetic patients have more distress in the first year of diagnosis, while moderately treated patients, such as those prescribed oral agents reported more distress 2-3 years following diagnosis (Hood, 2012). Moreover, another study in Bangladesh showed that duration since detection of diabetes mellitus significantly influenced the level of diabetes distress. Diabetes distress occurred among 29.5% patients who had diabetes duration $\leq$ 10 years. Whereas, among those diagnosed with diabetes for more than 10 years diabetes distress occurred in 88.7% (Islam et al., 2013; Islam et al., 2017). Diabetes duration had a positive correlation with diabetes distress (r= 0.64, $p<0.001$) (Islam et al., 2013)

Sleep dysfunction. A study among T2DM patients in China revealed that diabetes distress was negatively associated with total sleep time (β= -0.19). Individuals with less sleep time experienced higher diabetes distress. Sleep time of 5 hours or less is associated with an increased prevalence of diabetes mellitus. Poor sleep quality can worsen insulin resistance and result in poor glycemic control. Furthermore, lack of sleep accompanied by diabetes distress negatively affects the quality of life of people with T2DM (Zhou et al., 2017).

Family support. A study among 425 Norwegians with T2DM showed that diabetes distress was negatively associated with family support (r= -0.14, $p<0.01$)

(Karlsen et al., 2012). Higher perceived support from family can reduce the level of diabetes distress (Baek et al., 2014; Karlsen & Bru, 2014; Karlsen et al., 2012). In addition, greater support satisfaction was significantly associated with lower distress after controlling for burden. Support satisfaction and amount of support significantly moderated the relationship with diabetes distress (Baek et al., 2014). Whereas, non-supportive behaviors from family may be a source of distress. Negative behaviors such as nagging and criticism from family members may give rise to more perceived problems in living with T2DM and increase feeling of distress. These non-supportive family behaviors were positively associated with diabetes distress (r= 0.41, p<0.001) (Karlsen et al., 2012).

Self-efficacy. Self-efficacy is a person's trust in the ability to take action to achieve the expected results. A person who has this belief can independently lead a determined life and will be more free from despair and experience less distress. (Kim et al., 2015). Self-efficacy is a major factor of self-determination that influences behavior in varying contexts and situations. If people do not believe they can obtain their desired results, they have limited incentive to try. People with low self-efficacy beliefs are easily discouraged, whereas people with high efficacy beliefs will persevere during challenging times. In individuals diagnosed with diabetes, the belief that they have the ability to gain, improve, or maintain glycemic control may contribute to the decision and motivation for making the necessary behavioral changes (Chung, 2014). A study conducted in Chinese patients with T2DM have shown a negative relationship between self-efficacy and diabetes distress (r = -0.31, p < 0.001) (Wang et al., 2017). Moreover, another study conducted among American

T2DM patients also showed the same relationship between diabetes self-efficacy and diabetes distress (r= -0.53, $p<0.01$) (Wardian & Sun, 2014).

      Spirituality. A previous cross-sectional research study among black women with T2DM showed that spirituality has been associated with diabetes distress in patients with T2DM. The correlation is negative which means that the patients with higher levels of spirituality have lower levels of diabetes distress. The standardized coefficient of this relationship was 0.40 (Newlin et al., 2008). It was found that participation in religious acts reduced stress levels. Spirituality is a source of emotional support that protects people against negative feelings, ways of life and behavior by strengthening type 2 diabetes patients in dealing with the daily challenges caused by their illness in a more effective way. It helped them accept personal responsibility from self-management, and gave them the strength and support to make appropriate daily decisions regarding disease management (Darvyri et al., 2018). Another study revealed the relationship between religious practice and disease, this can promote health as a coping mechanism, because patients will turn to God, with frequent attendance at religious services when conditions become worse, to provide strength and comfort, or as a complement to medical therapy, with a significant correlation in reducing deaths. Religious coping has a role as efforts to find spiritual connections, and supportive collaboration with God in problem solving. It has been considered an important strategy in dealing with disasters and maintaining self-acceptance to facilitate useful solutions, fight the psychological impact of negative life events or to increase self-empowerment in managing poor health conditions. Furthermore, spiritual coping can be used in any spiritual aspect in life, such as belief

in divine beings, performing ritual actions to maintain harmony with others, as levers to improve self-empowerment (Permana, 2018).

In summary, it is rare that a study proposes to identify factors that influence diabetes distress among older persons with T2DM. Therefore, the prediction factors of this study were chosen based on the relevant literature available. Moreover, literature showed among Indonesian patients with T2DM, family support, self-efficacy, and spirituality are the important factors used in overcoming distress. Therefore, family support, self-efficacy and spirituality were chosen in this study.

Instruments Related to the Study Variables

The literature review revealed that there were several instruments used to measure diabetes distress, family support, self-efficacy, and spirituality. The research instruments are described as follows:

Measurement of diabetes distress. The literature review showed the different measurement tools used to measure diabetes distress. Generally, there are two tools, The Diabetes Distress Scale and Problem Area in Diabetes Scale.

1. Problem Area in Diabetes Scale (PAID) consists of 20 statements to identify the overall diabetes distress score. The patient rates on a 5-point Likert scale (0= not a problem, 1= Minor problem, 2= Moderated problem, 3= Somewhat serious problem and 4= Serious problem). The total score ranges from 0 to 100 with a higher score indicating greater emotional distress (Fisher et al., 2012). The PAID has been reported to have adequate validity and reliability. Cronbach's alpha values ranged between 0.93 and 0.95 (Jannoo, Wah, Lazim, & Hassali, 2017). However, this scale

was standardized primarily with adults with Type 1 diabetes mellitus. Moreover, the subscale score of diabetes distress is not identified in this scale (Fisher et al., 2019).

2. The Diabetes Distress Scale (DDS) was developed by Polonsky et al. (2005) to measure distress related to the burden of managing diabetes. The instrument contains 17 items with four separate domains related to the burden of managing diabetes: 1) emotional burden, 2) physician-related distress, 3) regimen-related distress, and 4) interpersonal distress. Diabetes distress uses a Likert scale with each item scored from 1 (no distress) to 6 (serious distress) concerning distress experienced over the last month, with a mean item score of $2 \geq$ (moderate distress) used as the distress cut-point (Fisher et al., 2008). Moreover, this scale was standardized primarily with adults with Type 2 diabetes mellitus (Fisher et al., 2019). A previous study showed the internal consistency reliability of this scale was adequate with a Cronbach's alpha of 0.93 (Polonsky et al., 2005).

DDS and PAID both have certain advantages in measuring diabetes distress. However, the PAID scale' questions do not cover the subscale of diabetes distress to identify the specific sources of diabetes distress (Fisher et al., 2019). Moreover, some of the questions are difficult to interpret and understand for patients (Berry et al., 2015). Subsequently, the validation study showed that the DDS has a consistent factor structure that is more precise and consistent compared to PAID (Schmitt et al., 2016). Hence, after considering these criticisms, the DDS scale was used in the study.

Measurement of family support. The literature review found that there were several instruments used to measure family support. The instruments are described as follows:

1.   The Diabetes Family Behavior Checklist (DFBC), developed by Schafer and colleagues (1986), is widely used to measure family support for people suffering diabetes. Generally, the tool has two domains, the positive items indicate supportive family behavior and the negative items, indicate non-supportive behavior from the family. The tool consists 16 items covering support related to diet, exercise, medication adherence, blood glucose monitoring, and doctor's appointment management. The scale ranges from 1 (never) to 5 (at least once a day). Supportive and non-supportive items are calculated separately. A higher score on the subscale indicates greater supportive or non-supportive family behaviors (Choi, 2009). Previous studies revealed that this tool has adequate reliability. A study conducted among 378 Norwegian with T2DM showed the Cronbach's alpha of positive and negative items were 0.79, and =0.78 respectively (Karlsen & Bru, 2012). Moreover, a study conducted among 75 Americans with T2DM showed the Cronbach's alpha of positive and negative items were 0.85 and 0.78, respectively (Mayberry & Osborn, 2015).

2.   The Diabetes Family Support and Conflict was developed to assesses the frequency of supportive and unsupportive interactions of family over patients with diabetes. The tool consists of 10 items measure diet, exercise, medication, psychological support, and conflict. The items are measured using a five-point (1-5) Likert scale ranging from yes, always to no, never. In this tool, family support and family conflict are calculated separately. Higher scores indicate greater support or conflict. A study conducted among adult with T2DM in New Zealand revealed that the tool has a Cronbach's alpha 0.84. This tool, however, did not measure the support from family members related to blood glucose monitoring (Paddison, 2010).

3.   The Julkunen Family Support Scale was developed to assess the sense of support individuals receive from family members. The tool consists of 13 items regarding the sense of how much the subject is supported by the persons with whom they live. The items in this scale range from 1 (not relevant) to 4 (absolutely relevant). This tool was tested among 130 patients with chronic diseases including diabetes in Greece. The findings showed that the Cronbach's alpha of this tool was 0.82 (Tselebis et al., 2011). This tool, however, was not specifically developed for use with the diabetes population. Moreover, the questions in this tool do not specifically relate to diabetes.

The DFBC, The Diabetes Family Support and Conflict, and The Julkunen Family Support Scale have certain advantages in measuring family support. However, among these three instruments, The DFBC has covered the scope of diabetes related family support more completely than The Diabetes Family Support and Conflict, and The Julkunen Family Support Scale. Furthermore, the scale was specifically developed to measure family support received by patients with diabetes. Hence, after consideration of these criticisms, the DFBC was used in this study.

Measurement of self-efficacy. The literature review found that there were several instruments used to measure self-efficacy. The instruments are described as follows.

1.   Diabetes Management Self-Efficacy Scale (DMSES) developed by Bijl et al. (1999) to measure the level of self-efficacy of patients with type 2 diabetes mellitus. The tool consists of 20 items that measure three main contexts related to diabetes activity: 1) diabetes management activity performance, essential diabetes treatment including medication use, diet and physical exercise management, 2) self-

observation including self-control or observation and reporting glucose in urine and blood, body weight, skin condition of feet and general health condition, 3) self-regulating activities including correction of hypo- and hyperglycemia, preparation for a vacation, variation in nutrition, and self-regulation in extra body weight, illness and stress. Prior studies revealed that this scale was tested among patients with T2DM in Korea, Malaysia, and the Netherlands with Cronbach's alpha scores of 0.94, 0.70, and 0.81, respectively (Bijl et al., 1999; Devarajoh et al., 2017; Lee et al., 2009).

2.   The Diabetes Empowerment Scale (DES) was developed to measures self-efficacy among patients with diabetes. The tool consists of 20 items related to overcoming barriers, determining suitable methods, achieving goals, obtaining support, and coping. Each item is rated with a five-point Likert scale with 1 indicating strongly disagree and 5 strongly agree. The total score ranges from 20 to 100. A higher total score indicates higher empowerment or self-efficacy. This tool has a low reliability with Cronbach's alpha at 0.69 (Lin et al., 2017).

3.   The Diabetes Self-Efficacy Scale (DSLF) was developed to measure self-efficacy in women with T2DM. The tool consists of two subscales namely 1) diabetes knowledge of self-care activity, diabetes diet self-care (DSLF-I), and 2) diabetes medication self-care (DSLF-II). The DSLF-I and DSLF-II consist of 12 items in an 11- point Likert scale ranging from 0 (not at all confident) to 10 (very confident). This tool was tested among 208 women with T2DM with Cronbach's alpha of DSLF-I at 0.82, and DSLF-II at 0.98 (Grinslade et al., 2015).

The literature review showed of these three instruments, the DMSES is more appropriate to measure self-efficacy in patients with T2DM. The tool covers four dimensions of diabetes self-care activities which patients with T2DM have to perform

to prevent short- and long-term complications. Moreover, this instrument was developed based on self-care activities the patients have to carry out in order to manage their diabetes. Nevertheless, the DES showed a weak reliability. Whereas, the DSLF was developed particularly to measure self-efficacy in women with T2DM. In this study, the Diabetes Management Self-Efficacy Scale was used to measure self-efficacy.

Measurement of spirituality. The literature review found that there were several instruments used to measure spirituality. The instruments are described as follows.

1. The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being, Expanded (FACIT-Sp-Ex) was developed to measure spirituality among populations with chronic illness including diabetes. The tool has 23 items assessing a sense of meaning, peace, purpose in life, role of faith in illness, connectedness, love, gratitude, and forgiveness. Each item in this scale is rated on a 5-point Likert scale from 0 (not at all) to 4 (very much) (Peterman et al., 2002). A previous study tested this tool among 5.163 patients with major chronic illness including diabetes in the USA. The results showed the Cronbach's alpha of FACIT-Sp-Ex was 0.91 (Brintz et al., 2017).

2. The Daily Spiritual Experience Subscale (DSES) was used to measure a person's perception of the transcendent (God, the divine) in daily life. The tool has 6 items consisting of meaning, peace and belief in a higher power. Moreover, this tool assesses the presence of the transcendent in daily life, and perception of interaction with or involvement of the transcendent in life. Participants were asked to respond using in a modified Likert scale comprising many times a day, every day, most days,

some days, once in a while, and never or almost never. A lower total summed score reflected more frequent daily spiritual experiences. A prior study conducted among 201 American patients with T2DM showed the Cronbach's alpha of this scale was 0.92 (Lynch et al., 2012).

However, the psychosocial religious mediators such as congregational support, coping style, and attendance at religious services were not measured by this tool. Moreover, the tool was not developed specifically to measure spirituality related to illness such as diabetes.

3. Red's Scale of Spiritual Perspective (RSSP) was developed to measure spiritual beliefs and spiritual practice among patient with diabetes. The tool has 10 items concerning spiritual practice and spiritual beliefs. The spiritual practice subscale consists four questions rated with 6 possible answers namely; never, less than once a year, more or less once a year, more or less once a month, more or less once a week. Whereas, the spiritual beliefs subscale consists of 6 items rated with possible answers namely; extremely disagree, disagree, disagree rather than agree, agree rather than disagree, agree, and extremely agree. The score is calculated by the average of the total items score. A study conducted among 54 adults with diabetes in Peru showed the Cronbach's alpha of this scale was 0.87 (Krederdt-Arujo et al., 2019). Nevertheless, the responses to this tool are seen as confusing, especially for older persons. Moreover, the items do not specifically relate to the illness or diabetes context.

According to this literature review, the FACIT-Sp-Ex showed a high score of reliability. Moreover, the tool was originally developed to measure spirituality among persons with chronic illness including diabetes. The item consists of dimensions of

spirituality which cover questions related to the illness. Therefore, this study used the FACIT-Sp-Ex as the instrument to measure spirituality.

Summary of Literature Review

T2DM develops slowly and is often undetected, especially in older persons. Although undiagnosed, diabetes can produce symptoms, which result in complications and worsen existing comorbidities. In older persons, diabetes can be asymptomatic in up to 50% of sufferers. However, the symptoms that appear are non-specific and can be associated with aging. Moreover, there is no difference in the diagnostic criteria of diabetes for older persons and other age groups. It remains constant across all ages

Persons with T2DM have an obligation associated with management of their diabetes which requires changes in their daily lives. The increased prevalence of comorbidity combined with geriatric syndrome contribute to the complexity of diabetes management in older persons. Moreover, the burden of daily self-management causes an emotional response from patients with diabetes in the form of diabetes distress. Diabetes distress significantly impacts medication-taking behaviors, and negatively affects dietary, and exercise behaviors which may contribute to the high rate of diabetes complications and degrade quality of life. The consequences of diabetes distress make it important to pay attention to the treatment of T2DM, especially in older patients as several studies show that higher rates of distress occurs in this group.

Several studies revealed that diabetes distress was associated with several factors including treatment regimen, self-management, neighborhood, diabetes

duration, sleep dysfunction, family support, self-efficacy, and spirituality. However, it is rare studies are conducted specifically among older persons with T2DM. Furthermore, literature showed among Indonesian patients with T2DM, family support, self-efficacy, and spirituality are the important factors used in overcoming distress. Therefore, family support, self-efficacy and spirituality were chosen to be the predictive factors of diabetes distress in this study

Chapter 3

Research Methodology

This chapter explains the research design, setting, population and sample, sample size estimation, instrumentation, the validity and reliability of the instruments, the translation of the instruments, data collection procedures, ethical considerations, and data analysis of the study.

Research Design

This study was conducted with a cross sectional predictive design, which aimed to assess the level of diabetes distress, and determined predictive factors of diabetes distress among Indonesian older persons with type 2 diabetes mellitus.

Setting

The study was conducted in outpatient department, Geriatric Clinic, Central General Hospital Dr. Soeradji Tirtonegoro, which is located in Klaten, Central Java province, Indonesia. The hospital has been designated a National Referral Hospital specially for geriatric care.

In Indonesia, there are 14 national referral hospitals located in 13 provinces, namely North Sumatra, South Sumatra, DKI Jakarta, West Java, DI Yogyakarta, Central Java, East Java, and Bali. Other provinces are South Kalimantan, West Kalimantan, South Sulawesi, Maluku and Papua. Central General Hospital Dr. Soeradji Tirtonegoro is one of several national referral hospitals located in the province of Central Java.

In term of geriatric care, the hospital has a geriatric clinic which specifically provides health care service for older persons. The clinic provides integrated geriatric services including services for internal medicine, psychiatry, neurology, medical rehabilitation, dental and mouth examination, nutrition consultation, physiotherapy, laboratory examination and pharmacy service. All of the older person patients who come to the outpatient department of this hospital will be referred to the geriatric clinic. The patients of this geriatric clinic have been referred from various provinces in Indonesia including Yogyakarta, Central Java, Jakarta, West Java, North Sumatra, and West Sumatra.

Moreover, this hospital provides several programs and services related to diabetes care. They have outpatient and inpatient internal medicine departments which provide health care for patients with chronic diseases including diabetes mellitus. Moreover, the hospital also holds monthly diabetes education in the outpatient department, this education program consists of diet management plan, physical exercise, medication treatment, and complication prevention education.

In addition, the hospital has also established diabetes care activities which include weekly group diabetes exercise, blood glucose and blood pressure testing, and diabetes education program. Participants in this program include the community from around Klaten City, the Hospital and anyone who wants to participate for free. This program was established to improve the health-related quality of life among the community.

Population and Sample

The population in this study were older persons with T2DM admitted at Central General Hospital Dr. Soeradji Tirtonegoro, Klaten, Indonesia selected by purposive sampling method.

Inclusion criteria. To be selected for the study, participants' needed to match the following criteria:

1. older persons aged 60 years old or more;

2. have been diagnosed with T2DM

3. are able to communicate in Indonesian language.

4. did not have cognitive impairment diagnosed by physician.

Sample Size Estimation

This study used power analysis to determine the sample size estimation. Moreover, function of effect size, the number of predictors, desired power, and significance criterion were used to estimate the number of participants needed. The multiple regression formula of Polit and Beck (2016), was used to calculate sample size. The formula is described as follows.

$N = L / \gamma + \kappa + 1$

Where,

N = estimated number of subjects needed

L = tabled value for the desired α and power

γ = estimated effect size

K = number of predictors

The value of estimated effect size (ᵞ) is calculated as:

$$\gamma = R^2 / 1 - R^2$$

According to Polit's table (1996), if a study consists of three independent variables then the power (L) of the three variables is 10.90. A previous study conducted in USA showed that the correlation coefficient of family support and diabetes distress was 0.10 (Karlsen & Bru, 2014). Another study in the USA found that the correlation coefficient of self-efficacy and diabetes distress was 0.30 (Wang et al., 2017). In addition, another study revealed that spirituality was significantly related to diabetes distress with a standardized coefficient of 0.40 (Newlin, et al., 2008). Therefore, in this study, the correlation coefficient value of 0.25, which was between 0.10 and 0.40, was selected to be used for the sample size calculation. Based on the correlation coefficient value of 0.25 accounted for the gamma (ᵞ) value of 0.06, the calculation of the sample size of the three variables is based on power analysis formula, which accounted for the total of 186 individuals.

Moreover, according to Grove and Cipher (2017), researchers need to identify a large enough accessible population to ensure that an adequate sample is obtained after accounting for refusal rates. Refusal rate is the percentage of potential subjects who decide not to participate in a study. The researcher used a refusal rate of 10%. Therefore, the total sample obtained in the present study was 206.

However, in the data analysis some outliers were found. The outliers were managed, by removing eight of the participants' data to meet the assumption. Therefore, only a total of 198 participants were included in this study.

Instrumentation

There were five instruments used for data collection in this study. They were 1) Personal Characteristics Questionnaire, 2) Diabetes Distress Scale, 3) Diabetes Family Behavior Checklist, 4) Diabetes Management Self-Efficacy Scale, and 5) The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale Expanded version (FACIT-Sp-Ex). The instruments are described below.

Personal Characteristics Questionnaire. This questionnaire was developed by the researcher based on the literature review. This questionnaire consists of the demographic and clinical characteristics of the patients. The demographic data consists of 8 questions based on age, gender, religion, ethnicity, marital status, monthly income, level of education, and occupation. Whereas the clinical characteristics consists of questions based on the treatment modality, diabetes complication, duration of having diabetes mellitus, comorbidities, underlying diseases, and current clinical information including blood pressure, blood glucose, BMI.

Diabetes Distress Scale (DDS). DDS is an instrument widely used to measure the diabetes-related emotional distress in diabetic patients. This is a 17-item scale that measures diabetes distress in four domains including emotional burden, physician related distress, regimen-related distress, and interpersonal distress. All statements were measured on a 6-point Likert scale ranging from 1 = not a problem to 6 = serious problem. The mean score of the 17 items was used, with higher scores indicating greater distress (Fisher et al., 2008). In this study, the researcher will use the DDS Indonesian version which was translated, revised and validated by Arifin et al.,

(2017). The reliability of this scale was tested with Cronbach α of four domains ranged from 0.78 to 0.83.

The DDS total score reflects overall diabetes distress from all domains (17 items). This is the average response across items 1 to 17. Moreover, each subscale of the DDS also can be scored from the average score of each item as follows:

1. Emotional burden by average of 5 items which consist of item numbers 2, 4, 7, 10, and 14.

2. Physician related distress by average of 4 items which are numbers 1, 5, 11, and 15.

3. Regimen related distress by average of 5 items which are numbers 6, 8, 3, 12, and 16.

4. Interpersonal distress by average of 3 items which are numbers 9, 13, and 17.

Moreover, the level of diabetes distress was categorized in three levels according to the Diabetes distress Assessment and Resource Center (2017) as follows.

Levels of diabetes distress	Average score
Low	<2.0
Moderate	2.0 - 2.9
High	≥ 3.0

The Diabetes Family Behavior Checklist. This questionnaire was widely used to assess family support for people suffering from type 2 diabetes. In the present study, the researcher modified the term "insulin" in items number 3 and 14 to "DM medication" based on the experts' suggestion, in order to be more representative of the treatment regimen received by respondents. Karlsen and Bru (2014) explained that originally in this scale, the participants rated frequency of close relatives or significant others living with them who provide constructive support or demonstrate supportive behavior. Moreover, this scale consists of 16 items with 9 positive (supportive) items including item numbers 1,3,5,8,9,10,12,13 and 15. 7 negative (non-supportive) items

including item numbers 2,4,6,7,11,14 and 16. This scale includes response
alternatives according to a 5-point Likert-type scale: never, seldom, sometimes, often
and very often (scores from 1 to 5) in the areas of medication compliance, glucose
testing, exercise, and diet (Choi, 2009). The family support were categorized in two
categories according to Karlsen and Bru (2014).

Categories of family support	Total score
Supportive behaviors	Higher scores on positive items
Non-supportive behaviors	Higher scores on negative items

The Diabetes Management Self-Efficacy Scale. This instrument was a
widely used to measure diabetes-specific self-efficacy and was developed by Bijl et
al. (1999). The questionnaire originally contained 20 items with a 10-point Likert-
type scale ranging from 1= Yes, to 10= definitely not. Higher scores on the scale
would indicate lower self-efficacy in diabetes management. This scale reflects the
three self-care tasks of: 1) performing activities, 2) self-observation, and 3) self-
regulating activities. Performing activities include self-care activities such as
medication management, diet/nutrition, and physical exercise. Moreover, self-
observation in this context is the frequent monitoring of bodily functions and general
health condition, including glucose monitoring, weight control, feet and skin care.
Whereas, self-regulating activities refers to regulation of hypo- and hyperglycemia as
well as regulating nutrition, exercise, and overall health wellness (Chung, 2014). In
the present study, the researcher changed the term "walking the dog" in item number
8 to be "walking or biking or calisthenics or swimming or other exercises" based on
the experts' suggestion in order to be more representative of Indonesian culture and
context.

Total score ranges from 0 to 200, lower scores indicating low self-efficacy for coping with the activities listed. The scores were grouped in three categories according to Chew et al. (2018) as follows:

Level of self-efficacy	Total score
Low	≤ 135
Moderate	136 - 165
High	≥ 166

The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale (FACIT-Sp) expanded version. This scale was widely used measure of spirituality in people with chronic illness developed by Bredle et al. (2011). The scale consists of 23 items and three sub-domains of spirituality including meaning/peace, faith and relational. The items concerned peacefulness, forgiveness, connectedness, and appreciation. In this present study, the researcher modified the term of "illness" to "diabetes" based on the experts' suggestion in order to be more representative of the context of diabetes.

The questionnaire has a five-point Likert-scale ranging from 0= Not at all; 1= a little bit; 2= somewhat; 3= quite a bit; 4= very much (Bredle et al., 2011). This scale provides questions regarding the aspects of spirituality that were deemed most important to those who were living with chronic illness (Peterman et al., 2014). Total score ranges from 0 to 92, which can be calculated by the sum of the individual item score multiplied by 23 then divided by the number of items answered. A higher score indicates a higher level of spirituality. The levels of spirituality were categorized in three levels according to Peterman et al. (2014) as follows:

Level of spirituality	Total score
Low	≤ 45
Moderate	46 - 68
High	≥ 69

Validity of the Instruments

In this study, the content validity of Diabetes Family Behavior Checklist, Diabetes Management Self-Efficacy Scale, and The Functional Assessment of Chronic Illness Therapy-Spiritual Well-Being Scale expanded version were validated by three experts. One expert was a lecturer from Prince of Songkla University, Thailand. Another two experts were a lecturer from Alma Ata University, Indonesia and an internist from Central General Hospital of dr. Sardjito, Indonesia. The experts reviewed the mentioned questionnaires to ensure that all the items were sufficient to measure all the variables in this study. Changes in the instrument's items were made on the basis of experts' opinion. The experts evaluated the suitability of the questionnaires to the related construct, the clinical and cultural appropriateness, and language relevance in the Indonesian context. They were asked to rate each item of the questionnaires on a 4-point scale with "1" indicating not relevant through to "4" indicating very relevant. Based on the expert's suggestion, some items of the questionnaires were revised or changed. Subsequently, the scale content validity index (S-CVI) was calculated. The S-CVI value of equal or greater than 0.80 is considered acceptable (Beck & Polit, 2012), and in this study, S-CVI of DFBC, DMSES, and FACIT-Sp Ex were calculated and the S-CVI values of these tools were 0.87, 0.91 and 1, respectively.

Reliability of the Instruments

The reliability of the instruments is the consistency of the measurement of the construct the instrument intends to measure (Polit & Beck, 2016). In this study, the internal consistency reliability was used for testing DFBC, DMSES, and FACIT-Sp-Ex.

The reliability test study was conducted in 30 older persons with T2DM who met the inclusion criteria in the Geriatric clinic, dr. Soeradji Tirtonegoro, Klaten, Indonesia. Cronbach's alpha coefficient was calculated to determine the reliability of the instruments and a Cronbach's alpha coefficient greater than 0.70 is acceptable (Beck & Polit, 2012). Cronbach's alpha coefficients for DFBC, DMSES, and FACIT-Sp Ex were 0.72, 0.88, and 0.91, respectively.

Translation of the Instruments

Istruments used in this study were originally developed in the English language. However, one questionnaire the DDS has been translated and validated in Indonesian language. Hence, the other three questionnaires (DFBC, DMSES, and FACIT-Sp Ex) were translated into Indonesian version. Hence, the back-translation method purposed by Brislin (1980) was used for translation of the instruments.

The translation of instruments in this study was carried out by two translators and one reviewer who was fluent in English and Indonesian and familiar with the Indonesian cultural context. First, the first translator who was a lecturer at Nursing College translated the instrument into the Indonesian version. Then the second translator who was a lecturer at the University again translated the Indonesian version into English. The translated Indonesian and English versions of the instrument were

reviewed by a third translator. Changes to the questionnaire were made according to the comments of the third translator.

Data Collection Method

The data collection method was carried out through two phases, preparation and implementation. These phases are explained below:

Preparation phase. The preparation phase for data collection begins with obtaining ethical approval, permission, and preparing measurement tools, which consist of the following steps.

1. Ethical approval was obtained from the Institutional Review Board, Behavioral and Social Science, Prince of Songkla University, Thailand.

2. Permission was obtained from Central General Hospital dr. Soeradji Tirtonegoro, Indonesia.

3. Required instruments were prepared including tools translation and informed consent.

4. Tools have been tested for validity and reliability by testing the Indonesian version of the questionnaire in participants with similar characteristics as the study population.

Implementation phase. This phase consists of participants recrutement and data collection through the following steps.

1. After receiving the ethical approval from the Institutional Review Board, Behavioral and Social Science, Prince of Songkla University, Thailand, the researcher went to Central General Hospital Dr. Soeradji Tirtonegoro and introduced himself to the Education and Research Department, Outpatient Department. The

researcher explains the purpose, benefits, scope, research risks and data collection procedures.

    2. The researcher went to the outpatient department, and head of Geriatric Clinic Central General Hospital dr. Soeradji Tirtonegoro and contacted the registered nurse and head of Geriatric Clinic, which was a medical doctor to identify potential participants. Then requested permission from the eligible older persons to participate in the study.

    3. The researcher met eligible older persons at the geriatric clinic and introduced himself and explained information about the research that includes the objectives, benefits, potential risks of the study and data collection procedures. After obtaining permission, data collection was carried out to the participants.

    4. The researcher explained the informed consent to the participants and asked them to sign the agreement before data collection began.

    5. The researcher reads the questionnaire to the participants and explains the instructions to answer it.

    6. The researcher checked the completeness of the questionnaire before the participants left.

Ethical Considerations

Ethical considerations in this study were based on the ethical principles proposed by Polit and Beck, (2016) namely, beneficence, respect for human dignity, and justice. Data collection was conducted after obtaining permission from the Institutional Review Board, Behavioral and Social Science, Prince of Songkla University, Thailand number PSU IRB 2019-NSt 004. In addition, the researchers

obtained permission to use and translate the instruments in the study from the authorized person or organization.

The ethical principle of beneficence refers to the researchers' responsibility to maximize benefit and minimize harm during the study (Polit & Beck, 2012). In this study, researchers maintained the principle of respect for human dignity through a full explanation of information about the nature of research such as objectives, procedures, risks, and benefits of research to participants who were willing to participate. There was no compulsion for participants to participate in this study. Verbal and written informed consent were obtained from them. In addition, researchers also explained to participants that they could withdraw from the study at any time and also allowed to ask questions during data collection.

The researcher also ensured participants had the right to fair treatment and privacy by applying the principle of justice according to Polit and Beck (2012).

Data Analysis

1.   All data were entered, checked, and analyzed using computer software. The personal characteristics data and study variables were analyzed by descriptive statistics consisting of frequency, percentage, mean, and standard deviation.

2.   The assumptions of multiple regression, consisting of normality, linearity, homoscedasticity, multicollinearity, and autocorrelation were checked prior to analyzing the data (Appendix L).

3.   Multiple regression was used to examine the predictive factors of family support, self-efficacy, and spirituality on diabetes distress.

3.1   The normality of diabetes distress, family support, self-efficacy, and spirituality were checked. It was found that diabetes distress did not have normal distribution. Therefore, the data from 8 samples were removed from the analysis. Finally, the data from 198 samples were used for the final analysis.

3.2   The linearity between each independent variable and dependent variable were checked by using a scatter plot. The results showed that the assumption of linearity of all pairs of independent and dependent variables were assumed.

3.3   Homoscedasticity evaluation can be done by examining the scatterplot between the residual of dependent variable against the residual of each independent variable. In this study, the results showed that the assumption of homoscedasticity was assumed.

3.4   The multicollinearity was checked for the correlation between the independent variables. Multicollinearity can be determined by using tolerance and Variance Inflation Factor (VIF). The results showed that the values of tolerance of family support, self-efficacy, and spirituality were 0.96, 0.95, and 0.91, respectively. These values were greater than 0.10 which indicates that the multicollinearity among the independent variables is not assumed (Pallant, 2011). Moreover, the values indicated no multicollinearity among the independent variables (Pallant, 2011).

3.5   Autocorrelation was checked for errors of independent variables. It was found that the errors of each variable did not show autocorrelation detected by a Durbin-Watson value of 1.9, which was between 1.5-2.5 (Tabachnic & Fidell, 2013)

Chapter 4

Results and Discussion

This chapter explains the results and the discussion of the study. This study was conducted among 198 older persons who were suffering type 2 diabetes mellitus. The details and explanation are as follows.

Results

This chapter consists of the results as follows: 1) personal characteristics of the participants, 2) the level of study variables (family support, self-efficacy, spirituality, and diabetes distress), and 3) the relationship and predictive value of the study variables.

Personal characteristics of the participants. The data of personal characteristics of the participants were divided into two categories which are demographic characteristics and clinical characteristics.

Demographic characteristics. The participants in the study who were 198 older persons with T2DM between the ages of 60 to 88 years old ($M = 69.34$, $SD = 5.57$). More than half of participants (58.6%) were aged between 60 to 69 years old. The highest percentage (58.6%) of participants were female. More than half of participants' religion (59.6%) was Islam. Regarding marital status, 131 participants (66.2%) were married. The majority of participants in this study 196 (99%), were Javanese. Seventy-five (37.9%) of participants had completed senior high school education. In term of occupation, 63.7% of the respondents were retired. Moreover, more than half of participants (52.5%) reported that their monthly income ranged

from 2,600,000 to 5,000,000 IDR. The demographic characteristics of the participants

are shown in Table 1.

Table 1.

Frequency and Percentage of the Demographic Characteristics of the Participants
(N = 198)

Characteristics	*N*	%
Age		
60-69 years	116	58.6
≥70 years	82	41.2
M = 69.34, SD = 5.57, Min-Max =60-88		
Gender		
Female	116	58.6
Male	82	41.4
Religion		
Islam	118	59.6
Christian	43	21.7
Catholic	36	18.2
Hindu	1	.5
Marital Status		
Married	131	66.2
Widowed	59	29.8
Single	4	2.0
Widower	4	2.0
Ethnicity		
Javanese	196	99.0
Sumatran	1	.5
Chinese	1	.5
Level of education		
Elementary school	25	12.6
Junior high school	33	16.7
Senior high school	75	37.9
Diploma degree	18	9.1
Bachelor degree	39	19.7
Master Degree	1	.5
Doctoral Degree	1	.5
No School	6	3.0

Note. *M* = mean, *SD* = standard deviation, *min* = minimum, *max* = maximum,
N = frequency, % = percentage

Table 1 (continued)

Characteristics	*N*	%
Occupation		
Retired	126	63.7
Housewife	47	23.7
Entrepreneur	16	8.1
Employee	5	2.5
Farmer	2	1.0
Teacher	2	1.0
Monthly Income		
< 1 million IDR	5	2.5
1 – 2.5 million IDR	85	43.0
2.6 - 5 million IDR	104	52.5
> 5 million IDR	4	2.0

Note. ** 1 USD = 14,221 IDR. IDR* = Indonesian Rupiah, *N* = frequency, % = percentage

Clinical characteristics. Regarding their treatment regimen, 124 (62.6%) of participants had received oral medication, 45 (22.7%) of participants had received both oral medication and insulin, and only 29 (14.7%) of them had received insulin. In term of diabetes duration, this ranged from 2 months to 30 years with a mean duration of 12.58 (*SD* = 7.43), more than half (65.6%) of them had suffered diabetes for more than 10 years. The most common diabetes complication was coronary heart disease which was suffered by 18 (9.1%) older persons with type 2 diabetes. Moreover, more than half (54%) of them also had hypertension as the underlying disease. Regarding blood glucose, this ranged from 69-633 mg/dL (*M* = 178.42, *SD* = 2.13) and more than two-thirds (71.2%) of participants had controlled blood glucose. In term of BMI, 106 (53.5%) participants had normal range from 18.5-24.9 kg/m^2. The clinical characteristics of the participants are shown in Table 2.

Table 2

Frequency and Percentage of the Clinical Characteristics of the Participants

(N = 198)

Characteristics	*N*	%
Treatment regimen		
Oral medication	124	62.6
Insulin	29	14.7
Both oral medication and Insulin	45	22.7
Duration of diabetes		
< 1 year	4	2.0
1 – 5 years	31	15.7
6 – 10 years	33	16.7
> 10 years	130	65.6
M = 12.58, SD = 7.43, Min-Max = 0.2-30		
Complications		
Without complication	153	77.4
Coronary heart disease	18	9.1
Stroke	6	3.0
Diabetes retinopathy	6	3.0
Diabetes neuropathy	3	1.5
Combination of diabetes neuropathy and coronary heart disease	3	1.5
Combination of coronary heart disease and stroke	3	1.5
Erectile dysfunction	1	0.5
Chronic kidney disease	1	0.5
Combination of erectile disfunction and coronary heart disease	1	0.5
Combination of diabetes retinopathy and coronary heart disease	1	0.5
Combination of diabetes retinopathy and stroke	1	0.5
Combination of stroke and chronic kidney disease	1	0.5
Underlying diseases		
Hypertension	107	54.0
Combination of hypertension and osteoarthritis	11	5.5
Asthma	3	1.5
Osteoarthritis	3	1.5
Combination of hypertension and dyslipidemia	3	1.5
Combination of hypertension and asthma	1	0.5
Combination of hypertension and gall stone	1	0.5
Without underlying disease	69	35.0

Note. *M* = mean, *SD* = standard deviation, *min* = minimum, *max* = maximum, *N* = frequency, % = percentage

Table 2 (continued)

Characteristics	*N*	%
Blood Glucose *Min-Max = 69 – 633, M = 178.42, SD = 2.13*		
Controlled Blood Glucose (<200 mg/dL)	141	71.2
Uncontrolled Blood Glucose ((≥ 200 mg/dL)	57	28.8
BMI *Min-Max = 15.63 – 37.78, M = 24.9, SD = 4.04*		
Underweight (< 18.5)	3	1.5
Normal (18.5-24.9)	106	53.5
Overweight (25-29.9)	59	29.8
Obese (≥ 30)	30	15.2
Systolic BP *Min-Max = 93-198, M = 140.76, SD = 21.93*		
Diastolic BP *Min-Max = 45-111, M = 71.65, SD = 11.58*		

Note. *M* = mean*, SD* = standard deviation*, min* = minimum*, max* = maximum, *N* = frequency, % = percentage

The level of the variables. The level of diabetes distress, family support, self-efficacy, and spirituality were reported. It was found that the total level of diabetes distress was at the low level ($M = 1.14$, $SD = 0.19$). Moreover, in term of the domain of diabetes distress, the level of emotional burden was the highest at 1.29 ($SD = 0.54$), followed by regimen-related distress at 1.19 ($SD = 0.33$), and interpersonal related distress at 1.02 ($SD = 0.18$). The level of physician-related distress was the lowest at 1.00 ($SD = 0.02$). In addition, the total family support with supportive behavior was ($M = 19.19$, $SD = 6.01$), the total level of self-efficacy was at moderate level, ($M = 164.97$, $SD = 23.92$), and the total level of spirituality was at high level, ($M = 74.60$, $SD = 9.36$). The level of the variables is displayed in Table 3.

Table 3

Mean, Standard Deviation, and Level of Diabetes Distress, Family Support, Self-Efficacy, and Spirituality (N = 198)

Variables	Possible Score	Min-Max	*M*	*SD*	Level
Diabetes distress	1-6	1-1.88	1.14	0.19	Low
Emotional Burden	1-6	1-4	1.29	0.54	Low
Regimen-Related Distress	1-6	1-2.8	1.19	0.33	Low
Interpersonal Distress	1-6	1-3	1.02	0.18	Low
Physician Related Distress	1-6	1-1.25	1.00	0.02	Low
Family Support					
Supportive Behavior	9-45	10-38	19.19	6.01	Supportive
Non-Supportive Behavior	7-35	7-26	9.59	2.93	Supportive
Self-efficacy	0-200	70-200	164.97	23.92	Moderate
Spirituality	0-92	48-92	74.60	9.36	High

Note. Min = Minimum, Max = Maximum, *M* = Mean, *SD* = Standard deviation

The relationship between the study variables: family support, self-efficacy, spirituality, and diabetes distress. The relationship was analyzed using Pearson correlation as the assumption of normality, linearity, and homoscedasticity were met (Appendix L). Pearson correlation showed a significant positive relationship between supportive behavior ($r = 0.15$, $p < 0.05$) and non-supportive behavior ($r = 0.21$, $p < 0.01$), with diabetes distress. On the contrary, there were significant negative correlations between self-efficacy ($r = -0.35$, $p < 0.01$), spirituality ($r = -0.21$, $p < 0.01$) and diabetes distress. The relationship between the study variables is illustrated in Table 4.

Table 4

Pearson Correlation Matrix of Family Support, Self-Efficacy, Spirituality, And Diabetes Distress (N = 198)

Variables	1	2	3	4	5
1. Supportive Behavior	1				
2. Non-supportive Behavior	0.47^*	1			
3. Self-Efficacy	-0.15^*	-0.23^{**}	1		
4. Spirituality	0.00	-0.05	0.22^{**}	1	
5. Diabetes distress	0.15^*	0.21^{**}	-0.35^{**}	0.21^{**}	1

Note. $^*p< 0.05$ $^{**}p< 0.01$

The predictive value of family support, self-efficacy, and spirituality on diabetes distress among older persons with type 2 diabetes mellitus. The variables under study, family support (supportive and non-supportive behavior), self-efficacy, and spirituality were entered into the stepwise regression (Table 5). The first step used stepwise regressions to test the predictor of self-efficacy (Model 1). From the analysis, it was revealed that 12.5% ($R^2 = 0.125$) of the variance in diabetes distress of older persons with T2DM was due to self-efficacy. Moreover, the model 2 showed that 14.4% ($R^2 = 0.144$) of the variance in diabetes distress of older persons with T2DM was due to self-efficacy and non-supportive family behavior. As shown in Model 3, 16.3% ($R^2 = 0.163$) of the variance in diabetes distress of older persons with T2DM was due to self-efficacy, non-supportive family behavior, and spirituality. Therefore, self- efficacy, non-supportive behavior, and spirituality were the variables that could statistically predict the diabetes distress among older persons with T2DM.

The multiple regression equation for this study is:

R^2 diabetes distress = 28.34 + (-0.04) (self-efficacy) + (0.16) (non-supportive

behavior) + (-0.05) (spirituality)

Table 5

The Predictive Factors of Diabetes Distress (N = 198)

Model	Variables	R	R^2	Adjusted R^2	F	P
1	Self-efficacy	0.35	0.125	0.120	27.95	0.000
2	Self-efficacy Non-supportive behavior	0.38	0.144	0.135	16.42	0.000
3	Self-efficacy Non-supportive behavior Spirituality	0.40	0.163	0.150	12.56	0.000

Note. Constant model 1 = 27.663, constant model 2 = 25.327, constant model 3 = 28.344

Self-efficacy was the strongest predictor of diabetes distress among older persons with T2DM (β = -0.29, p = 0.000), followed by non-supportive family behavior (β = 0.14, p = 0.036), and spirituality (β = -0.14, p = 0.040) (Table 6).

Table 6

Each Predictive Factor of Diabetes Distress (N = 198)

Predictors	B	β	t	p
Self-efficacy	-0.04	-0.29	-4.18	0.000
Non-supportive behavior	0.16	0.14	2.11	0.036
Spirituality	-0.05	-0.14	-2.07	0.040

Discussion

The discussion of the findings of the study is focused on the level of diabetes distress, the relationship between family support, self-efficacy, and spirituality, and the predicting factors of diabetes distress.

The level of diabetes distress. The level of diabetes distress was low ($M =$ 1.14, $SD = 0.19$) (Table 3). This finding was consistent with a previous study conducted in Canada in which the majority (80%) of the participants had low level of diabetes distress (Al Sayah, Yeung, & Johnson, 2019). Several factors in demographic (e.g., marital status, level of education, and monthly income) and clinical characteristics of the participants (e.g., diabetes duration, treatment regimen, complications, blood glucose, and BMI) may contribute to the low level of diabetes distress.

The demographic data of this study showed that more than half of participants were married. Previous studies revealed that those who were married experienced low diabetes distress (Al Sayah, et al., 2019; Berry et al., 2015). Perceived support tailored with the valuation of the available coping resources, greatly influences psychological adjustment which can lead to decreased distress. Moreover, protectiveness in partners of individuals with diabetes has also been found to influence physical outcome and coping with distress (Berry et al., 2015). In addition, more than half of participants in this study completed high education, more than one third of them completed senior high school education and some of them graduated from university. Majority of participants also had moderate to high monthly income. Prior studies revealed that patients with higher diabetes distress were those who had a lower educational level (Al Sayah, et al., 2019; Devarajooh & Chinna, 2017), and lower income (Aljuaid, Almutairi, Assiri, Almalki, & Alswat, 2018; Al Sayah, et al., 2019).

Moreover, clinical factors might also play a role in the lower level of diabetes distress in the study. Results showed that more than half of participants had suffered from diabetes more than 10 years and still without any complication. This condition

provides the opportunity for older persons with T2DM to receive more knowledge and education regarding their disease and its management. In addition, more than half of participants had received oral medication, had normal BMI and about two thirds of them had normal blood glucose (Table 2). Previous studies explained that insulin use, higher blood glucose (Nanayakkara et al., 2018), complications, and BMI (Aljuaid et al., 2018) were significantly associated with diabetes distress.

Another factor that might contribute to the low level of diabetes distress in this study was the participation of the older persons in a national program for managing chronic diseases including diabetes called *Program Pengelolaan Penyakit Kronis* (PROLANIS). The program is organized by the Indonesian government by involving participants, health facilities and national health insurance institutions. The majority of participants in this study were reported to actively participate in PROLANIS.

PROLANIS activities consist of medical consultations, high-risk education clubs (PROLANIS Club) aimed at increasing health knowledge in efforts to recover from illness, prevent disease awakening and improve health status for PROLANIS participants, reminders aimed at motivating participants to regularly visit managers health facilities, and home visits in the form of home visiting service activities by health service providers to conduct self and environmental health education to PROLANIS participants and families (Ahmad et al., 2017).

A previous study revealed that participation in PROLANIS was significantly associated with increasing knowledge related to diabetes, and high level of diabetes treatment adherence (Asfiani & Ilyas, 2017). Another study has also revealed that it was associated with good control of blood glucose level, HbA1c and indirectly prevented complications among patients with T2DM (Ahmad et al., 2017). Such outcomes have

been reported as significantly associated with low levels of diabetes distress (Aljuaid et al., 2018; Nanayakkara et al., 2018).

Furthermore, diabetics are highly individual and often have personalized coping. Several factors can contribute to an individual's ability to cope with a diagnosis of diabetes, including resilience, beliefs about health and spirituality, access to social support, and socioeconomic status. In addition, daily blood glucose monitoring, treatment regimens, dietary and lifestyle changes, surveillance, concerns about hypoglycemia and anxiety about the results of past and future blood glucose control can be factors that make patients consider themselves burdened (Giese, 2018). In addition, the high level of self-management behaviors along with increasing patients' empowerment were also noted to help decrease diabetes distress among older persons with T2DM (Wang et al., 2017).

Whereas, regarding the sub domain of diabetes distress, the findings of the present study showed that emotional burden was the most prevalent as 23 (11.6%) participants had moderate level and 4 (2.0%) of them had high level. In addition, it also revealed that four (2.0%) participants had moderate level of regimen-related distress. Two (1.0%) participants had moderate and one (0.5%) a high level of interpersonal-related distress (Table 4). Several factors might contribute to this finding. According to Giese (2018), the burden of diabetes self-care activities often overwhelms diabetics. Besides, the threat of complications from diabetes also contributes to the emotional burden of patients with diabetes.

Nevertheless, according to DAWN2 (Diabetes Attitudes, Wishes and Needs Second Study), the prevalence of diabetes distress is reported to differ according to several factors including the setting (primary, secondary, tertiary or quaternary care

level), medical condition (outpatients or inpatients with acute complications) as well as current treatment intensity (no diabetes medication, oral antidiabetic drugs or insulin) of the patients (Kuniss et al., 2017).

Prior studies revealed that diabetes complication influenced diabetes distress. Patients with more diabetes complication experienced higher diabetes distress (Fisher et al., 2009; Islam et al., 2014). Complication often occurs in older persons with T2DM. Approximately 60% of older persons with diabetes have at least one complication and as many as 40% have four or more. The increasing number of people in the population reaching older ages has contributed to the rising prevalence of older persons with multiple chronic diseases (Huang, 2016). Whereas, more than three-quarters (77.4%) of participants in the present study had no complications.

Moreover, A cross-sectional study conducted among T2DM patients in the USA revealed that diabetic patients who received insulin regimen therapy experience greater diabetes distress than those who use oral medication or diet and exercise alone (Rothschild, 2010). Whereas, the results of the present study showed that more than half of participants (62.6%) had received oral medication. Only 29 (14.6%) participants had received insulin and 45 (22.7%) participants had received both oral medication and insulin. Various factors might have played role in the treatment regimen among older persons with type 2 diabetes mellitus as the majority received oral medication. Insulin injection is relatively complicated compared with oral medication and more difficult for older persons (Zhou et al., 2017). Moreover, patient misconceptions surrounding insulin have influenced treatment regimen choice. Many patients often have the preconception that insulin will not effectively provide

glycemic control. Patients also expressed low confidence in taking insulin and feared potential side effects, particularly weight gain and hypoglycemia (Spollett, 2012).

In addition, another factor which could influence lower level of diabetes distress was monthly income. The bivariate analysis of our study revealed a negative correlation between the total diabetes distress score and the emotional burden with monthly income (Table 7). It showed that the respondents with lower income had higher diabetes distress and emotional burden. This result was in line with a prior study conducted among T2DM patients in Bangladesh (Islam et al., 2014).

The result of the present study was in accordance with prior studies conducted in Saudi Arabia (Aljuaid et al., 2018) and India (Gahlan, et al., 2018) in which emotional burden was the most prevalent occurrence among participants. The higher prevalence of emotional burden may be attributed to difficulty in self-management, care and the psychological aspect of dealing with diabetes as a chronic disease (Gahlan, et al., 2018). However, the study conducted in Saudi Arabia explained that easy accessibility to the health care centers and free replenishment of drugs could explain the observed lower prevalence. In particular, this issue was depicted in this study as the lowest mean of the DDS scores being physician-related distress and regimen-related distress after interpersonal distress, while the highest score was emotional distress (Aljuaid et al., 2018). Another study conducted in Bangladesh also revealed that emotional burden was the most prevalent domain of diabetes distress. It was considered the most important domain in measuring diabetes distress (Islam et al., 2014).

The relationship between family support, self-efficacy, spirituality, and diabetes distress. In the present study, Pearson correlation was used to examine the relationship between the study variables. The result found that there was a weak

($r = 0.19$, $p < 0.01$) significant positive relationship between supportive family behavior and diabetes distress. Moreover, there was also a weak ($r = 0.21$, $p < 0.01$) significant positive relationship between non-supportive behavior of family support and diabetes distress. Furthermore, there was a moderate ($r = -0.35$, $p < 0.01$) and negative correlation between self-efficacy and diabetes distress. A weak ($r = -0.26$, $p < 0.01$) and negative correlation between level of spirituality and diabetes distress was also demonstrated in the present study (Table 5).

The relationship between family support and diabetes distress. The results of the study demonstrated a weak significant positive relationship between the diabetes distress and supportive family behavior, meaning that more supportive family behavior is associated with higher diabetes distress. This finding was uncommon and contradicted results from previous studies. This may have occurred due to all of the participants in the present study indicating a low score of diabetes distress. In addition, the findings also revealed that non-supportive behavior from the family had positively influenced the diabetes distress among older persons with T2DM. Non-supportive family behavior such as nagging and criticism can reduce people's perceptions of autonomy. This could result in less motivation to cope with problems induced by diabetes and increase feelings of distress (Karlsen & Bru, 2014). Moreover, a prior qualitative study conducted in Indonesia explained that non-supportive behavior from the family member might also trigger sadness among older persons (Badriah & Sahar, 2018). This finding was in line with the study conducted by Karlsen et al. (2012) in which non-supportive family behavior was positively associated with diabetes distress.

The relationship between self-efficacy and diabetes distress. The study revealed a significant negative relationship between self-efficacy and diabetes distress, meaning that diabetes distress tends to increase as self-efficacy scores decrease. The belief that individuals with diabetes have the ability to gain, improve, or maintain glycemic control may contribute to the decision and motivation for making necessary behavioral changes. These behavioral changes are mostly associated with self-care tasks that require diabetic persons to adapt to changes in their daily lives (Chung, 2009). A previous study among Indonesian T2DM patients revealed that daily life changes were often perceived as challenges and a burden among diabetic persons. Patients with high self-efficacy increased their behavior for managing these changes and were able to manage and organize their condition to adhere to healthy behavior. This behavior impacted glycemic control and negatively influenced diabetes distress (Putra, Toonsiri, & Junprasert, 2016). Moreover, the results of this study were also supported by the study conducted by Lin et al. (2017) which also showed the significant negative relationship between self-efficacy and diabetes distress.

The relationship between spirituality and diabetes distress. The results of this study showed that spirituality had a weak negative association with diabetes distress among older persons with T2DM. A successful adaptation process enables an older person with T2DM to eventually accept their condition. Responses received regarding the disease indicated older persons show a patient manner in a way to get closer to God. Spiritual change in the older persons was reflected in an increase in the activity of worship. Older persons with T2DM felt with good spiritual practice, they became closer to God. Spirituality is one the potential approaches to manage stress and to act as a support for older persons in terms of minimizing distress (Badriah & Sahar, 2018).

In addition, religious and/or spiritual practice carried out by older persons have also been found to be associated with self-caring activities (O'Brien, 2014). A prior study reported that older persons who had routine spiritual practice also reported having positive self-concepts and took the initiative and responsibility for self-care (Callaghan, 2006). For ill older persons, a common religious practice such as prayer can help alleviate feelings of loneliness or anxiety. Moreover, uncertainty of the future can be the source of much fear among older persons experiencing illness. However, those with a spiritual or religious perspective on life, express little fear of the future, and have a close relationship and connectedness to God which leads to comfort and peace (O'Brien, 2014). This finding was also supported by that of Arifin who reported that spirituality was the most common coping mechanism for reducing DD among Indonesian T2DM patients. The older person participants felt that communicating with God was as good way to find comfort (Arifin et al., 2018).

Predictive factors of diabetes distress. In the present study, stepwise regression analysis revealed self-efficacy, non-supportive family behavior and spirituality as statistically significant contributing factors for diabetes distress.

This present study also showed that self-efficacy was the strongest predictor of diabetes distress. Several factors might contribute to this finding. Patients with T2DM have sustained behavioral demands such as medication dosing, frequency and titration, monitoring blood glucose, food intake, diet, and physical activity of diabetes self-management. In addition, other aspects may potentially or actually affect the development of the disease directly such as visual, motor, cognitive abilities or skills, and behavioral demands as diabetes self-management requires self-efficacy (ADA, 2019b). In addition, on average, the participants in this study had moderate level of self-efficacy.

Individuals with higher level of self-efficacy perform better diabetes self-management. This is associated with better self-autonomy, more confidence, more initiative and persistence in dealing with daily needs of diabetes care (Devarajooh & Chinna, 2017). Improving patients' self-efficacy by referring to diabetes management is important for achieving clinical control of diabetes (Huang, 2016; Lin et al., 2017; Trief, Teresi, Eimicke, Shea, & Weinstock, 2009). Prior studies conducted in Korea and China revealed that self-efficacy was significantly associated with diabetes self-management behaviors (Chang, Song, & Im, 2014; Jiang et al., 2019). It also mediates the association between diabetes self-management behavior with diabetes distress (Jiang et al., 2019).

Moreover, the present study showed non-supportive behavior from family as a contributing factor of diabetes distress among older persons with T2DM. A prior study explained that type 2 diabetes affects family members differently, either by improving family cohesion or causing distress. In some families, the obligation to support the patient is experienced as a burden. They are affected by changes in the patient's health and need to know how to provide the best support. Pressure and forceful behaviors lead to a negative emotional response and negative effect on health behavior. It also shown to lead to anxiety, low self-esteem and distress (Bennich et al., 2017).

The present study confirmed spirituality as one contributing factor of diabetes distress. A prior qualitative study conducted in Indonesian older persons revealed that spirituality was a strategy to cope with diabetes distress. Moreover, older participants explained that T2DM brought them closer to God because they were encouraged to worship more often. In addition, the older persons used spirituality as a strategy to

seek comfort in having a positive attitude including believing that regularly taking their medicine and having monthly blood sugar checks would result in better outcomes (Arifin, 2018).

IDF explained that management of T2DM can be demanding on older persons. Moreover, spirituality can be an instrumental coping mechanism for individuals dealing with health issues including diabetes (IDF, 2013). Another qualitative study undertaken by Namageyo-Funa and colleagues among African Americans explained that spirituality among people with diabetes reported coping strategies such as having hope, religious support, prayer, faith in God, turning things over to God, and changing unhealthy behaviors. In addition, the use of spirituality in coping with management of diabetes focused on how an individual thinks about God, others, and themselves which contributed to their view of managing the situation (Namageyo-Funa et al., 2015).

Therefore, the findings of this study indicated that the predicting factors of diabetes distress among older persons with T2DM were non-supportive family behavior, self-efficacy and spirituality. Non-supportive family behavior caused a negative emotional response in older persons with T2DM and led to diabetes distress. Whereas, self-efficacy enhanced better diabetes self-management performance by improving self-autonomy, confidence, initiative and persistence in dealing with the sustained demands of diabetes which can affect diabetes distress. Similarly, spirituality was used as coping mechanism to deal with burden of diabetes in relieving diabetes distress.

Chapter 5

Conclusion and Recommendations

This chapter comprises conclusion, strengths, limitations, and recommendations of this study.

Conclusion of the Study

This study was a cross-sectional predictive study conducted in the Geriatric Clinic, Central General Hospital of Dr. Soeradji Tirtonegoro, Klaten, Indonesia to examine the predictive factors of diabetes distress among older persons with T2DM. Samples in the study consisted 198 older persons with T2DM ranging in ages from 60 to 88 years old using purposive sampling. Information regarding the demographic and clinical data of the participants was collected using the Personal Characteristic Questionnaires. Data related to family support, self-efficacy, spirituality and diabetes distress were collected using DFBC, DMSES, FACIT-Sp-Ex, and DDS, respectively.

The DDS has been translated by back translation and the Indonesian version validated by Arifin et al. (2017). The other questionnaires were validated by three experts and the reliability was examined in 30 participants who met the inclusion criteria of the study. S-CVI of DFBC, DMSES, and FACIT-Sp Ex were calculated and the S-CVI values of these tools were 0.87, 0.91 and 1, respectively. Moreover, Cronbach's alpha coefficient for DFBC, DMSES, and FACIT-Sp-Ex were 0.72, 0.88, and 0.91, respectively.

Data were analyzed by descriptive statistics and multiple regression. The results revealed low level of diabetes distress. In addition, stepwise regression analysis yielded non-supportive behavior ($\beta = 0.14$, $p = 0.036$), self-efficacy ($\beta = -0.29$, $p = 0.00$) and spirituality ($\beta = -0.14$, $p = 0.04$) as variables that could statistically predict diabetes distress among older persons with T2DM. It also showed that self-efficacy was the strongest predictor of diabetes distress among older persons with T2DM. These factors explained the variant of diabetes distress of 16.3% ($R^2 = 0.163$).

Strengths of the Study

This study has strengths which are described as follows.

1. The instruments used in this study (e.g., DFBC, DMSES, FACIT-Sp-EX) have been modified considering the diabetes terms and context. In addition, the validity and reliability test also showed good value of CVI and Cronbach's alpha coefficient which mean that the instruments have good validity and reliability. Hence, the data obtained can adequately reflect the good accuracy and actual results.

2. The data collection process in this study did not involve research assistants. Therefore, the researcher bias in this study can be minimized.

Limitations of the Study

Beyond strength, this study has also limitations. The limitations are mentioned below.

1. This study was not conducted with random sampling. Therefore, the generalization of the study findings might be impacted. However, the hospital where

the study was conducted is the national referral hospital for geriatric care and

participants were from different areas of Java Island, Indonesia.

2. The theoretical model of variables proposed in the present study was based

on the literature review of factors associated with diabetes distress among individuals

with T2DM. While this was sufficient for this study, there might be other factors

which may not have been included as predicting factors in this study.

Recommendations

The findings of the study will be beneficial for future nursing research,

nursing education and for the development of nursing practice.

Nursing research.

1. This present study revealed non-supportive behavior, self-efficacy and

spirituality as the predicting factors of diabetes distress among older persons with

T2DM. Therefore, an interventional study with reference to aforementioned factors

can be conducted to decrease diabetes distress.

2. The present study was conducted at the hospital outpatient setting. Therefore,

studies in different settings such as long-term care facilities and at large number of

health care facilities are suggested in future studies to explore more regarding

predictive factors of diabetes distress among older persons with T2DM.

Nursing education.

In managing diabetes distress among older persons with T2DM, education

with regard to minimizing non-supportive family behavior, enhancing self-efficacy

and practicing spirituality should be approached by nursing students and nurses.

Nursing practice.

1. Non-supportive family behavior, self-efficacy and spirituality are influencing factors of diabetes distress among older persons with T2DM. The result of this study revealed non-supportive family behavior as a positive predictive factors of diabetes distress. Whereas, self-efficacy and spirituality were negative predictive factors of diabetes distress. Hence, to manage diabetes distress of older persons with T2DM, nurses could endeavor to empower family in reducing non-supportive behavior, and improve diabetes self-efficacy, and spirituality.

2. Nurses need to be aware of the possible negative effect on increasing diabetes distress among older persons with T2DM, by regularly screening diabetes distress by considering their self-efficacy, spirituality and non-supportive family behavior.

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APPENDICES

Appendix A

Sample Size Estimation

The sample size estimation for the study was determined by power analysis. The number of participants needed in the study was estimated by function of effect size, the number of predictors, desired power, and significance criterion. According to Polit and Beck (2016), the formula to calculate sample size for multiple regression is:

N = L / γ + κ + 1

Where,

N = estimated number of the subjects needed

L = tabled value for the desired α and power

γ = estimated effect size

K = number of predictors

The value of estimated effect size (γ) is calculated as:

γ = R^2 / 1- R^2

According to Polit table (1996), if a study consists of three independent variables then the power (L) of the three variables is 10.90. A previous study conducted in USA showed that the correlation coefficient of family support and diabetes distress was .10 (Karlsen & Bru, 2014). Another study in USA found that the correlation coefficient of self-efficacy and diabetes distress was .30 (Wang et al., 2017). In addition, another study revealed that spirituality was related significantly to diabetes distress with standardized coefficient was .40 (Newlin et al., 2008). Therefore, in this study, the correlation coefficient value of .25, which was between .10 and .40 was selected to be

used for the sample size calculation. Based the correlation coefficient value of .25 accounted for the gamma (γ) value of .06.

$$\gamma = \frac{R^2}{1 - R^2}$$

$$\gamma = \frac{(0.25)^2}{1 - (0.25)^2}$$

$$\gamma = 0.06$$

Hence, the calculation of the sample size of the three variables is based on power analysis formula, which accounted for the number of 186 individuals.

$$N = 10.90 / 0.06 + 3 + 1$$

$$N = 185.6$$

$$N = 186$$

Moreover, according to Grove and Cipher (2017), researchers need to identify a large enough accessible population to ensure an adequate sample is obtained after accounting for refusal rates. Refusal rate is the percentage of potential subjects who decide not to participate in a study. The researcher used refusal rate 10%. Therefore, the total sample obtained in the present study was 206.

However, in the data analysis some outliers were found. The outliers were managed, by removing eight data of the participants to meet the assumption. Therefore, 198 total participants were included in this study.

Appendix B

Personal Characteristics Questionnaire

Code   **:**

Date of Data Collection   **:**

1. Age   :   years old
2. Gender   : (   ) Male   (   ) Female
3. Religion   :
   - (   ) Islam   (   ) Catholic
   - (   ) Protestant   (   ) Hindu
   - (   ) Buddha   (   ) Konghucu
4. Marital status   :
   - (   ) Single   (   ) Widowed
   - (   ) Married   (   ) Divorced
   - (   ) Widower
5. Etnicity   :
   - (   ) Javanese   (   ) Chinese
   - (   ) Sundanese   (   ) Other ………………….
6. Level of education
   - (   ) Elementary School   (   ) Diploma degree
   - (   ) Junior High School   (   ) Bachelor degree
   - (   ) Senior High School   (   ) Graduate school
7. Occupation   :
8. Monthly income   :
   - (   ) < Rp 1,000,000   (   ) Rp 2,500,000 – Rp 5,000,000
   - (   ) Rp 1,000,000 – Rp 2,500,000   (   ) > Rp 5,000,000
9. Treatment modality
   - (   ) Oral medication
   - (   ) Insulin
   - (   ) Both oral medication and Insulin
10. Duration of having diabetes mellitus :…………Years …………… Month (s)
11. Diabetes complication :
    - (   ) Diabetes Neuropathy
    - (   ) Diabetic Cardiovascular Autonomic Neuropathy
    - (   ) Diabetic Genitourinary Autonomic Neuropathy
    - (   ) Erectile Dysfunction
    - (   ) Sarcopenia (Muscle weakness)
    - (   ) Diabetic Nephropathy

(   ) Vision and Hearing Impairment
(   ) Coronary Heart Disease
(   ) Cerebrovascular Disease
(   ) Peripheral Vascular Disease
(   ) Others.……………………………………………………….(Specific)

12. Comorbidities: ………………………………………………………….
…………………………………………………………………………………..

13. Underlying diseases: …………………………………………………………
…………………………………………………………………………………..

14. Current clinical information:
-    Blood Glucose: ………………………………………………….mg/dL
-    Blood Pressure: ………………………………………….....mmHg
-    BMI: ………………………………………………………….Kg/m^2

Indonesian Version of Personal Characteristic Questionnaire

Kuesioner Karakter Pribadi

Kode : …………………………………………

Tanggal Pengumpulan Data : …………………………………………

1. Usia : tahun

2. Jenis kelamin : ( ) Laki-laki.　　( ) Perempuan

3. Agama :

    a. ( ) Islam　　　　　　　　d. ( ) Katolik

    b. ( ) Kristen　　　　　　　e. ( ) Hindu

    c. ( ) Buddha　　　　　　　f. ( ) Konghucu

4. Status Pernikahan :

    a. ( ) Belum menikah　　　　e. ( ) Janda

    b. ( ) Menikah　　　　　　　f. ( ) Cerai

    c. ( ) Duda

5. Suku :

    a. ( ) Jawa

    b. ( ) Sunda

    c. ( ) Cina

    d. ( ) lainnya………………………………………………………

6. Jenjang pendidikan :

    a. ( ) SD　　　　　　　　　d. ( ) Diploma

    b. ( ) SMP　　　　　　　　e. ( ) Sarjana

    c. ( ) SMA　　　　　　　　f. ( ) Pascasarjana

7. Pekerjaan :

    a. ( ) Wiraswasta

    b. ( ) Tani

    c. ( ) Guru

    d. ( ) Nelayan

    e. ( ) Ibu rumah tangga

    f. ( ) Karyawan

g. ( ) Tidak bekerja

h. ( ) Lainya, ……………………………………………………………

8. Penghasilan perbulan :

a. ( ) < Rp 1,000,000

b. ( ) Rp 1,000,000 – Rp 2,500,000

c. ( ) Rp 2,500,000 – Rp 5,000,000

d. ( ) > Rp 5,000,000

9. Jenis obat yang digunakan :

a. ( ) Obat oral

b. ( ) Insulin

c. ( ) kedua-duanya

10. Lama mengidap diabetes : …………. Tahun ………….. Bulan

11. Komplikasi diabetes :

a. ( ) Neuropati Diabetik (kerusakan syaraf karena diabetes)

b. ( ) Gangguan ereksi

c. ( ) Sarkopenia (kelemahan otot)

d. ( ) Nefropati diabetic (kerusakan ginjal akibat diabetes)

e. ( ) Retinopati diabetic (kerusakan mata karena diabetes)

f. ( ) Ganguan penglihatan dan pendengaran

g. ( ) Penyakit jantung coroner

h. ( ) Penyakit pembuluh darah di otak

i. ( ) Penyakit pembuluh darah tepi

j. ( ) Lainnya …………………………………………………………

12. Penyakit lain yang diderita :

………………………………………………………………………………………………

……………………………………………………………………………

13. Informasi klinis terbaru:

a. Kadar glukosa/gula darah : …………………. mg/dL

b. Tekanan darah : ………………… mmHg

c. Tinggi badan : ………………… Cm

d. Berat badan : ………………… Kg

Appendix C

Diabetes Distress Scale

Direction: Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 17 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 17 items may have distressed or bothered you **during the past month** and circle the appropriate number.

Please note give (√) on the column number gives the best answer for you and please provide an answer for each question. If you feel that a particular item is not a bother or a problem for you, you would circle "1". If it is very bothersome to you, you might circle "6".

1 = Not a Problem

2 = A Slight Problem

3 = A Moderate Problem

4 = Somewhat Serious Problem

5 = A Serious Problem

6 = A Very Serious Problem

No	Question	1	2	3	4	5	6
1	Feeling the diabetes is taking up too much of my mental and physical energy every day						
2	Feeling that my doctor doesn't know enough about diabetes and diabetes care						
3	Feeling angry, scared and/or depressed when I think about living with diabetes						
4	Feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes						
5	Feeling that I am not testing my blood sugars frequently enough						
6	Feeling that I am often failing with my diabetes routine						
7	Feeling that friends or family are not supportive enough of self-care efforts (e.g. planning activities that conflict with my schedule, encouraging me to eat the "wrong" foods)						
8	Feeling that diabetes controls my life						
9	Feeling that my doctor doesn't take my concerns seriously enough						
10	Not feeling confident in my day-to-day ability to manage diabetes						
11	Feeling that I will end up with serious long-term complications, no matter what I do						
12	Feeling that I am not sticking closely enough to a good meal plan						
13	Feeling that friends or family don't appreciate how difficult living with diabetes can be						
14	Feeling overwhelmed by the demands of living with diabetes						
15	Feeling that I don't have a doctor, who I can see regularly enough about my diabetes						
16	Not feeling motivated to keep up my diabetes Self-management						
17	Feeling that friends or family don't give me the emotional support that I would like						

INSTRUCTIONS FOR SCORING: DDS

The DDS total score reflects overall diabetes distress from all domain (17 items). It is the average response across items 1 to 17. To score, simply sum the patient's responses to the appropriate items and divide by the number of items in that scale.

A mean item score of <2.0 reflects low distress, a mean item score $2.0 – 2.9$ should be considered 'moderate distress,'and a mean item score > 3.0 should be considered 'high distress.'

Total DDS Score:
a. Sum of 17 item scores.   _____
b. Divide by: _____17_____
c. Mean item score: _____
   Moderate distress or greater? (mean item score > 2)   yes__   no__

Moreover, each subscale of DDS also can be scored from the average score of each as follows:

A. Emotional Burden:
a. Sum of 5 items (2, 4, 7, 10, 14)   _____
b. Divide by: _____5_____
c. Mean item score: _____
   Moderate distress or greater? (mean item score > 2)   yes__   no__

B. Physician Distress:
a. Sum of 4 items (1, 5, 11, 15)   _____
b. Divide by: _____4_____
c. Mean item score: _____
   Moderate distress or greater? (mean item score > 2)   yes__   no__

C. Regimen Distress:
a. Sum of 5 items (6, 8, 3, 12, 16)   _____
b. Divide by: _____5_____
c. Mean item score: _____
   Moderate distress or greater? (mean item score > 2)   yes__   no__

D. Interpersonal Distress:
a. Sum of 3 items (9, 13, 17)   _____
b. Divide by: _____3_____
c. Mean item score: _____
   Moderate distress or greater? (mean item score > 2)   yes__   no__

Diabetes Distress Scale Indonesian Version

PETUNJUK : Hidup dengan menderita **penyakit diabetes (sakit gula atau kencing manis)** terkadang sulit. Banyak permasalahan dan gangguan terkait dengan diabetes, dan penyakit tersebut bisa bervariasi tergantung pada tingkat keparahannya. Permasalahan mungkin datang dari gangguan kecil hingga kesulitan besar dalam hidup. Berikut ini adalah 17 (tujuh belas) masalah yang mungkin dialami penderita diabetes. Pertimbangkan seberapa jauh ke 17 masalah tersebut telah mengganggu dan

menekan hidup anda selama **1 (SATU) BULAN TERAKHIR**.

Harap diingat bahwa kami meminta Anda untuk menunjukkan sejauh mana masing-masing tersebut mengganggu kehidupan anda, BUKAN apakah pernyataan tersebut semata-mata benar untuk Anda. Jika Anda merasa bahwa suatu pernyataan pada tabel di bawah ini,

Bukanlah suatu gangguan atau masalah, Anda bisa melingkari angka "1". Namun, jika hal tersebut sangatlah mengganggu, Anda dapat melingkari angka "6".

No	Pertanyaan	(1) Bukan Masalah	(2) Masalah Ringan	(3) Masalah Sedang	(4) Masalah Cukup Serius	(5) Masalah Serius	(6) Masalah Sangat Serius
1.	Saya merasa bahwa teman-teman atau keluarga saya tidak memberikan dukungan emosional yang saya inginkan. Contoh dukungan emosional misalnya mereka selalu mengingatkan saya, agar makan makanan yang baik, olah raga, mengingatkan minum obat dan menjaga kebersihan.						
2.	Saya merasa bahwa teman-teman atau keluarga tidak menghargai bagaimana sulitnya hidup dengan diabetes.						
3.	Saya merasa bahwa teman-teman atau keluarga saya tidak cukup mendukung usaha perawatan mandiri (contohnya: mengajak saya makan makanan yang salah).						
4.	Saya merasa tidak mempunyai dokter yang bisa saya temui secara teratur untuk berkonsultasi masalah diabetes.						
5.	Saya sendiri merasa tidak termotivasi untuk meneruskan penanganan diabetes						
6.	Saya merasa marah, takut dan/atau tertekan ketika saya memikirkan tentang hidup dengan menderita diabetes.						
7.	Saya merasa diabetes mengambil terlalu banyak energi jiwa dan fisik setiap harinya.						
8.	Saya merasa kewalahan oleh tuntutan hidup dengan penyakit diabetes						
9.	Saya merasa bahwa nantinya dalam hidup saya, saya akan mengalami komplikasi serius jangka panjang, terlepas dari apapun yang saya lakukan.						
10.	Saya merasa tidak percaya diri dengan kemampuan keseharian saya dalam menangani masalah diabetes. Contohnya: menjaga pola makan dan kebersihan,						

No	Pertanyaan	(1) Bukan Masalah	(2) Masalah Ringan	(3) Masalah Sedang	(4) Masalah Cukup Serius	(5) Masalah Serius	(6) Masalah Sangat Serius
	minum obat tepat waktu dan olah raga teratur.						
11	Saya merasa bahwa dokter saya tidak cukup mengetahui tentang perawatan diabetes						
12	Saya merasa bahwa dokter tidak memberikan petunjuk yang cukup jelas tentang bagaimana menangani diabetes.						
13	Saya merasa dokter tidak cukup serius dalam memperhatikan kekhawatiran yang saya rasakan.						
14	Saya merasa bahwa saya tidak cukup sering melakukan pengetesan gula darah.						
15	Saya merasa bahwa saya sering gagal dengan rutinitas diabetes saya.						
16	Saya merasa bahwa saya tidak ketat dalam menyiapkan makanan yang baik						
17	Saya merasa bahwa diabetes mengontrol hidup saya, dimana saya merasa bahwa aktivitas aktivitas saya menjadi terbatas sejak dan selama saya menderita diabetes.						

Appendix D

Diabetes Family Behavior Checklist

We want to know how often family members do each of the following things. Just put down what usually happens at home-there are no right or wrong answer. Give (√) on the column number from the scale below that best shows how often the person being rated does each of the following things.

1 = Never

2 = Twice a month

3 = Once a Week

4 = Several times a Week

5 = At Least once a day

	How often does he/she:	1	2	3	4	5
1	Praise you following your diet					
2	Nag you about testing your glucose level					
3	Suggest things that might help you take insulin on time					
4	Criticize you for not exercising regularly					
5	Help you decide if changes should be made based on glucose testing results					
6	Nag you about following your diet					
7	Argue with you about your diabetes self-care activities					
8	Encourage you to participate in sports activities					
9	Plan family activities so that they will fit in with your diabetes self-care schedule					
10	Congratulate you for sticking to your diabetes self-care schedule					
11	Criticize you for not recording the results of glucose test					
12	Eat at the same time that you do					
13	Exercise with you					
14	Let you sleep late rather than getting up to take your insulin					
15	Buy you things containing sugar to carry with you in case of an insulin reaction					
16	Eat foods that are not part of your diabetic diet					

Scoring DFBC:

Sum the total score of each item:

- Higher score in 9 positive items number 1,3,5,8,9,10,12,13 and 15 indicate supportive behaviors.

- Whereas, higher score in 7 negative items number 2,4,6,7,11,14 and 16 indicate non-supportive behaviors.

Indonesian Version of Diabetes Family Behavior Checklists

Kami ingin tahu seberapa sering anggota keluarga melakukan setiap hal berikut. Isilah sesuai yang biasa terjadi di rumah, tidak ada jawaban benar atau salah. Bubuhkan tanda (√) pada nomor kolom yang paling merepresentasikan seberapa sering orang yang dinilai melakukan setiap kegiatan berikut.

Keterangan:

1 = Tidak pernah

2 = Dua kali sebulan

3 = Sekali Seminggu

4 = Beberapa kali dalam seminggu

5 = Setidaknya sekali sehari

	Seberapa sering dia:	**1**	**2**	**3**	**4**	**5**
1	Memuji anda saat anda mengikuti diet anda dengan baik					
2	Mengomeli anda saat anda tidak mengecek kadar gula darah anda					
3	Menyarankan hal-hal yang membantu anda untuk bisa mengonsumsi insulin anda tepat waktu					
4	Mengkritik anda saat anda tidak melakukan olahraga secara teratur					
5	Membantu anda memutuskan bahwa *perubahan aktifitas* harus dilakukan berdasarkan hasil pengukuran gula darah anda					
6	Mengomeli anda ketika anda tidak mengikuti diet anda dengan baik					
7	Memarahi anda ketika anda tidak peduli mengenai kegiatan perawatan diri diabetes anda					
8	Mendorong anda untuk mengikuti kegiatan olahraga					
9	Merencanakan kegiatan keluarga sehingga keluarga anda bisa mendukung jadwal self-care (perawatan-diri) diabetes anda					
10	Memberikan anda ucapan selamat karena anda telah mengikuti jadwal perawatan-diri diabetes anda dengan baik					
11	Mengingatkan anda saat anda tidak mencatat/menyimpan hasil tes gula darah anda					

	Seberapa sering dia:	1	2	3	4	5
12	Makan dengan waktu yang sama dengan yang anda					
13	Berolahraga bersama anda					
14	Membiarkan anda terjaga sampair larut malam dari pada membangunkan anda untuk mengkonsumsi insulin					
15	Membelikan anda makanan yang mengandung gula untuk berjaga-jaga jika terjadi reaksi insulin					
16	Makan makanan yang bukan merupakan bagian dari diet diabetes anda					

Appendix E

Diabetes Management Self-Efficacy Scale

Directions

Below is a list of activities you have to perform to manage your diabetes.

Please read each one and then put a line through the number which best describes how

confident you usually are that you could carry out that activity.

For example, if you are completely confident that you are able to check your

blood sugar levels when nessessary, put a line through 10. If you feel that most of the

time you could not do it, put a line through 1 or 2.

Cannot do at all				**Maybe yes Maybe no**				**Certain can do**		
I am confident that										
1	I am able to check my blood/urine sugar if necessary									
	0	1	2	3	4	5	6	7	8	9	10
2	I am able to correct my blood sugar when the sugar level is too high									
	0	1	2	3	4	5	6	7	8	9	10
3	I am able to correct my blood sugar when the blood sugar level is too low									
	0	1	2	3	4	5	6	7	8	9	10
4	I am able to choose the correct food									
	0	1	2	3	4	5	6	7	8	9	10
5	I am able to choose different foods and stick to a healthy eating pattern									
	0	1	2	3	4	5	6	7	8	9	10
6	I am able to keep my weight under control									
	0	1	2	3	4	5	6	7	8	9	10
7	I am able to examine my feet for cuts									
	0	1	2	3	4	5	6	7	8	9	10
8	I am able to take enough exercise, for example, walking the dog or riding a bicycle									
	0	1	2	3	4	5	6	7	8	9	10
9	I am able to adjust my eating plan when ill									
	0	1	2	3	4	5	6	7	8	9	10
10	I am able to follow a healthy eating pattern most of the time									
	0	1	2	3	4	5	6	7	8	9	10

Cannot do at all				**Maybe yes Maybe no**				**Certain can do**		
I am confident that										
11	I am able to take more exercise if the doctor advises me to									
0	1	2	3	4	5	6	7	8	9	10
12	When taking more exercise, I am able to adjust my eating plan									
0	1	2	3	4	5	6	7	8	9	10
13	I am able to follow a healthy eating pattern when I am away from home									
0	1	2	3	4	5	6	7	8	9	10
14	I am able to adjust my eating plan when I am away from home									
0	1	2	3	4	5	6	7	8	9	10
15	I am able to follow a healthy eating pattern when I am on holiday									
0	1	2	3	4	5	6	7	8	9	10
16	I am able to follow a healthy eating pattern when I am eating out or at a party									
0	1	2	3	4	5	6	7	8	9	10
17	I am able to adjust my eating plan when I am feeling stressed or anxious									
0	1	2	3	4	5	6	7	8	9	10
18	I am able to visit my doctor once a year to monitor my diabetes									
0	1	2	3	4	5	6	7	8	9	10
19	I am able to take my medication as prescribed									
0	1	2	3	4	5	6	7	8	9	10
20	I am able to adjust my medication when I am ill									
0	1	2	3	4	5	6	7	8	9	10

SCORING DMSES

Total score ranges from 0 to 200, lower scores indicating low self-efficacy for coping with the activities listed.

The scores were grouped in three categories:

1. Total DMSES score $\leq$ 135 indicates low self-efficacy.

2. Total DMSES score 136 to 165 indicates moderate self-efficacy.

3. Total DMSES score $\geq$ 166 indicates high self-efficacy (Chew et al., 2018).

Indonesian Version of Diabetes Management Self-Efficacy Scale

Petunjuk

Di bawah ini adalah daftar kegiatan yang harus Anda lakukan untuk mengelola diabetes Anda. Silakan baca masing-masing dan kemudian berikan garis [/] melalui nomor yang paling menggambarkan kamampuan Anda melakukan aktivitas itu.

Sebagai contoh, jika Anda benar-benar yakin bahwa Anda dapat memeriksa kadar gula darah Anda saat diperlukan, berikan garis pada nomor 10. Jika Anda merasa bahwa Anda tidak dapat melakukannya, masukkan garis pada nomor 1 atau 2.

Sama sekali tidak bisa melakukan melakukan		Mungkin bisa mungkin juga tidak						Bisa		
Saya percaya bahwa										
1	Saya dapat memeriksa gula darah saya jika perlu									
	0	1	2	3	4	5	6	7	8	9	10
2	Saya dapat mengoreksi gula darah saya sendiri ketika kadar gula terlalu tinggi (mis. Makan makanan yang berbeda)									
	0	1	2	3	4	5	6	7	8	9	10
3	Saya dapat mengoreksi gula darah saya sendiri ketika kadar gula terlalu rendah (mis. Makan makanan yang berbeda)									
	0	1	2	3	4	5	6	7	8	9	10
4	Saya bisa memilih makanan yang tepat yang sesuai dengan kondisi saya									
	0	1	2	3	4	5	6	7	8	9	10
5	Saya dapat memilih makanan yang berbeda dan tetap berpegang pada pola makan yang sehat									
	0	1	2	3	4	5	6	7	8	9	10
6	Saya bisa mengendalikan berat badan saya									
	0	1	2	3	4	5	6	7	8	9	10
7	Saya bisa memeriksa kaki saya apakah ada luka									
	0	1	2	3	4	5	6	7	8	9	10
8	Saya dapat melakukan cukup olahraga, misalnya, berjalan atau naik sepeda									
	0	1	2	3	4	5	6	7	8	9	10

Sama sekali tidak bisa melakukan				Mungkin bisa mungkin juga tidak					Bisa melakukan	

9	Saya bisa menyesuaikan rencana makan saya ketika sakit									
	0	1	2	3	4	5	6	7	8	9	10

10	Saya bisa mengikuti pola makan sehat hampir sepanjang waktu									
	0	1	2	3	4	5	6	7	8	9	10

11	Saya bisa melakukan lebih banyak olahraga jika dokter menyarankan saya untuk melakukannya									
	0	1	2	3	4	5	6	7	8	9	10

12	Ketika berolahraga lebih banyak, saya bisa menyesuaikan rencana makan saya									
	0	1	2	3	4	5	6	7	8	9	10

13	Saya bisa mengikuti pola makan yang sehat ketika saya jauh dari rumah									
	0	1	2	3	4	5	6	7	8	9	10

14	Saya bisa menyesuaikan rencana makan saya ketika saya jauh dari rumah									
	0	1	2	3	4	5	6	7	8	9	10

15	Saya bisa mengikuti pola makan yang sehat ketika saya sedang berlibur									
	0	1	2	3	4	5	6	7	8	9	10

16	Saya bisa mengikuti pola makan yang sehat ketika saya makan di luar atau di sebuah acara/pesta									
	0	1	2	3	4	5	6	7	8	9	10

17	Saya dapat menyesuaikan rencana makan saya ketika saya merasa stres atau cemas									
	0	1	2	3	4	5	6	7	8	9	10

18	Saya dapat mengunjungi dokter saya setidaknya setahun sekali untuk memantau diabetes saya									
	0	1	2	3	4	5	6	7	8	9	10

19	Saya dapat minum obat sesuai resep									
	0	1	2	3	4	5	6	7	8	9	10

20	Saya dapat menyesuaikan dengan obat saya ketika sakit									
	0	1	2	3	4	5	6	7	8	9	10

Appendix F

**The Functional Assessment of Chronic Illness Therapy–Spiritual Well-Being
Scale (FACIT-Sp) Ex**

Below is a list of statements that other people with your illness have said are
important. **Please circle or mark one number per line to indicate your response as
it applies to the <u>past 7 days</u>.**

No	Questions	Not at all	A little bit	Some-what	Quite a bit	Very much
Sp1	I feel peaceful	0	1	2	3	4
Sp2	I have a reason for living	0	1	2	3	4
Sp3	My life has been productive	0	1	2	3	4
Sp4	I have trouble feeling peace of mind	0	1	2	3	4
Sp5	I feel a sense of purpose in my life	0	1	2	3	4
Sp6	I am able to reach down deep into myself for comfort	0	1	2	3	4
Sp7	I feel a sense of harmony within myself	0	1	2	3	4
Sp8	My life lacks meaning and purpose	0	1	2	3	4
Sp9	I find comfort in my faith or spiritual beliefs	0	1	2	3	4
Sp10	I find strength in my faith or spiritual beliefs	0	1	2	3	4
Sp11	My diabetes has strengthened my faith or spiritual beliefs	0	1	2	3	4
Sp12	I know that whatever happens with my diabetes, things will be okay	0	1	2	3	4
Sp13	I feel connected to a higher power (or God)	0	1	2	3	4
Sp14	I feel connected to other people	0	1	2	3	4
Sp15	I feel loved	0	1	2	3	4
Sp16	I feel love for others	0	1	2	3	4
Sp17	I am able to forgive others for any harm they have ever caused me	0	1	2	3	4
Sp18	I feel forgiven for any harm I may have ever caused	0	1	2	3	4
Sp19	Throughout the course of my day, I feel a sense of thankfulness for my life	0	1	2	3	4
Sp20	Throughout the course of my day, I feel a sense of thankfulness for what others bring to my life	0	1	2	3	4
Sp21	I feel hopeful	0	1	2	3	4
Sp22	I feel a sense of appreciation for the beauty of nature	0	1	2	3	4
Sp23	I feel compassion for others in the difficulties they are facing	0	1	2	3	4

SCORING FACIT-Sp Ex

     Total score ranges from 0 to 92, which can be calculated by sum individual item score and multiply by 23 then divide by number of items answered. Higher score indicates higher level of spirituality.

	Item Code	**Reverse item?**		**Item response**	**Item Score**
	Sp1	0	+	_____	=_____
	Sp2	0	+	_____	=_____
	Sp3	0	+	_____	=_____
	Sp4	4	-	_____	=_____
	Sp5	0	+	_____	=_____
	Sp6	0	+	_____	=_____
Score range: **0-92**	Sp7	0	+	_____	=_____
	Sp8	4	-	_____	=_____
	Sp9	0	+	_____	=_____
	Sp10	0	+	_____	=_____
	Sp11	0	+	_____	=_____
	Sp12	0	+	_____	=_____
	Sp13	0	+	_____	=_____
	Sp14	0	+	_____	=_____
	Sp15	0	+	_____	=_____
	Sp16	0	+	_____	=_____
	Sp17	0	+	_____	=_____
	Sp18	0	+	_____	=_____
	Sp19	0	+	_____	=_____
	Sp20	0	+	_____	=_____
	Sp21	0	+	_____	=_____
	Sp22	0	+	_____	=_____
	Sp23	0	+	_____	=_____

*Sum individual item scores:*_____

Multiply by 23: _____

Divide by number of items answered: _____=**Sp-Ex Scale score**

**Indonesian Version of The Functional Assessment of Chronic Illness Therapy–
Spiritual Well-Being Scale Expanded (FACIT-Sp-Ex)**

Di bawah ini adalah daftar pernyataan yang dikatakan orang penting tentang penyakit Anda. **Harap lingkari atau tandai satu nomor per baris untuk menunjukkan respons Anda sebagaimana berlaku dalam 7 hari terakhir.**

No	Pertanyaan	Tidak sama sekali	Sedikit	Agak	Cukup sedikit	Sangat banyak
1	Saya merasa damai	0	1	2	3	4
2	Saya punya alasan untuk hidup	0	1	2	3	4
3	Hidup saya produktif	0	1	2	3	4
4	Saya kesulitan merasakan ketenangan pikiran	0	1	2	3	4
5	Saya merasakan arti tujuan hidup saya	0	1	2	3	4
6	Saya bisa menjangkau jauh ke dalam diri saya untuk kenyamanan	0	1	2	3	4
7	Saya merasakan keharmonisan dalam diri saya	0	1	2	3	4
8	Hidup saya tidak memiliki arti dan tujuan	0	1	2	3	4
9	Saya menemukan kenyamanan dalam iman atau keyakinan spiritual saya	0	1	2	3	4
10	Saya menemukan kekuatan dalam iman atau keyakinan spiritual saya	0	1	2	3	4
11	Penyakit saya telah memperkuat iman atau keyakinan spiritual saya	0	1	2	3	4
12	Saya tahu bahwa apa pun yang terjadi dengan penyakit saya, semuanya akan baik-baik saja	0	1	2	3	4
13	Saya merasa dekat dengan Tuhan	0	1	2	3	4
14	Saya merasa dekat dengan orang disekitar saya	0	1	2	3	4
15	Saya merasa dicintai	0	1	2	3	4
16	Saya mencintai untuk orang-orang disekitar saya	0	1	2	3	4

No	Pertanyaan	Tidak sama sekali	Sedikit	Agak	Cukup sedikit	Sangat banyak
17	Saya bisa memaafkan orang lain untuk hal-hal buruk yang pernah dilakukan kepada saya	0	1	2	3	4
18	Saya merasa termaafkan untuk kesalahan yang pernah saya lakukan	0	1	2	3	4
19	Sepanjang hari, saya selalu bersyukur atas hal-hal yang ada dihidup saya	0	1	2	3	4
20	Sepanjang hari, saya merasa bersyukur atas hal-hal yang telah diberikan oleh orang-orang disekitar saya	0	1	2	3	4
21	Saya memiliki harapan	0	1	2	3	4
22	Saya mengapresiasi keindahan alam sekitar	0	1	2	3	4
23	Saya merasa prihatin atas kesulitan yang dihadapi orang lain	0	1	2	3	4

Appendix G

Informed Consent Form

Title of Research: Predictive Factors of Diabetes distress Among Indonesian Older Persons with Type 2 Diabetes Mellitus

Researcher: Muhammad Ischaq Nabil Asshiddiqi, Student in Master of Nursing International Program, Faculty of Nursing, Prince of Songkla University, Thailand.

Advisor: Asst. Prof. Dr. Kantaporn Yodchai, Faculty of Nursing, Prince of Songkla University, Thailand.

Participant's Name: …………………………………………………………

I invite you to take part in a research study which seeks to identify the predictive factors of diabetes distress among Indonesian older persons with type 2 diabetes mellitus.

Description of your involvement

I am asking you to participate because recently you are having type 2 diabetes mellitus. Your involvement will last approximately 30 minutes to one hour. I will come to meet you at your convenience. I will give some questions and ask you to answer in 5 (five) questionnaires about personal characteristics data, diabetes distress, family support, self-efficacy, and spirituality. I also will help guide you while answer the questionnaire.

Benefits

While you may not receive a direct benefit from participating in this research, your involvement will be a valuable experience for other people. I hope that the results of this research may contribute to the improvement of diabetes mellitus management, especially guide the future management in diabetes distress for people with type 2 diabetes mellitus and those who provide care.

Potentials risks and discomforts

Answering questions can be difficult for you and will take your time. Please feel free to ask me if you have question with the questionnaire. I will explain you with additional information.

Confidentiality

I plan to publish the results of this study, but will not include any information that would identify you. I will protect your privacy and your research records will be confidential. Your real name will not be used in the written copy of the research discussion.

Voluntariness

Participating in this study is truly voluntary. Even though if you decide to participate now, you may change your mind and free to leave the study any time for any reason. By signing this document, you are willingly consented to join the study.

Additional Information

You are given the opportunity to ask all things that are not clear regarding this study. If at any time you need further clarification, please do not hesitate to contact the researcher Muhammad Ischaq Nabil Asshiddiqi at phone: +6287838308585, or email:

ischaq.nabil@gmail.com. Or my advisor Asst. Prof. Dr. Kantaporn Yodchai at phone: +66894649319, or email: kantporn.y@psu.ac.th.

You can also ask questions about the study to the Center for Social and Behavioral Siences, Institutional Review Board, Prince of Songkla University at Tel: +6674-286475, or email: chayanit.p@psu.ac.th.

Agreement of Participation in The Study

All these explanations have been addressed to me and all my questions have been answered by the researcher.

By signing this form, I agree to participate in this study

Name: _____

Signature: _____ Date _____/_____/_____

Indonesian Version of Informed Concent

Judul Penelitian: Faktor-Faktor Prediktif *Diabetes Distress* Pada Lanjut Usia Dengan Diabetes Mellitus Tipe 2.

Peneliti: Muhammad Ischaq Nabil Asshiddiqi, Mahasiswa Master of Nursing Program Internasional, Fakultas Keperawatan, Prince of Songkla University, Thailand.

Nama Peserta: ……………………………………………………………………

Saya mengajak Anda untuk berpartisipasi dalam penelitian yang saya lakukan untuk mengidentifikasi faktor-faktor yang memprediksi *diabetes distress* (kesulitan-kesulitan terkait diabetes) pada lansia penderita diabetes mellitus tipe 2.

Penjelasan keterlibatan Anda

Saya meminta Anda untuk berpartisipasi karena saat ini Anda menderita diabetes mellitus tipe 2. Keterlibatan Anda akan berlangsung sekitar 30 menit sampai satu jam. Saya akan datang untuk menemui Anda pada waktu yang Anda perkenankan. Saya akan memberikan beberapa pertanyaan dan meminta Anda menjawab dalam 5 (lima) kuesioner tentang data karakter pribadi, kesulitan-kesulitan terkait diabetes, dukungan keluarga, keyakinan diri, dan spirituaitas. Saya juga akan membantu membimbing Anda saat menjawab kuesioner tersebut.

Manfaat

Meskipun Anda mungkin tidak menerima manfaat secara langsung dari berpartisipasi dalam penelitian ini, keterlibatan Anda akan menjadi pengalaman berharga bagi orang lain. Saya berharap bahwa hasil penelitian ini dapat berkontribusi pada peningkatan manajemen diabetes mellitus, terutama memandu manajemen kesulitan –kesulitan terkait diabetes di masa yang akan datang bagi penderita diabetes mellitus tipe 2 dan bagi pihak yang memberikan perawatan.

Potensi risiko dan ketidaknyamanan

Menjawab pertanyaan bisa sulit bagi Anda dan akan mengambil beberapa saat waktu Anda. Silahkan bertanya kepada saya jika Anda memiliki pertanyaan terkait kuesioner. Saya akan menjelaskan kepada Anda dengan informasi lebih lanjut.

Kerahasiaan

Saya berencana untuk menerbitkan hasil penelitian ini dalam jurnal penelitian, tetapi tidak akan menyertakan informasi apa pun yang akan mengidentifikasi Anda. Saya akan melindungi privasi atau kerahasiaan Anda dan catatan penelitian Anda. Nama asli Anda tidak akan digunakan dalam salinan tertulis dari pembahasan hasil penelitian.

Kesukarelaan

Partisipasi dalam penelitian ini benar-benar sukarela. Meskipun jika Anda memutuskan untuk berpartisipasi sekarang, Anda dapat berubah pikiran dan bebas untuk meninggalkan kapan saja dengan alasan apapun. Dengan menandatangani dokumen ini, Anda bersedia untuk bergabung dengan penelitian ini.

Informasi Tambahan

Anda diberi kesempatan untuk menanyakan semua hal yang belum jelas tentang penelitian ini. Jika sewaktu-waktu Anda memerlukan klarifikasi lebih lanjut, jangan ragu untuk menghubungi peneliti Muhammad Ischaq Nabil Asshiddiqi di telepon: +6287838308585, atau email: ischaq.nabil@gmail.com. Atau menghubungi pembimbing saya Asst. Prof. Dr. Kantaporn Yodchai di telepon: +66894649319, atau email: kantporn.y@psu.ac.th.

Anda juga dapat mengajukan pertanyaan tentang penelitian ini ke Center for Social and Behavioral Siences, Institutional Review Board, Prince of Songkla University di Telp: + 6674-286475, atau email: chayanit.p@psu.ac.th.

Persetujuan Keikutsertaan dalam Penelitian

Semua penjelasan ini telah dijelaskan kepada saya dan semua pertanyaan saya telah dijawab oleh peneliti.

Dengan menandatangani formulir ini, saya setuju untuk berpartisipasi dalam penelitian ini.

Nama _____

Tanda tangan: _____Tanggal: _____/_____/_____

Appendix H

Letters of Ethical Consideration and Permission

Certificate of Approval of Human Research Ethics

Center for Social and Behavioral Sciences Institutional Review Board,

Prince of Songkla University

Document Number: 2019 NSt - Qn 004

Research Title: Predictive Factors of Diabetes Distress among Indonesian Older People with Type 2 Diabetes Mellitus

Research Code: PSU IRB 2019 – NSt 004

Principal Investigator: Muhammad Ischaq Nabil Asshiddiqi

Workplace: Master of Nursing Science (International Program), Faculty of Nursing, Prince of Songkla University

Approved Document:
1. Human Subjects
2. Instrument
3. Invitation and Informed Consent

Approved Date: 26 March 2019

Expiration Date: 26 March 2021

This is to certify that the Center for Social and Behavioral Sciences Institutional Review Board, Prince of Songkla University approved for Ethics of this research in accordance with Declaration of Belmont.

(Assoc. Prof. Dr. Sununta Youngwanichsetha)
Committee Vice-Chairman of Center for Social and Behavioral Sciences
Institutional Review Board, Prince of Songkla University

Appendix I

Permission Letter

MINISTRY OF HEALTH OF THE REPUBLIC OF INDONESIA
DIRECTORATE GENERAL OF HEALTH SERVICES
RSUP Dr. SOERADJI TIRTONEGORO
Jln. KRT. dr. Soeradji Tirtonegoro No. 1 Klaten
Tel: (0272) 321020 Fax: (0272) 321104 E-mail: rsupsoeradji_klaten@yahoo.com

Number: DP.02.01 / II.2.2 / / 2019 / 7666   April 2019
Hal: Research permission

Dear Assistant Dean for Research and Graduate Studies
Faculty of Nursing
Prince of Songkla University

In connection with your letter number MOE.0521.1.05 / 711 dated February 2019, here with we submit that we give permission to students in your Institution for:

Name   : **Muhammad Ischaq Nabil As-shiddiqi**

To conduct research with the title "Predictive Factors of Diabtes Distress Among Indonesian Older People with Type 2 Diabetes Mellitus

This permit is valid for three months from the issuance of letters up to three months (Dated (April 16 to July 15, 2019) in accordance with the applicable provisions. If within the specified time limit the permit process must be renewed.

Furthermore, the person concerned is required:
1. Obey the rules and regulations that apply in RSUP Dr. Soeradji Tirtonegoro Klaten
2. It is not justified to conduct research or retrieve data that is not in accordance with the research title.
3. Submit the results of their research along with publication texts in hard copy and soft copy to the Education and Research Department of RSUP, dr. Soeradji Tirtonegoro after the research was completed.
4. Present the results of his research at RSUP dr. Soeradji Tirtonegoro

Thus we convey, for your kind attention and good cooperation, we thank you.

President Director
Director General, HR and Education

Drs. Amrizal M, Apt, M.Kes, MARS
NIP 196206111992031002

Appendix J

Reliability Test of the Questionnaires

The pilot study was conducted among 30 respondents which are older persons with type 2 diabetes mellitus. Three instruments which are Diabetes Family Behaviour Checklist, Diabetes Management Self-Efficacy Scale, and FACIT-Sp Expanded Version were tested for internal consistency reliability by using SPSS software. The result of this test is showed as follow:

1. Diabetes Family Behaviour Checklist

Reliability Statistics

Cronbach's Alpha	N of Items
.727	16

2. Diabetes Management Self-Efficacy Scale

Reliability Statistics

Cronbach's Alpha	N of Items
.875	20

3. FACIT-Sp Expanded Version

Reliability Statistics

Cronbach's Alpha	N of Items
.908	23

The Chronbach's Alpha score of Diabetes Family Behaviour Checklist, Diabetes Management Self-Efficacy Scale, and FACIT-Sp Expanded Version were .727, .875, and .908 respectively which are greater than .70. Therefore, these scales were considered satisfactory.

Appendix K

Additional Tables

Table 7

Pearson Correlation Matrix of Diabetes Distress and Personal Characteristics

(N = 198)

Variables	1	2	3	4	5	6	7	8	9
1. Diabetes distress	1								
2. Age	.02	1							
3. Gender	.06	-.14*	1						
4. Religion	.22**	.08	.11	1					
5. Marital status	.12	.11	.38**	.11	1				
6. Ethnicity	.03	-.09	-.12	.02	-.07	1			
7. Level of education	.02	-.08	-.32**	.01	-.08	-.05	1		
8. Occupation	-.03	.18*	.14*	.003	.11	-.11	.02	1	
9. Monthly income	-.19**	.11	.06	-.19**	-.02	.02	.04	.13	1

Note. $^*p < .05$ $^{**}p < .01$

Table 8

Mean, Standard Deviation, and Level of Dimensions of Spirituality (N = 198)

Variables	M	SD	Level
Meaning/Peace	26.28	3.85	Moderate
Faith	12.78	1.90	Moderate
Connectedness	35.55	5.24	Moderate

Note. M = Mean, *SD* = Standard deviation

Table 9

Frequency and Percentage Level of Dimensions of Spirituality (N = 198)

Variables	n	%
Meaning/Peace		
Low	2	1.0
Moderate	26	13.1
High	170	85.9
Faith		
Moderate	17	8.6
High	181	91.4
Connectedness		
Moderate	14	7.1
High	184	92.9

Note. n = frequency, % = percentage

Table 10

Frequency and Percentage of Diabetes Distress Scale (N = 198)

Question Number of Diabetes Distress Scale	Not a Problem n (%)	A Slight Problem n (%)	A Moderate Problem n (%)	Somewhat Serious Problem n (%)	A Serious Problem n (%)	A Very Serious Problem n (%)
Emotional Burden						
6	157(79.3)	3(1.5)	24(12.1)	14(7.1)	-	-
7	158(79.8)	17(8.6)	14(7.1)	9(4.5)	-	-
8	171(86.4)	11(5.6)	10(5.1)	6(3.0)	-	-
9	176(88.9)	8(4.0)	7(3.5)	7(3.5)	-	-
17	180(90.9)	9(4.5)	5(2.5)	2(1.0)	2(1.0)	-
Physician Distress						
4	197(99.5)	1(.5)	-	-	-	-
11	198(100)	-	-	-	-	-
12	197(99.5)	1(.5)	-	-	-	-
13	198(100)	-	-	-	-	-
Regimen Distress						
5	192(97.0)	1(.5)	2(1.0)	2(1.0)	1(.5)	-
10	195(98.5)	1(.5)	2(1.0)	-	-	-
14	198(100)	-	-	-	-	-
15	157(79.3)	16(8.1)	23(11.6)	2(1.0)	-	-
16	136(68.7)	28(14.1)	29(14.6)	4(2.0)	1(.5)	-

Table 10 (continued)

Question Number of Diabetes Distress Scale	Not a Problem n (%)	A Slight Problem n (%)	A Moderate Problem n (%)	Somewhat Serious Problem n (%)	A Serious Problem n (%)	A Very Serious Problem n (%)
Interpersonal Distress						
1	195 (98.5)	1 (.5)	2(1.0)	-	-	-
2	195(98.5)	1 (.5)	2(1.0)	-	-	-
3	195 (98.5)	2(1.0)	1 (.5)	-	-	-

Note. n = frequency, % = percentage

Table 11

Frequency and Percentage of Diabetes Family Behavior Checklist (N = 198)

Question Number of Diabetes Famili Behavior Checklist	Never n (%)	Twice a month n (%)	Once a Week n (%)	Several times a Week n (%)	At Least once a day n (%)
Supportive Behavior					
1	177(89.4)	12(6.1)	5(2.5)	2(1.0)	2(1.0)
3	23(11.6)	28(14.1)	51(25.8)	36(18.2)	60(30.3)
5	39(19.7)	29(14.6)	46(23.2)	31(15.7)	53(26.8)
8	176(88.9)	8(4.0)	7(3.5)	7(3.5)	-
9	47(23.7)	37(18.7)	42(21.2)	31(15.7)	41(20.7)
10	150(75.8)	12(6.1)	15(7.6)	11(5.6)	10(5.1)
12	86(44.4)	21(10.6)	34(17.2)	26(13.1)	29(14.6)
13	163(82.3)	10(5.1)	14(7.1)	4(2.0)	7(3.5)
15	165(83.3)	24(12.1)	7(3.5)	1(.5)	1(.5)
Non-Supportive Behavior					
2	173(87.4)	13(6.6)	7(3.5)	3(1.5)	2(1.0)
4	168(84.8)	17(8.6)	9(4.5)	3(1.5)	1(.5)
6	170(85.9)	17(8.6)	7(3.5)	3(1.5)	1(.5)
7	176(88.9)	14(7.1)	7(3.5	1(.5)	-
11	88(44.4)	21(10.6)	34(17.2)	26(13.1)	29(14.6)
14	191 (96.5)	3 (1.5)	1(.5)	1(.5)	2(1.0)
16	155(83.3)	22 (11.1)	8(4.0)	2(1.0)	1(.5)

Note. n = frequency, % = percentage

Table 12

Frequency and Percentage of Diabetes Management Self-Efficacy Scale (N = 198)

Question Number of Diabetes Management Self-Efficacy Scale	0 n (%)	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	6 n (%)	7 n (%)	8 n (%)	9 n (%)	10 n (%)
1	147(74.2)	4(2.0)	1(.5)	-	1(.5)	4(2.0)	4(2.0)	3(1.5)	5(2.5)	2(1.0)	27(13.6)
2	4(2.0)	-	-	2(1.0)	1(.5)	6(3.0)	6(3.0)	14(7.1)	24(12.1)	46(23.2)	95(48.0)
3	5(2.5)	-	-	2(1.0)	1(.5)	6(3.0)	7(3.5)	9(4.5)	18(9.1)	39(19.7)	111(56.1)
4	-	-	-	3(1.5)	-	9(4.5)	10(5.1)	14(7.1)	22(11.1)	50(25.3)	90(45.5)
5	1(.5)	-	2(1.0)	1(.5)	-	7(3.5)	8(4.0)	16(8.1)	25(12.6)	53(26.8)	85(42.9)
6	3(1.5)	-	-	1(.5)	-	7(3.5)	5(2.5)	19(9.6)	33(16.7)	45(22.7)	85(42.9)
7	3(1.5)	-	-	1(.5)	-	1(.5)	7(3.5)	19(9.6)	38(19.2)	47(23.7)	82(41.4)
8	18(9.1)	-	2(1.0)	1(.5)	2(1.0)	16(8.1)	12(6.1)	10(5.1)	21(10.6)	26(13.1)	90(45.5)
9	3(1.5)	-	3(1.5)	-	2(1.0)	8(4.0)	8(4.0)	24(12.1)	48(24.2)	50(25.3)	52(26.3)
10	1(.5)	-	2(1.0)	-	1(.5)	5(2.5)	10(5.1)	21(10.6)	50(25.3)	55(27.8)	53(26.8)
11	3(1.5)	-	4(2.0)	29(1.0)	1(.5)	5(2.5)	7(3.5)	28(14.1)	48(24.2)	45(22.7)	55(27.8)
12	3(1.5)	2(1.0)	-	-	3(1.5)	3(1.5)	18(9.1)	22(11.1)	44(22.2)	42(21.2)	61(30.8)
13	-	-	2(1.0)	1(.5)	11(5.6)	5(2.5)	20(10.1)	21(10.6)	37(18.7)	36(18.2)	65(32.8)
14	-	-	2(1.0)	1(.5)	11(5.6)	5(2.5)	24(12.1)	20(10.1)	37(18.7)	33(16.7)	65(32.8)
15	-	-	2(1.0)	1(.5)	11(5.6)	5(2.5)	25(12.6)	20(10.1)	40(20.2)	33(16.7)	61(30.8)
16	-	-	4(2.0)	1(.5)	9(4.5)	5(2.5)	26(13.1)	19(9.6)	36(18.2)	30(15.2)	68(34.2)
17	-	-	4(2.0)	1(.5)	9(4.5)	5(2.5)	26(13.1)	19(9.6)	36(18.2)	30(15.2)	68(34.2)

Note. n = frequency, % = percentage

Table 12 (continued)

Question Number of Diabetes Management Self-Efficacy Scale	0 n (%)	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)	6 n (%)	7 n (%)	8 n (%)	9 n (%)	10 n (%)
18	-	-	-	-	1(.5)	-	-	3(1.5)	2(1.0)	14(7.1)	178(89.9)
19	-	-	-	-	1(.5)	-	2(1.0)	2(1.0)	6(3.0)	16(8.1)	171(86.4)
20	-	-	-	-	1(.5)	2(1.0)	2(1.0)	2(1.0)	5(2.5)	17(8.6)	169(85.4)

Note. *n* = frequency, % = percentage

Table 13

Frequency and Percentage of FACIT-Sp Ex (N = 198)

Question Number of FACIT-Sp Ex	Not at all n (%)	A little bit n (%)	Some-what n (%)	Quite a bit n (%)	Very much n (%)
Meaning					
1	-	1(.5)	10(5.1)	128(64.6)	59(29.8)
2	-	1(.5)	11(5.6)	128(64.6)	58(29.3)
3	1(.5)	2(1.0)	13(6.6)	128(64.6)	54(27.3)
4	141(71.2)	17(8.6)	29(14.6)	10(5.1)	1(.5)
5	2(1.0)	1(.5)	11(5.6)	136(68.7)	48(24.2)
6	-	1(.5)	12(6.1)	142(21.7)	43(21.7)
7	6(3.0)	1(.5)	7(3.5)	139(30.2)	45(22.7)
8	183(92.4)	3(1.5)	2(1.0)	10(5.1)	-
Faith					
9	-	2(1.0)	6(3.0)	139(70.2)	51(25.8)
10	-	2(1.0)	5(2.5)	140(70.7)	51(25.8)1
11	-	3(1.5)	6(3.0)	137(69.2)	52(26.3)
Connectedness					
12	-	2(1.0)	10(5.1)	141(71.2)	45(22.7)
13	-	-	7(3.5)	135(68.2)	56(28.3)
14	-	-	7(3.5)	134(67.7)	57(28.8)
15	-	-	6(3.0)	137(69.2)	55(27.8)
16	-	-	7(3.5)	136(68.7)	55(27.8)
17	-	-	7(3.5)	141(71.2)	50(25.3)
18	-	-	8(4.0)	139(70.2)	51(25.8)
19	-	-	7(3.5)	134(67.7)	57(28.8)
20	-	-	6(3.0)	135(68.2)	57(28.8)
21	-	2(1.0)	7(3.5)	138(69.7)	51(25.8)
22	-	-	7(3.5)	141(71.2)	50(25.3)
23	-	-	8(4.0)	140(70.7)	50(25.3)

Note. n = frequency, % = percentage

Appendix L

Testing Assumption

Figure 2

The Results of Multivariate Normality Evaluation

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Total Score of DDS

Histogram
Dependent Variable: Total Score of DDS

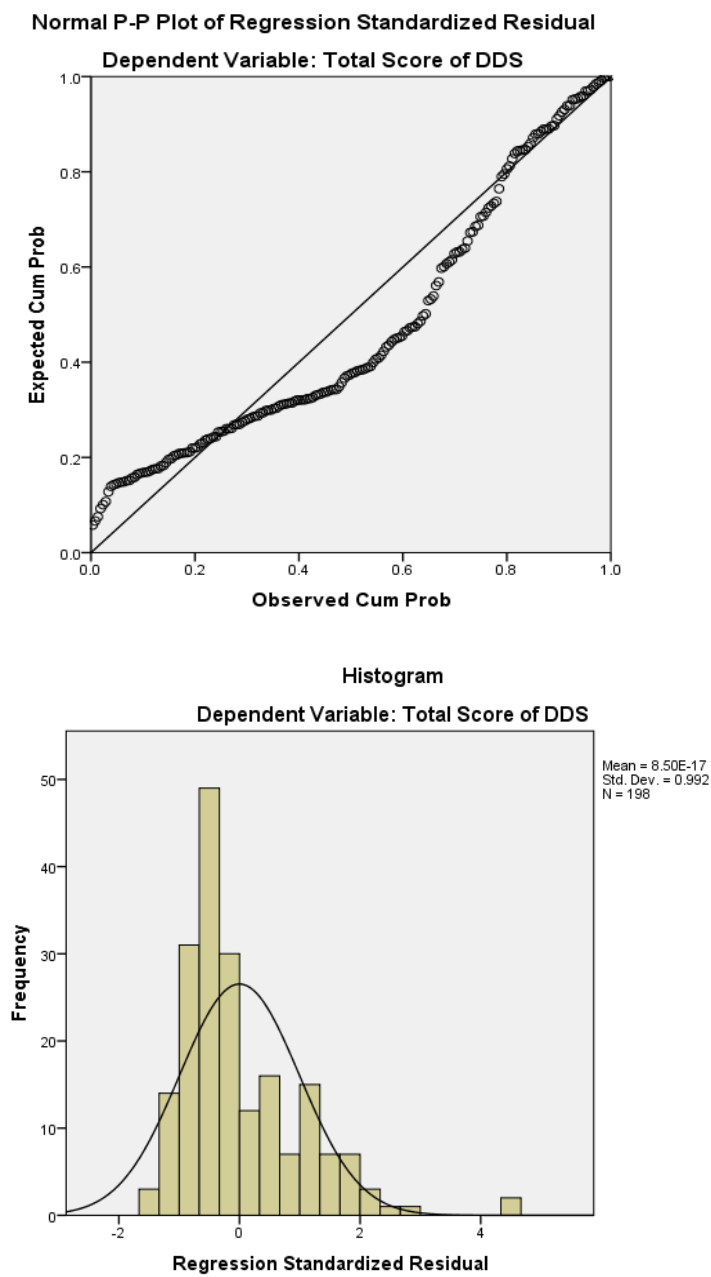Mean = 8.50E-17
Std. Dev. = 0.992
N = 198

Figure 3

The Results of Homoscedasticity Evaluation
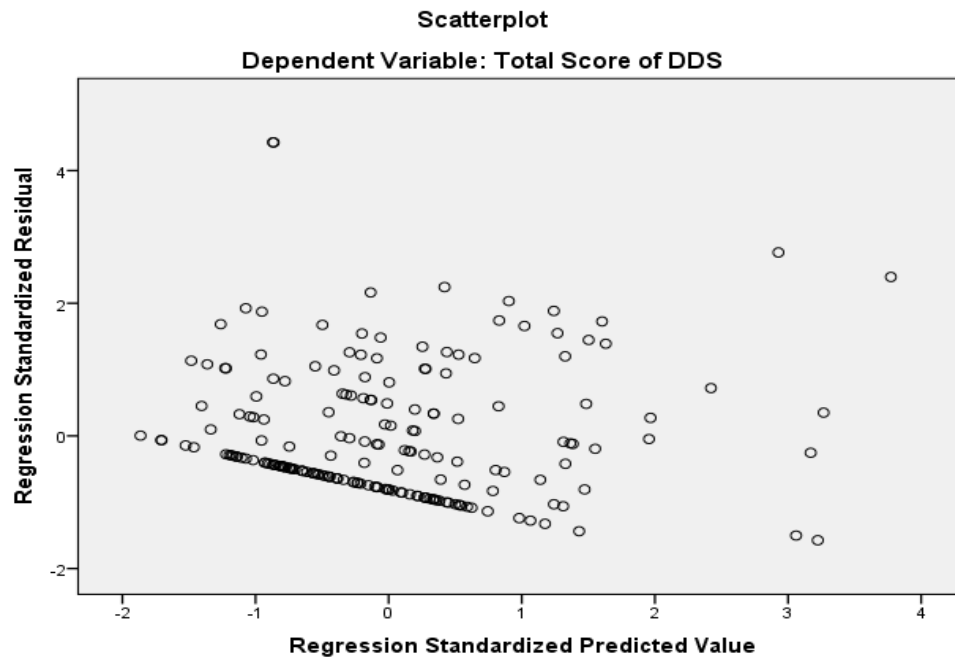
Table 14

The Tolerance Value and The Variance Inflation Factor Value

Variables	Tolerance	VIF
Non-supportive Behavior	.946	1.058
Self-Efficacy	.902	1.108
Spirituallity	.952	1.051

Table 15

The Results of Durbin-Watson Value

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.353[a]	.125	.120	3.14103	
2	.380[b]	.144	.135	3.11406	
3	.403[c]	.163	.150	3.08810	1.920

a. Predictors: (Constant), Total Score of DMSES

b. Predictors: (Constant), Total Score of DMSES, Non-Supportive Behavior

c. Predictors: (Constant), Total Score of DMSES, Non-Supportive Behavior, Total Score of Facit Sp ex

d. Dependent Variable: Total Score of DDS

Table 16

The Results of Multicollinearity Value

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Total Score of DMSES	Non-Supportive Behavior	Total Score of Facit Sp ex
1	1	1.990	1.000	.01	.01		
	2	.010	13.897	.99	.99		
2	1	2.922	1.000	.00	.00	.01	
	2	.070	6.471	.01	.08	.75	
	3	.008	18.987	.98	.92	.24	
3	1	3.904	1.000	.00	.00	.00	.00
	2	.076	7.171	.00	.04	.78	.01
	3	.014	16.987	.01	.68	.05	.53
	4	.006	25.409	.99	.28	.16	.46

a. Dependent Variable: Total Score of DDS

Appendix M

List of Experts

Content validity of the questionnaires used in this study was validated by three experts. They were:

1. Asst. Prof. Dr. Tippamas Chinnawong

    Lecturer, Faculty of Nursing, Prince of Songkla University, Thailand

2. Dr. Sri Werdati M.Kes

    Lecturer, Faculty of Health Sciences, Alma Ata University, Indonesia

3. Dr. dr. Probosuseno Sp.PD.,K-Ger

    Internits, Central General Hospital, dr. Sardjito, Indonesia

VITAE

Name	Mr. Muhammad Ischaq Nabil Asshiddiqi
Student ID	6010420003

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing	Alma Ata University	2013
Nursing Profession	Alma Ata University	2014

Scholarship Awards during Enrolment

The 2017 scholarship award for Master, studies Thailand's Education Hub for Southern Region of ASEAN Countries (TEH-AC).

The 2019 Research Grant, Graduate School, Prince of Songkla University.

Reward during Enrolment

The Best Poster Presentation on The First Academic Fair, Fulfilling the Royal Wish "Benefit of Mankind", 2018, Faculty of Nursing, Prince of Songkla University, 17 April 2018.

Work-Position and Address

Faculty Member, Faculty of Health Sciences, Alma Ata University, Bantul, Yogyakarta, Indonesia (October 2014 - present).

Secretary, Alma Ata Foundation, Bantul, Yogyakarta, Indonesia (January 2015 – present).

Deputy Treasurer, Alma Ata Foundation, Bantul, Yogyakarta, Indonesia (September 2009-December 2014).

List of Publication and Proceeding

Nabil, M.I., & Yodchai, K. (2018). Non-pharmacological strategies to improve blood glucose control among elderly with type 2 diabetes mellitus. Abstract paper presented at the Conference Moving Towards Global Health Leaders: A call for nurses, Bangkok, Thailand.