DIABETES SELF-CARE AND ITS ASSOCIATED FACTORS

AMONG ELDERLY DIABETES PATIENT

IN THE OUTPATIENT DEPARTMENT

HOSPITAL UNIVERSITI SAINS MALAYSIA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

BMI	Body Mass Index
CHD	Coronary heart disease
CKD	Chronic Kidney Diseas
CVD	Cardiovascular disease
HUSM	Hospital Universiti Sains Malaysia
IHD	Ischemic Heart Disease
KRK	Klinik Rawatan Keluarga
MDKT	Michigan Diabetes Knowledge Test
MEDSCaQ	Malay Elderly Diabetes Self-Care Questionnaire
M-GDS-14	Malay version of Geriatric Depression Scale 14
NHMS	National Health Morbidity Survey
SD	Standard Deviation
SMBG	Self-Monitoring Blood Glucose
SPSS	Statistical Package for Social Science
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

ABSTRACT – English

Introduction: The world population is ageing and diabetes mellitus is one of the most prevalent diseases that afflict senior citizens. One of the reason of suboptimal glycemic control and diabetes complications is lack of self-care by those with diabetes.

Objective: To describe diabetes self-care among elderly diabetic in the KRK, HUSM and to determine the associated factors.

Material and method: A cross sectional study was conducted among elderly type 2 diabetes patients attending KRK, HUSM, Kelantan. Diabetes self-care was assessed using interview-based questionnaire the Malay Elderly Diabetes Self-Care Questionnaire (MEDSCaQ).

Result: A total of 143 patients responded giving a response rate of 91.7%. The mean of total diabetes self-care score was 26.5 (SD 8.0), with minimum score of 1 and maximum score of 40. The factors with positive impact on diabetes self-care were being non-Malay (β=5.275, p=0.002), taken care by family during sick (β=8.995, p=0.004), higher family support (β=0.159, p=0.042), without neuropathy (β=3.261, p=0.016), acceptable knowledge in diabetes (β=4.375, p=0.001) and good knowledge in diabetes (β=5.893, p=0.004). However, having no CKD lowered diabetes self-care (β=-4.053, p=0.003).

Conclusion: Race, care-taker during sick, family support, diabetes knowledge, neuropathy and CKD were significantly associated with diabetes self-care in elderly. These factors should be taken in account in planning future diabetes self-management programs among the elderly.

ABSTRAK - Bahasa Melayu

Pengenalan: Populasi dunia sedang mengalami penuaan dan kencing manis adalah salah satu penyakit yang kerap dihidapi oleh warga tua. Salah satu punca kawalan gula yang suboptima and berlakunya komplikasi kencing manis adalah disebabkan kurang pengurusan kendiri oleh pesakit kencing manis itu sendiri.

Objektif: Untuk menilai pengurusan kendiri kencing manis dan faktor-faktor yang berkaitan di kalangan warga tua di KRK, HUSM, Kelantan.

Metodologi: Satu kajian keratin rentas telah dijalankan di kalangan pesakit kencing manis warga tua yang menghadiri KRK, HUSM, Kelantan. Pengurusan kendiri kencing manis dinilai secara temuramah menggunakan "Malay Elderly Diabetes Self-Care Questionnaire" (MEDSCaQ).

Keputusan: Sebanyak 143 pesakit terlibat, justeru memberi kadar penglibatan pesakit sebanyak 91.7%. Purata keseluruhan markah pengurusan kendiri kencing manis adalah 26.5 (SD 8.0), dengan markah minima 1 dan markah maksima 40. Faktor yang memberi impak positif terhadap pengurusan kendiri kencing manis adalah bukan Melayu (β=5.275, p=0.002), dijaga oleh keluarga semasa sakit (β=8.995, p=0.004), sokongan keluarga yang tinggi (β=0.159, p=0.042), tiada masalah saraf (β=3.261, p=0.016), pengetahuan kencing manis yang memuaskan (β=4.375, p=0.001) dan pengetahuan kencing manis yang bagus (β=5.893, p=0.004). Namun, tiada masalah buah pinggang merendahkan pengurusan kendiri kencing manis (β=-4.053, p=0.003).

Kesimpulan: Bangsa, penjaga ketika sakit, sokongan keluarga, pengetahuan kencing manis, masalah saraf, dan masalah buah pinggang adalah berkait dengan signifikan terhadap pengurusan kendiri kencing manis di kalangan warga tua. Faktor-faktor ini perlu diambil kira dalam merangka program pengurusan kendiri kencing manis di kalangan warga tua.

CHAPTER 1: INTRODUCTION

Ageing is inevitable and as the result of development, the world's population is ageing. According to the United Nations, the ageing society is when the population aged 65 and over to achieve seven per cent of the total population. It is postulated that by 2050 the average life span worldwide is expected to extend another 10 years.(1) As a developing country, Malaysia is not spared to become one of the ageing society. Based upon the projection rate and current trend, Malaysia is projected to become an ageing population in 2021.(2) This may be due to as a result of low birth rate and low mortality rate among the adult population.(2)

With increasing age, these ageing population are also more likely to have chronic illness and disability. Chronic conditions not only impact the quality of life of elderly, but are also associated with considerable economic cost. Primary health facilities in Malaysia are facing difficulties in providing adequate care to the older population, especially as geriatric medicine is still a new specialty in our country. Therefore, our health care service need to aggressively evolve to provide a good quality of care to a larger number of elderly especially to those with multiple health problems and complex health care needs. Apart from that, involvement of elderly in the development and strengthening of primary and long-term care services is also important. This can be achieved by promoting self-care in elderly and maximize their strengths and abilities within health services.(1)

Type 2 diabetes mellitus (T2DM) is a common chronic disease among elderly in Malaysia. (3) T2DM is a disabling disease resulting in cognitive and functional disabilities as well as dependencies which cause significant burden to the healthcare and social care resources. T2DM demands long-term care which might pose the greatest challenge for both personal/family

resources and public resources. However, T2DM is a self-managed disease where patients need to provide at least 99% of their own care.(4) Therefore, self-care strategies has the potential to change the roles played by T2DM patients to maintain independence, functioning, and healthand at the same time reduce the burden to the healthcare resources.

According to the World Health Organization (WHO), increasing the effectiveness of self-management support may have a far greater impact on the health of the population than any improvement in specific medical treatments.(5) Although the benefits of diabetes self-care are well known, not many patients among of the elderly population practice diabetes self-care.(6)

1.1   Justification of study

Despite the abundance of studies on self-care practices, little is known about self-care practices of elderly diabetic in Malaysia. So far, there are only 2 studies available in assessing the level of self-care among diabetic patient in Malaysia.(6, 7) Those studies which were done in Melaka and Selangor may not represent whole of Malaysian populations. Moreover, both studies were done among adult patients and not represent the elderly population. There are only small number of research which involves adults aged 60 years old or older with diabetes in Malaysia. On the other hand, this underrepresented population is vulnerable because those belonged to this age group are the most likely to be affected by diabetes and would have to bear the burden of the effects of the disease. Before designing an intervention such as diabetes self-management program to enhance self-care practices among elderly, it is important to understand the current self-care practices of elderly Malaysians with diabetes. Hence this study was undertaken to explore the different aspects of self-care practices among elderly and its associated factors.

2

CHAPTER 2: LITERATURE REVIEW

2.1   Elderly
2.1.1   Definition of elderly

According to the WHO, ageing is a biological, sociological, economic and chronological phenomenon.(8) Biologically, ageing begins at least as early as puberty and is a continuous process throughout adult life.(8) Socially, the characteristics of members of society who are perceived as being old vary with the cultural setting and from generation to generation.(8) Economically, the elderly are sometimes defined in terms of retirement from the work-force. However, in societies with a normal or statutory retirement age, many individuals cease economic activity for reasons unrelated to ageing. Furthermore, many of those who stopped working continue to contribute indirectly to their society's economy through support to working family members, voluntary work, or deployment of wealth.(8) Chronologically, age has long been used as an indicator of expected residual life span.(8)

Chronological definition is the most popular definition used to refer to the elderly population where most developed world countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person.(9) At the moment there is no standard numerical criterion. However, the United Nations agreed cutoff is 60 years or older to refer to *"the elderly or ageing population"*(8) and Malaysia has adopted this cutoff point in formulating and implementing plans for our elderly senior citizens.(10)

2.1.2 Demographic of the elderly

The world population is ageing. Driven by falling fertility rates and remarkable increases in life expectancy, ageing is a "silent epidemic" which started initially in the developed countries. (11) In 2010, the number of people aged 65 or older was estimated to be around 524 million and projected to grow to nearly 1.5 billion in 2050, with most of the increase occurs in developing countries.(12)

However, the process of population ageing is occurring much more rapidly in Asia than it did in Western countries. In Asia, the number of people age 65 and above is expected to grow dramatically. The Asian population in this age group will increase by 314 percent, from 207 million in 2000 to 857 million in 2050.(13) As a result, chronic non-communicable disease such as heart disease, cancer, and diabetes in this region are on the rise due to this ageing population.(12)

As a fast developing nation, Malaysia is also fast becoming an ageing society. Over the twenty years from 1970-1991, the number of senior citizens in Malaysia almost doubled from 546 thousand persons in 1970 to 1.03 million persons in 1991. In 2000, the numbers have increased by another 35 per cent to 1.4 million persons or 6.3 per cent of the total population in 2000.(10) Based on population projections, the number of senior citizens is likely to reach 7.1 per cent of the total population by 2021.(2)The main cause for this trend in Malaysia are mainly due to decline in fertility rate, longer life expectancy due to better health services as well as international migration.(2)

2.2   Diabetes Self-care
2.2.1   Definition of Diabetes Self-care

There are many definitions of self-care or also known as self-management, and yet no universally accepted definition. According to Orem's self-care theory developed by Dorothea Orem who is a classic nursing theorist, human beings have the inherent ability to care for themselves.(14) Orem defined self-care as a practice of activities that maturing or mature person initiates and performs, within time frames, on their own behalf in the interest of maintaining life, healthful functioning, continuing personal development and well-being.(14) Another definition by Barlow et al, self-management refers to the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition.(15) Efficacious self-management encompasses ability to monitor one's condition and to effect the cognitive, behavioral, and emotional responses necessary to maintain a satisfactory quality of life.(15) Generally, self-care can be understood as care administered by the individual suffering a disease, such as self-medication or self-checks with the collaboration and guidance of the individual's physician and other health care providers.

2.2.2   Diabetes Self-care Activities and Recommendations

Despite the well-known benefits of engaging in a recommended self-care regimen, research remains unresolved on the frequency and correlates of recommended self-care practices as self-care activities vary extensively according to the nature of the activity itself. Biomedical recommendations for diabetes self-care encompass a broad range of activities but generally fall within the following areas: diet, self-monitoring blood glucose (SMBG), exercise, medication, and foot care.(16, 17)

2.2.2.1 Dietary control

An accurate food planning will help the diabetes patient to maintain a stable blood glucose level, reduce the cardiovascular risk factors and help the patient to get a well-balanced diet. Of the total energy intake, 50-55 % should come from carbohydrates and 30 % or less from fat.(18) The protein intake should be 15-20 % of the total intake and the salt intake should be less than 6g per day.(19)

2.2.2.2 Physical activity

Physical activity is a key element in the diabetes type 2 self-care as it can help the patient to lose weight, and then also improve the body´s insulin sensitivity and glycaemic control. When performing physical activity it is still important for diabetes patients to adjust their food intake and medications to avoid hypoglycaemia.(18) Recommended regime to achieve benefits on cardiorespiratory fitness and HbA1c is the duration of exercise should be at least 150 minutes per week of moderate intensity aerobic physical activity or at least 90 minutes per week of vigorous aerobic plus at least two sessions per week of resistance exercise. (20)

2.2.2.3 Self-monitoring of blood glucose

Some patients with type 2 diabetes self-monitor their blood glucose levels regularly at home, which is associated with a better improvement of the metabolic control (Guerci et al., 2003; Benjamin, 2002). If a patient is self-monitoring his/her glucose level, it is also important to make sure the patient knows how the equipment works and how to interpret the results. Based on our local guideline, those who are on diet control or oral hypoglycemic agents only were recommended to

do SMBG at four points of time which are pre and post breakfast, post lunch and post dinner/pre-bed. While those on insulin have additional 2 points which are pre-lunch and pre-dinner, making the recommended SMBG frequency six times daily for those who are on insulin.(21) However, how frequent monitoring will be done apart from depending on glucose status, glucose goals, and mode of treatment, the available resources for the individual need to be taken into considerations.(18)

2.2.2.4 Medication Adherence

Medication adherence refers to the act of conforming to the recommendations made by the provider with respect to timing, dosage, and frequency of medication taking.(20) Medication adherence can be measured in many ways, including biological markers, pill counts, electronic monitoring devices, patient surveys, and prescription claims data. There is no "gold standard" to measure medication adherence Based on pill counts, patients are generally considered adherent to their medication if they took their pills greater than 80% as prescribed.(22)

2.2.2.5 Foot Care

Foot complications are common among diabetes type 2 patients. The disease can cause neuropathy, which make the patient unable to feel any blisters or stones in the shoes. The blood circulation can also be reduced to the foot due to peripheral vascular disease, which can make it difficult for wounds or ulcers to heal. This complication of non-healing wound can lead to amputations of toes, foot or legs which may lead to loss of quality of life, physical loss and economic burden in terms of industrial disability and health care loss. In the presence of feet with reduced sensation, the

patient is advised to look at feet daily using a mirror to detect early ulcerations.(23) They also recommended to wear flat, soft and well-fitted shoes to avoid callosities.(23) Before putting feet in the shoes, they need to ensure no foreign objects in the shoes.(23) Apart from that they need to have one pair of shoes for indoor use as well.(23)

Although foot care is important part of self-care, however, there are many limitations in that may influence foot care in elderly (24) such as:

1. Reduced visual acuity

2. Difficulty to reach their toes or foot due to physical limitations such as poor joint flexibility, and obesity

3. Postural hypotension.

It is recommended that foot care for elderly should be provided by either caretakers, podiatrist, trained health care staff or trained social care staff.(25) Therefore, it was not included in this study as part of the self-care activities in elderly diabetics.

2.2.3   Tools to Measure Diabetes Self-Care

There are many methods in measuring self-care, particularly in diabetes patient. Most methods in measuring self-care are using patient administered questionnaire and among the popular and most widely used are the " Summary of Diabetes Self-Care Activities (SDSCA)"(26), "Self-care Inventory Scale"(27), and "Diabetes Self-Management Questionnaire (DSMQ)"(28). However, there was no questionnaire specifically measure level of diabetes self-care in elderly. Therefore, many studies done previously designed their own questionnaire to measure self-care activities

among elderly. The diabetes self-care studies among elderlies done in different countries and different tools were summarized in Table 1.

Table 1. Diabetes self-care studies among elderlies.

Author	Study title	Study place	Tools use to assess diabetes self-care	Diabetes self-care activities assessed
Tu and Barchard, 1993 (17)	An Assessment of Diabetes Self-care barriers in Older Adults	Alabama, US	Diabetes Self-care Barriers Assessment Scale for Older Adults (DSCB-OA) 25-item scale	blood glucose monitoring, medication regime, dietary regime, exercise and health care utilization.
Bai et al., 2009 (29)	Self-care behaviour and related factors in older people with Type 2 diabetes	Taiwan	Diabetes Self-Care Scale (DSC) 27-item scale	exercise, diet, medication, blood sugar monitoring, foot care and prevention of unstable blood sugar levels
Klainin and Ounnapiruk, 2010 (30)	A Meta-Analysis of Self-Care Behavior Research on Elders in Thailand	Thailand	1. 24-item Thai version of Self Care Behavior Scale (Hanucharurnkul, 1988) 2. Diabetes Self-Care Behavior Questionnaire (Phumivisiate, 1994). 3. 38-item Self-Care Behavior Scale (Homnan, 1996) 4. 34-item Self-Care Behavior Questionnaire (Ubolwan, 1997 5. 24-item Self- Care Questionnaire (Wittayachokitikun, 1991) 6. 44-item Self-Care Questionnaire (Jantarakupt, 1997)	Not available

2.3   Diabetes Self Care Activities in Elderly
2.3.1   Prevalence of diabetes in elderly

Diabetes mellitus is one of the most prevalent diseases that afflict senior citizens. (3) It is a costly disease, both for the patient and the health care provider due to its chronicity and multi-organ involvement which resulted in frequent visit and admission to health facilities. Letchuman, Nazaimoon et al. (2010) reported in the National Health and Morbidity Survey III that the prevalence of diabetes mellitus among adult age more than 60 years in Malaysia for the year 2006 was more than twenty per cent. (3) In Malaysia, one of the reason of suboptimal glycemic control and diabetes complications is lack of self-care by those with diabetes.(6, 31)

2.3.2   Associated Factors
2.3.2.1 Socio-demographic factors

Various demographic factors appear to influence different self-care practices. One of them is gender factor. There has not been enough attention paid to gender differences in older adult self-care, and many literatures suggest that there may be some important gender differences related to self-care. A correlational study done in three hospitals in southern Taiwan involving type 2 diabetes aged 65 years and above reported that males had significantly higher self-care behaviour scores than females. (29) Another study involving 78 older patients with diabetes found that gender proved to be an important predictor of physical activity level (r=-.33), where males reporting substantially greater levels of exercise than females.(32) A local study done in Selangor and Melaka among 126 diabetic adults with mean (±S.D.) age of the subjects was 54.7 ± 11 years found that males had significantly better mean scores for diabetes self-care as regard the items of general diet and exercise.(6) However, a descriptive study carried out in Northern Finland among

213 adult patients with insulin-treated diabetes from two outpatient clinics reported that gender had no significant association with neglect of self-care.(33) Unfortunately the later 2 studies were not done specifically among elderly. Therefore, further study is required to determine the effect of gender on diabetic self-care in elderly.

Malaysia is a multiethnic country. According to Malaysian population census in 2010, the total population was 28.3 million of which 91.8 per cent were Malaysian citizens and 8.2 per cent were non-citizens. Malaysian citizens consist of the ethnic groups Bumiputera (67.4%), Chinese (24.6%), Indians (7.3%) and Others (0.7%). Among the Malaysian citizens, the Malays was the predominant ethnic group in Peninsular Malaysia which constituted 63.1 per cent. The Ibans constituted 30.3 per cent of the total citizens in Sarawak while Kadazan/Dusun made up 24.5 per cent in Sabah. Similar local studies by Tan and Magarey (2008) stated that as regard to diet self-care, Indian subjects consumed the least amount of sweet intake, whereas Malay subjects consumed the most (mean rank = 41.92; x2 = 7.33, d.f. = 2, p = 0.03).(6) However the findings could be biased due to unequal distribution of subjects according to ethnicity where Malays dominated the study subjects. (71% Malays, 15% Chinese and 15% Indian).

Another important factor is education level. Similar study from Taiwan, reported that older diabetics with higher education levels were better at self-care than illiterate older people.(29) They found there were significant differences in the self-care behaviour scores due to educational level (F = 8.321, p < 0.001). Those with educational levels of senior high school, college, or university level had higher self-care behaviour scores than illiterate respondents. Moreover, college and university graduates had higher self-care behaviour scores than those with only elementary school educations. This finding is similar to another study, who investigated self-care behaviour among the older diabetics and found that educational level is significantly associated with adherence,

where the higher the education level, the better the adherence to treatment regime.(16) Two other local studies done among local adults population with diabetes also stated that those with secondary education and above had better self-care.(6, 7)

In term of economic background, cost would be an important associated factor of level of SMBG. In Malaysia, the medications are heavily subsidized by the government. However every diabetic patient have to bear the cost of SMBG supplies on their own which could be a financial burden for those with poorer background.(6) It was also found that economic status is positively correlated with self-care behaviour among elderly diabetic patient.(29)

Social support is an individual's perception that assistance is readily available when one needs it. Support can be obtained from friends, family members and physician. Social support including the living conditions under which individuals with diabetes reside impact their diabetes self-care performance.(34) It was found that social support and self-care behaviour were positively correlated among type 1 and type 2 diabetic patients. (29, 33)

2.3.2.2 Medical characteristics

The longer duration of diabetes was significantly associated with poor glycemic control.(35) Poor control of the diabetes in these group is due to the fact that as duration of the disease increases, parallel with increasing age of patients, diabetes causes greater decline in physical and functional status in elderly diabetics compared to the younger ones. However, there was positive correlation between disease duration and self-care behaviour as by longer disease duration, patient can learn from previous disease and treatment experience.(29)

Knowledge of diabetes is an important component of diabetes self-management. The level of education, duration of diabetes, visits to a dietician and diabetes self-management are associated with diabetes knowledge. Age and occupation were associated with diabetes knowledge, with older persons having less knowledge and white-collar workers having the highest scores on diabetes knowledge.(36) In a study among 108 older adults with type 2 diabetes in Beijing, diabetes knowledge was not related to diabetes self-care activities or glucose level.(37) However, a local study reported that knowledge deficit contributes to poor self-care among our local people.(6)

Diabetes is complex and demanding, and has a major impact on the psychosocial functioning of patients and their families. The diagnosis of diabetes may come as a shock, and can induce serious emotional distress in both patient and family. Major depression was associated with less physical activity, unhealthy diet, and lower adherence to oral hypoglycemic, antihypertensive, and lipid lowering medications.(38) It was suggested that even low levels of depressive symptomatology are associated with non-adherence which is an important aspects of diabetes self-care.(39)

2.3.3 Importance of Diabetes Self Care Activities to Elderly

As we are approaching to be an ageing nation, we need to empower the current elderly and future elderly to be more responsible to their own health by practicing self-care. Diabetes is a mainly a self-managed condition. Whilst healthcare professionals offer education, treatment, and support, the patient is principally responsible for the day to day management of the condition. Apart from reducing dependency to others and reduce healthcare cost due to frequent admission or visits, it will also delays diabetic complications and promote healthy ageing.(40)

CHAPTER 3: OBJECTIVES AND HYPOTHESIS

3.1 General Objective

To study diabetes self-care and its associated factors among elderly diabetic patient in the Outpatient Department Hospital Universiti Sains Malaysia.

3.2 Specific Objectives

1. To describe diabetes self-care score among elderly diabetic in the outpatient department Hospital Universiti Sains Malaysia.

2. To determine the associated factor for diabetic self-care among elderly diabetic in the outpatient department Hospital Universiti Sains Malaysia including:

   - Psychosociodemographic: age, gender, race, education, marital status, income, smoking status, living arrangement, care-taker during ill, transportation problem, and family support.

   - Diabetes characteristic: diabetes duration, diabetes knowledge, types of medication, HbA1C, blood pressure control, BMI, macrovascular complications, microvascular complications, comorbidities (depression, hypertension, dyslipidemia).

3.3 Hypothesis

1. Diabetes self-care among elderly diabetic in the outpatient department Hospital Universiti Sains Malaysia is low.
2. Psychosociodemographic factors and medical characteristic are associated with diabetes self-care practice in elderly diabetic patients.

CHAPTER 4: METHODOLOGY

4.1 Study Design

This is a cross sectional study.

4.2 Study Area

Hospital Universiti Sains Malaysia (HUSM) is located in the district of Kubang Kerian, Kota Bharu, Kelantan, the east coast of Peninsular Malaysia. It acts as one of tertiary center in the state of Kelantan.

Klinik Rawatan Keluarga (KRK) is the outpatient department of HUSM that follow-up majority of chronic diseases including diabetes. Apart from that, KRK also receive referrals from all health clinics in Kelantan. This study was conducted at KRK.

4.3 Study Period

This study was conducted from 4th January 2015 till 31st March 2015

4.4 Reference Population

All elderly type 2 diabetics in Kelantan.

4.5 Source Population

Elderly type 2 diabetics in Hospital Universiti Sains Malaysia.

4.6   Study Sample

Elderly type 2 diabetics at outpatients' clinics HUSM that fulfill the inclusion and exclusion

criteria

4.7   Inclusion and Exclusion Criteria
Inclusion criteria:

- Elderly patient age more than 60.

- Diagnosed with type 2 diabetes based on WHO diagnostic criteria for diabetes for at

  least 1 year before study started.

Exclusion criteria:

- Those with

  - Hearing impairment*, or

  - Visual impairment*, or

  - Mental impairment* which impacted on their ability to answer questions

    independently

* Based on the medical record, reviewed by primary investigator.

4.8   Sampling Method

Subjects will be recruited from all elderly patients age 60 and above with diabetes attending the clinic and fulfilling the inclusion criteria. By using systematic random sampling, one in every two patients will be chosen for the study.

4.9   Sample Size Calculation

The sample size calculation was done for each objective and the one that yielded the biggest sample size was taken as the study sample.

Objective 1: To describe diabetes self-care among elderly diabetic in the outpatient department Hospital Universiti Sains Malaysia.

The calculation is using the single mean formula.

$n = (z\sigma / \Delta)^2$

The parameters were as follows:

n = sample size

Z = 1.96; standard normal distribution at 95% confidence interval

σ = standard deviation = 14.46

Δ = precision = 5

Based on the previous study,[41] the SD score for self-care was 14.46. Taking the precision of 5 with 95% confidence, the minimum sample size required was 32. However, after considering the non-response rate of 20%, the sample size calculated was 38.

For Objective 2, sample size calculation to determine the associated factors for diabetic self-care was done using Power and Sample Size Calculation software (version 3.0.43) for comparing two means. The parameters were as follows:

$\alpha = 0.05$

Power = 80%

m = Ratio of female and male respondent =1

σ = Standard deviation = 2.9

δ = Detectable difference in population mean =1

Table 2: Sample size calculation for Objective 2

Variables	σ	δ	Sample size	Total sample size + 20%
Duration of DM (42)	1.65	1	44	53
Type of DM (42)	1.84	1	54	65
Education (42)	2.09	1	70	84
Gender (42)	2.87	1	130	156

From the above calculation, the associated factor that yielded the biggest sample size for this objective was for the variable gender. Therefore, the minimum required sample size was 130. However, after considering the non-response rate of 20%, the sample size calculated was 156.

4.10   Study Operational Definition

1. Diabetes

Patients who diagnosed as T2DM registered in Klinik Rawatan Keluarga HUSM.

2. Elderly

In this study elderly was defined as those aged 60 years old and above.

3. Diabetes Self-care

Self-care is the practice of activities that individuals initiate and perform on their own behalf in maintaining life, health, and well-being. In this study, the self-care activities that are being examined include dietary control, physical activity, self-monitoring blood glucose, medication adherence and situational related adherence behavior.

4. Living arrangement

Living arrangements in this study with whom the patient stay with.

5. Care-taker during ill

A caregiver or caregivers can be either family members or others (friend/institution/none) who helps patients during illness with his or her activities of daily living.

6. Transportation problem

Refers to either having transportation problem to clinic or not.

7. Education

Level of patients' education.

Education level	Type of education received
No formal education	None
Primary education	Standard 1 to standard 6
Secondary education	Form 1 to form 6
Tertiary education	Diploma/ Degree/ PHD

8. Family support

Support received by patient from family in term of managing diabetes at home. It was assessed using a set of questions taken from the validated Malay version Diabetes Care Profile questionnaire.(43) The score will be totaled and the higher the score the better the family support.

9. Depression

Those score 8 and above on M-GDS-14 are in depression group, while those who score less than 8 belong to the non-depression group using cut-off point which was used in previous study. (44)

10. Duration of diabetes

Duration of patient diagnosed with T2DM.

11. Type of medications

Refers to type of medications patients' on for the past 3 months.

12. HbA1C level

The latest level of HbA1C recorded for the past 6 months.

13. Diabetes knowledge

Patients' knowledge regarding diabetes based on Malaysian Version Michigan Diabetes Knowledge Test (MDKT) score. (45)

SCORE	KNOWLEDGE
<7	Low
7-10	Acceptable
≥11	Good

14. Blood pressure control

Blood pressure reading during visit less than 140/80mmHg according to BP target for diabetics or less than 150/90 for elderly aged 80 years old and above.

15. BMI

Based on Asian BMI classification: (46)

Classification	BMI (kg/m^2)
Underweight	<18.5
Normal range	18.5 – 22.9
Overweight/ Pre-obese	23.0 – 27.4
Obese I	27.5 – 34.9
Obese II	35.0 – 39.9
Obese III	≥40.0

16. Ischemic heart disease

Patient who already had been diagnosed with IHD.

17. Stroke

Patient who had documented history of ischemic or hemorrhagic stroke.

18. CKD

Glomerular filtration rate less than 60 mL/min/1.73 m2 body surface area.

19. Retinopathy

Presence of any diabetes retinopathy changes based on non-mydriatic fundus camera.

20. Neuropathy

Documented symptoms and/or signs of peripheral neuropathy.

21. Hypertension

Patients who has been diagnosed with hypertension and on treatment.

22. Dyslipidemia

Patient diagnosed with dyslipidemia.

4.11   Research Tools
4.11.1 Sociodemographic Characteristic Questionnaire

During interview, participants were asked regarding general questions. The contents were age, gender, race, education, marital status, income, smoking status, living arrangement, care-taker during ill, transportation problem, and family support. The family support questions were taken from the validated Malay version Diabetes Care Profile questionnaire.(43)

4.11.2 Medical Characteristic Questionnaire
The questionnaire consists of 3 parts.

Part 1: Malay version of Geriatric Depression Scale 14 (M-GDS-14)

The M-GDS-14 is based on the Geriatric Depression Scale (GDS). It has been recommended to be use to screen for depression among elderly by the Royal College of Physicians, British Geriatric Society and the Royal College of General Practitioners scale.(44) It has been validated in many countries in two formats, 15- and 30-item formats.(44) It is a self-rating scale but can also be given by interview. The 15-items scale was translated into Malay language and validated, living out item 9, due to its non-discriminatory value against clinical diagnosis of depression, making it a 14-item scale (M-GDS-14).(47) The validated M-GDS-14 was used in this study because it has been studied and proven effective and relatively easy scale to be used in detecting depression among local elderly population.(47) Subjects who score 8 and above on M-GDS-14 are in depression group, while those who score less than 8 belong to the non-depression group.(44)