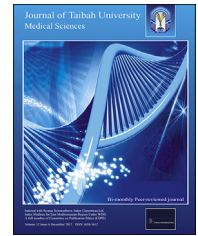Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com

Original Article

Diabetes self-care and its associated factors among elderly diabetes in primary care

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الملخص

أهداف البحث: داء السكري في المقام الأول هو داء يمكن التحكم فيه ذاتيا. ويقدم متخصصو الرعاية الصحية التعليم، والعلاج، والمساندة، ولكن المرضى هم المسئولين عن الإدارة اليومية لحياتهم. يمكن أن يكون لزيادة فعالية-الدعم الذاتي تأثير كبير على الرعاية الصحية، خاصة لدى كبار السن. وتهدف هذه الدراسة إلى وصف الرعاية الذاتية لداء السكري بين مرضى السكري المسنين، وتحديد العوامل المرتبطة به.

طرق البحث: ضمت هذه الدراسة المقطعية ١٤٣ من مرضى السكري المسنين، في العيادات الخارجية للمستشفى الجامعي في سينز ماليزيا. بحيث قيمت أنشطة الرعاية الذاتية متضمنة السيطرة الغذائية، والنشاط البدني، والرصد الذاتي للجلوكوز بالدم، والالتزام بالدواء، وسلوك الالتزام المتعلق بالمواقف، التي تم الحصول عليها باستخدام استبانة مالاي للرعاية الذاتية لمرضى السكري المسنين.

النتائج: كان متوسط أعمار المشاركين (± الإنحراف المعياري) ٦٧.٩(±٥.٤) عاما. وكان معظمهم من مالاي، ومتوسط الهيموجلوبين السكري ٨.٤ (±١.٩). وكان متوسط درجة الرعاية الذاتية لداء السكري ٢٦.٥ (±٨.٠). والعوامل التي لها تأثير موجب على الرعاية الذاتية لداء السكري تشمل: كون المريض ليس من مالاي، ولديه أسرة مقدمة للرعاية، ودعم أسري أكبر، وامتلاك معرفة مقبولة بداء السكري، والمعرفة الجيدة. ووجود الاعتلال العصبي يؤثر سلبا على الرعاية الذاتية، بينما للاعتلال الكلوي تأثير إيجابي.

الاستنتاجات: لدى كبار السن المصابون بداء السكري النوع ٢، درجة معتدلة من ممارسة الرعاية الذاتية لداء السكري بناء على استبانة مالاي للرعاية الذاتية لمرضى السكري المسنين. وتشمل محددات الممارسة الجيدة للرعاية الذاتية لداء

السكري العرق، والدعم الاجتماعي، ووجود مقدمي الرعاية أثناء فترات المرض، والمعرفة بداء السكري، ومضاعفات الأوعية الدموية لداء السكري.

الكلمات المفتاحية: داء السكري النوع ٢؛ الرعاية الذاتية لداء السكري؛ كبار السن؛ الدعم الاجتماعي

Abstract

Objectives: Diabetes is a primarily self-manageable condition. Healthcare professionals usually offer education, treatment, and support, but patients themselves are responsible for the daily management of their condition. Increasing the effectiveness of self-management support may have a considerable impact on health care, especially for elderly people. The aim of this study was to describe diabetes self-care among elderly diabetics and to determine its associated factors.

Methods: This report describes a cross-sectional study involving 143 elderly diabetes patients in the outpatient department of the Hospital Universiti Sains Malaysia (HUSM). Self-care activities assessed in this study included dietary control, physical activity, self-monitoring of blood glucose, medication adherence, and situational related adherence behaviour, all of which were obtained using the validated Malay Elderly Diabetes Self-Care Questionnaire (MEDSCaQ).

Results: The mean (±SD) age of the subjects was 67.9 (±5.4) years old. A majority was Malay, with a mean HbA1c of 8.4 (±1.9). The mean diabetes self-care score was 26.5 (±8.0). Factors with a positive impact on diabetes self-care included being non-Malay (β = 5.275, p = 0.002), having family as care givers (β = 8.995,

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p = 0.004), having a higher level of family support (β = 0.159, p = 0.042), and possessing acceptable (β = 4.375, p = 0.001) or good knowledge of diabetes (β = 5.893, p = 0.004). The presence of neuropathy negatively impacted self-care, while diabetes nephropathy had a positive impact on self care (β = −4.053, p = 0.003).

Conclusions: Elderly individuals with type 2 diabetes in HUSM have a moderate score of diabetes self-care practice based on the MEDSCaQ. Determinants for good diabetes self-care include race, social support, having care-takers during periods of illness, diabetes knowledge, and diabetic microvascular complications.

Keywords: Diabetes self-care; Elderly; Social support; Type 2 diabetes

Introduction

Type 2 diabetes mellitus (T2DM) is a common chronic disease among elderly patients in Malaysia. The prevalence of diabetes among adults older than 30 years has increased from 14.9% to 20.8% over the last 5 years.[1,2] T2DM is a disabling disease resulting in cognitive and functional disabilities and dependencies, which cause a significant burden on the healthcare and social care resources. T2DM demands long-term care, which poses challenges for personal, family and public resources. However, T2DM is a self-manageable disease, in which patients are able to care for 99% of their own needs.[3] Therefore, self-care strategies have the potential to change the roles played by T2DM patients, such that they could maintain their independence while reducing the burden on healthcare resources.

Ageing populations are more likely to suffer from chronic illnesses and disabilities. Chronic conditions impact the quality of life of the elderly and are associated with considerable economic costs. Primary health facilities in Malaysia are facing difficulties in providing adequate care to the ageing population, especially as geriatric medicine is still a new speciality in the country. Therefore, health care services in Malaysia need to evolve, to provide good quality care to the largest number of elderly people, especially to those with multiple health problems and complex health care needs. Additionally, involving the elderly in the development and strengthening of primary and long-term care services is also important. This can be achieved by promoting self-care amongst the elderly, in order to maximize their strengths and abilities and to assist them to use available healthcare services.[4]

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 other improvement in specific medical treatments.[5] Self-management refers to the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent to living with a chronic condition.[6] Although the benefits of diabetes self-care are well known, few elderly patients practice diabetes self-care.[7]

Various demographic factors appear to influence different self-care practices. For instance, the literature suggests that gender differences may influence self-care, and males exhibit significantly higher self-care compared to females.[7−9] Educational level is also significantly associated with adherence, such that the higher the education level, the better the adherence to treatment regimes.[7,10,11] Social support and self-care behaviours may also be positively correlated in elderly type 2 diabetes patients.[8] Medical background, such as the duration of the illness and the presence of co-morbidities and complications are also important factors that influence diabetes self-care.[8,12−14]

The aim of this study was to describe diabetes self-care and to look for its associated factors among elderly diabetic patients in the Outpatient Department of the Hospital Universiti Sains Malaysia (HUSM).

Materials and Methods

We conducted a cross-sectional study at the outpatient department of the Hospital Universiti Sains Malaysia from January 2015 to March 2015. Elderly patients greater than 60 years of age and suffering from type 2 diabetes for over a year were approached. The patients were diagnosed based on WHO diagnostic criteria.[15] Those with mental health problems, including dementia, and hearing or visual impairments, were excluded based on their medical records. The presence of co-morbidities and diabetic complications were also gathered from patients' medical records. Chronic kidney disease or neuropathy was defined by a glomerular filtration rate (calculated using Modified Diet in Renal disease (MDRD) equation) of less than $60 \text{ mL/min}/1.73 \text{ m}^2$ body surface area. Systematic random sampling of 1 in 2 was used to select 156 eligible participants from the diabetes appointment list. The sample of 156 participants selected was based on a sample size calculation using Power and Sample Size Calculation software (version 3.0.43) for comparing two means. Consented patients then had face-to-face interviews with the investigator. The diabetic characteristic section was filled out by the investigator based on the clinical history and medical records of the patient. Weight and height were obtained on the day of the interview, and the latest Hba1c result was considered.

A new set of interview questions was designed to assess self-care practices among the elderly; the questions were called Malay Elderly Diabetes Self-Care Questionnaire (MEDSCaQ). A 16-item interview-based questionnaire was developed in the Malay language. It was adapted from the validated 75-item Malay Version of the 'Self-care Activity' questionnaire[7] and the validated Malay Version of the Morisky Medication Adherence Scale (MMAS-8), with the authors' permission.[16] A pilot study was conducted a

month before the actual study and included 108 elderly diabetic patients in the Diabetic Clinic of the Hospital Universiti Sains Malaysia. Patients were assessed using the MEDSCaQ to evaluate their psychometric qualities. Construct validity was assessed using factor analysis with a varimax rotation, while internal consistency and reliability was assessed using Cronbach's alpha. The questionnaire was found to have appropriate content and face validity. Factor analysis revealed that there were five domains comprising Dietary Control, Physical Exercise, Self-Monitoring of Blood Glucose, Medication Adherence and Situational Related Adherence Behaviour, with factor loading ranging from 0.634 to 0.93, respectively. The reliability processes indicated that the MEDSCaQ is reliable, with an overall Cronbach's alpha of 0.721, while for the individual domain, the Cronbach's alpha value was between 0.686 and 0.869. The MEDSCaQ items were scored using 4-point scales, ranging from 0 to 3, in which '0' means 'never', '1' means 'sometimes', '2' means 'frequent', and '3' means 'always. The scoring was a sum of all 16 items. The minimum possible score was 0, and the maximum possible score was 48. The higher total self-care scores reflected better diabetes self-care; however, in this study, we also based our inference on the interquartile, in which a mean score of <22 was considered low, and scores >33 were considered to be good. Therefore, the overall diabetes self-care score among elderly diabetic patients in this study was moderate.

The Malaysian 14-item version of the Michigan Diabetes Knowledge Test (MDKT) was used to assess the knowledge of the elderly in this study. The MDKT was developed by the Michigan Diabetes Research and Training Centre. The 14-item questionnaire is a valid and reliable knowledge test that has been widely used to assess diabetes knowledge.[17] It has been translated into Malay and validated in the Malaysian version (Appendix 1).[18] The Malaysian version of the MDKT has a good internal consistency (Cronbach's alpha = 0.702), with a test-retest reliability value of 0.894 (p < 0.001), making it a reliable and valid measure of diabetes knowledge.[18] In this study, the questionnaires were administered by self-guided interviews. Based on previous studies, subjects who scored <7 were considered to be in the low knowledge group, those who scored 7 to 10 were in the acceptable knowledge group, and those who scored 11 or more were in the good knowledge group.[18]

The validated Malay version of the geriatric Depression scale 14 (M-GDS-14) was used in this study to assess depression. The questionnaire has been assessed and has proven effective, with a relatively easy scale, to be used in detecting depression among the local elderly population.[19] Subjects who scored 8 and above on the M-GDS-14 were in the depression group, while those who scored less than 8 were in the non-depressed group.[20]

Data were entered and analysed using the Statistical Program for Social Sciences (SPSS), version 22.0 (SPSS Inc., 2013). Data checking and cleaning were performed before analysis. The mean and proportion of elderly patients involved in diabetes self-care was calculated and expressed using the mean and standard deviation. Descriptive analyses for numerical variables were used to determine the mean score of the diabetes self-care. The score of diabetes self-care was presented as the mean, with a 95% Confidence Interval/Standard deviation. Based on expert opinion, the diabetes

Table 1: Socio-demographic characteristic of the subjects (n = 143).

	Mean (SD)	n (%)
Age (years)	67.9 (5.4)	
Income	1289.1 (952.4)	
Total score family support	17 (8.2)	
Gender		
Male		70 (49.0)
Female		73 (51.0)
Race		
Malay		124 (86.7)
Chinese		18 (12.6)
Indian		1 (0.7)
Education		
No formal education		23 (16.1)
Primary education		35 (24.5)
Secondary education		58 (40.5)
Tertiary education		27 (18.9)
Marital status		
Single		1 (0.7)
Married		104 (72.7)
Divorced/widowed		38 (26.6)
Smoking status		
Active smoker		15 (10.5)
Ex-smoker		32 (22.4)
Never smoke		96 (67.1)
Living		
Alone		8 (5.6)
Family		131 (91.6)
Others		4 (2.8)
Caretaker during sick		
None		2 (1.4)
Family		138 (96.5)
Others		3 (2.1)
Transportation problem		
Yes		29 (20.3)
No		114 (79.7)

self-care was classified based on quartiles. The 1st or lower quartile (score below 25th percentile) was considered low, the 2nd or median quartile (score between 25th and 75th percentile) was considered moderate, and the 3rd or upper quartile (score above 75th percentile) was considered good. General Linear Regression was used to identify associated factors of diabetes self-care.

This study was approved by the Ethical Committee of Universiti Sains Malaysia (USM) on the 15th of January, 2015; the study's protocol code was USM/JEPeM/1406221.

Results

A total of 156 participants were recruited in this study, but 143 completed the questionnaires, for a total response rate 91.7%. The mean age of the participants was 67.9 (±5.4) years, the minimum age was 60 years, and the maximum age was 83 years old. A majority of the participants were Malay 124 (86.7%), followed by Chinese 18 (12.6%), and only 1 (0.7%) was Indian. Of the respondents, 104 (72.7%) were married and had a secondary education (40.6%), and a majority were non-smokers (67.1%). Most respondents lived with their family (91.6%) and were cared for by family

members during periods of illness (96.5%), as shown in Table 1.

The medical characteristics of 143 participants are shown in Table 2; more than half of them had been suffering from diabetes for 10 years or more (58.0%). The respondents' knowledge on diabetes, based on the MDKT questionnaire, indicated that 42% of the subjects had low diabetes knowledge. A majority of respondents (63.6%) were on oral hypoglycemic agents (OHA/OHAs). Of all the subjects interviewed, 96.5% had dyslipidemia, and 95.8% were hypertensive. 16.8% were found to be depressed. Ischaemic Heart Disease (IHD) was evident in 19.6%, stroke in 4.9%, and retinopathy in 29.4%. Sixty-five percent of the subjects had chronic kidney disease (CKD), and 55.2% had neuropathy (see Table 3).

Table 4 shows the final model which best fits our data; it represents the most parsimonious and biologically plausible model for the associated factors of diabetes self-care. The significant associated factors based on simple and multiple

Table 2: Medical characteristics of the subjects (n = 143).

	Mean (SD)	n (%)
HbA1c	8.4 (1.9)	
Depression		
Depressed		24 (16.8)
Not depressed		119 (83.2)
Diabetes knowledge (MDKT)		
Low		60 (41.9)
Acceptable		65 (45.5)
Good		18 (12.6)
Diabetes duration		
<10 years		83 (58.0)
≥10 years		60 (42.0)
Medication		
Without insulin		91 (63.6)
With insulin		52 (36.4)
Blood pressure		
Controlled		62 (43.4)
Uncontrolled		81 (56.6)
BMI		
Underweight		2 (1.4)
Normal		23 (16.1)
Overweight		55 (38.5)
Obese		63 (44.0)
IHD		
Yes		28 (19.6)
No		115 (80.4)
Stroke		
Yes		7 (4.9)
No		136 (95.1)
CKD		
Yes		93 (65.0)
No		50 (35.0)
Neuropathy		
Yes		79 (55.2)
No		64 (44.8)
Hypertension		
Yes		137 (95.8)
No		6 (4.2)
Dyslipidemia		
Yes		138 (96.5)
No		5 (3.5)

Table 3: Self-care activity score.

Total diabetes self score	
Mean	26.5 (8.0)
Min	1
Max	40

linear regressions for diabetes self-care among elderly were being non-Malay, having family care during periods of illness, having family support, having acceptable and good diabetes knowledge, and having chronic kidney disease (CKD) and neuropathy. The following interpretation could be made. Being non-Malay made the diabetes self-care score 5.275, which was higher (95% CI: 1.94, 8.61) than the Malay score after controlling for other variables. After controlling for other variables, those who were taken care of by their families during periods of illness scored 8.995 higher (95% CI: 2.88, 15.11) in diabetes self-care compared to those who were taken care of by others or by no one during their illness. For every 1 unit increase in family support, there was an increase of 0.159 units in the diabetes self-care score (95% CI: 0.01, 0.31), after controlling for other variables. Elderly who had acceptable knowledge of diabetes scored 4.375 higher (95% CI: 1.95, 6.80) in diabetes self-care compared to those with low diabetes knowledge, after controlling for other variables. Elderly who had good knowledge of diabetes scored 5.893 higher (95% CI: 1.95, 8.61) in diabetes self-care compared to those with low diabetes knowledge, after controlling for other variables. Those who did not have CKD scored 4.053 lower (95% CI: 6.71, −1.40) in diabetes self-care compared to those with CKD, after controlling for other variables. Those who did not have neuropathy scored 3.261 higher (95% CI: 0.63, 5.89) in diabetes self-care compared to those with neuropathy, after controlling for other variables.

Discussion

Diabetes self-care among elderly diabetics

Diabetes self-management is a major challenge in both developing and developed countries. The Diabetes Attitudes, Wishes, and Needs (DAWN) is a landmark study conducted across 13 developed countries (including Australia, Denmark, France, Germany, India, Japan, The Netherlands, Norway, Poland, Sweden, Spain, UK and USA) in 2001, involving more than 5000 adults with diabetes. The study reported low self-care behaviours among both type 1 and type 2 diabetes patients,[21] and indicated that most people with diabetes did not follow all the treatment recommendations suggested by their healthcare professionals; many patients thought their diabetes was demanding and prevented them from leading normal lives.[21]

In this study, the high total self-care scores reflect better diabetes self-care. The highest possible score was 48, and the mean diabetes self-care in our study was 26.5 (±8.0). Based on quartiles, diabetes self-care among elderly patients in the outpatient department of Hospital Universiti Sains Malaysia were at a moderate level. The findings of this study corroborated those of a recently published local study, using a different questionnaire, entitled the Summary of Diabetes

Table 4: Associated factors for self-care among elderly diabetics by using simple linear and multiple linear regressions.

Variables	Simple linear regression			Multiple linear regression		
	b^a (95% CI)	t Stat	p Value	b^b (95% CI)	t Stat	p Value
Age	0.108 (−0.14, 0.35)	0.86	0.389			
Gender						
Male						
Female	1.195 (−1.45, 3.84)	0.89	0.373			
Race						
Malay						
Non-Malay	4.417 (0.59, 8.25)	2.28	0.024	5.275 (1.94, 8.61)	3.13	0.002
Education						
None						
Primary	1.422 (−2.85, 5.69)	0.66	0.511			
Secondary	1.410 (−2.51, 5.33)	0.71	0.478			
Tertiary	0.973 (−3.54, 5.49)	0.43	0.671			
Marital status						
Married	0.212 (−2.76, 3.18)	0.14	0.888			
Single/Divorced/ Widowed						
Income	0.000 (−0.001, 0.002)	0.52	0.605			
Living						
Family	3.499 (−1.24, 8.24)	1.46	0.147			
Alone/Others						
Caretaker during sick						
Family	11.957 (5.03, 18.88)	3.41	0.001	8.995 (2.88, 15.11)	2.91	0.004
Alone/Others						
Family support						
Total support score	0.289 (0.13, 0.45)	3.67	<0.001	0.159 (0.01, 0.31)	2.05	0.042
Transportation problem						
Yes						
No	0.848 (−2.44, 4.14)	0.51	0.611			
Smoking status						
Active						
Ex-smoker	4.421 (−0.49, 9.34)	1.78	0.078			
Never smoke	3.400 (−0.96, 7.76)	1.54	0.125			
Depression						
Depressed						
Not depressed	3.000 (−0.507, 6.507)	1.69	0.093			
Diabetes duration						
<10 years						
≥10 years	1.255 (−1.42, 3.93)	0.93	0.355			
Diabetes knowledge (MDKT)						
Low						
Acceptable	5.218 (2.58, 7.85)	3.91	<0.001	4.375 (1.95, 6.80)	3.56	0.001
Good	7.944 (3.99, 11.90)	3.97	<0.001	5.893 (1.95, 8.61)	2.95	0.004
Medication						
With insulin						
Without insulin	0.151 (−2.60, 2.90)	0.11	0.914			
HbA1C	−0.321 (−1.02, 0.38)	−0.91	0.363			
Blood pressure						
Controlled						
Uncontrolled	−1.065 (−3.730, 1.601)	−0.79	0.431			
BMI						
Underweight						
Normal	−3.024 (−14.335, 8.287)	−0.53	0.598			
Overweight	−3.567 (−7.404, 0.269)	−1.84	0.068			
Obese	−0.960 (−3.866, 1.946)	−0.65	0.515			
IHD						
Yes						
No	0.003 (−3.333, 3.340)	0.002	0.998			
Stroke						
Yes						
No	−7.395 (−13.41 to 1.38)	−2.43	0.016			
CKD						
Yes						

Table 4 (*continued*)

Variables	Simple linear regression			Multiple linear regression		
	b^a (95% CI)	t Stat	p Value	b^b (95% CI)	t Stat	p Value
No	−2.150 (−4.90, 0.60)	−1.54	0.125	−4.053 (−6.71, 1.40)	−3.02	0.003
Retinopathy						
Yes						
No	0.088 (−2.818, 2.995)	0.06	0.952			
Neuropathy						
Yes						
No	3.749 (1.16, 6.34)	2.86	0.005	3.261 (0.63, 5.89)	2.45	0.016
Hypertension						
Yes						
No	−0.388 (−6.99, 6.22)	−0.12	0.908			
Dyslipidemia						
Yes						
No	2.551 (−4.64, 9.75)	0.70	0.485			

p Value significant at <0.05.
b^a Crude regression coefficient.
b^b Adjusted regression coefficient.
R^2 0.339.

Self-Care Activities (SDSCA) conducted among elderly patients in three government hospitals (Gua Musang Hospital, Kuala Krai Hospital, and Machang Hospital) in Kelantan, Malaysia.[22] However, the questionnaire used by Sharoni et al. (2015) was only validated among the general adult population and adolescents, but not among the elderly. These findings were also similar to those obtained by Bai et al. (2009),[8] who investigated self-care in elderly diabetic patients in Taiwan, using the Diabetes Self-Care Scale (DSC) as a tool. The results of Bai et al. (2009) also showed that moderate levels of self-care behaviour were exhibited among elderly diabetic patients. However, the results from both the above studies are not comparable with those of our study, as they use different tools and target different populations.

Socio-demographic characteristic and diabetes self-care

Based on our socio-demographic background data, the results of this study showed that race, caretaking during periods of illness, and family support were significantly associated with diabetes self-care in elderly patients. We found that being non-Malay positively influenced diabetes self-care (OR = 5.275, 95% CI: 1.939, 8.612) compared to Malay subjects. Another local study using different methods of measuring self-care among adult diabetic patients, reported that Malay subjects, comprising 70% of the total respondents, had high sweet consumption compared to other races.[7] The study also showed that there was a statistically significant relationship between dietary practice and a higher mean fasting blood sugar.[7] The high sweet consumption is a major factor that can be targeted to improve diabetes control among patients of Malay ethnicity. However, Tan and Magarey (2008) found no association between race and other self-care practices, such as physical activity, medication adherence, and self-monitoring of blood glucose. Furthermore, population surveys and studies of patients with diabetes conducted in Malaysia[23] and Singapore,[24] with similar multi-ethnic populations of Chinese, Malays and Indians, have also documented marked ethnic differences. In both countries, among patients with Type 2 diabetes, glycaemic control was reported to be the poorest in Malays; however, the factors influencing self-care have not been elucidated in these populations. Social support is one of the fundamental aspects needed to achieve good control and better outcomes in patients with chronic diseases.[25] Patients may get support from friends, family members, nurses or physicians. The findings outlined here were consistent with those of various studies worldwide, indicating a positive correlation between family support and diabetes self-care.[8,22,25,26] Thus, elderly diabetic patients with higher social support have higher diabetic self-care. Therefore, family partnership intervention care should be incorporated in diabetes management, especially among elderly patients, to promote optimal clinical outcomes.

We also found that elderly patients who were taken care of by their family during illness, had higher levels of diabetes self-care compared to those who had no caretaker during illness, or had been taken care of by others, such as friends or nursing home staff. However, these results need to be interpreted cautiously, as most patients (96.5%) were taken care of by their family during illness. Only 2 subjects had no caretaker during illness, and only 3 subjects were taken care of by friends or nursing home staff. Although most studies do not explore this factor, the literature shows similar findings in a case study from Japan comparing hospitalized or institutionalized elderly diabetic patients, and those who stayed at home with their family.[27] Matsuzawa et al. (2008) found that the self-care among those who were taken care of in institutions was lower compared to those who stayed at home with their family, due to lack of social support, and decline in cognitive function.[27] Therefore, from our sociodemographic data, elderly Malay patients with diabetes who lack family support and have absolutely no caretaker during periods of illness need to improve their self-care. As healthcare providers, serious attention must be given to this group of patients.

Medical characteristic and diabetes self-care

Based on our medical background data, our study showed that diabetes knowledge was significantly associated with diabetes self-care in elderly patients. Diabetes

knowledge was assessed using the Malaysian 14-item version of the MDKT. Only 12.6% of the subjects had good diabetes knowledge, whereas a majority had acceptable knowledge (45.5%), and the rest had low knowledge (42.0%). From the analysis, we found that diabetes self-care in elderly patients was significantly associated with the patients' diabetes knowledge. Patients who had a good and acceptable diabetes knowledge were found to have higher diabetes self-care compared to those with low knowledge. This finding corresponds to that obtained by Bai et al.; 2009, who investigated self-care behaviour among older diabetics and reported that deficiencies in diabetes knowledge could impair the ability of patients to care for themselves.[8] Our study also reflects the findings of a local study conducted by Tan et al., 2008, who found that inappropriate self-care could be attributed to diabetes-related knowledge deficits.[7] Generally, the assessment of a patient's knowledge is critical to identify his or her knowledge deficit. Improvements in a patient's knowledge of diabetes self-care practices will allow him or her to better contribute to their own care; this step is a small investment with a large benefit, especially in the case of elderly patients. This can be achieved through non-structured diabetes education during consultation, or via structured diabetes education, such as diabetic education classes, courses, or programmes. Education is a key factor, and must be made a priority. This investment will ensure long-term reductions in the high costs generated by diabetes complications. Two meta-analyses showed that patient education has led to an increase in patient knowledge and has had a positive effect on metabolic control.[28,29]

Previous studies have found that patients with diabetic microvascular complications (including renal disease, neuropathy and diabetic eye disease) have more difficulties with self-management tasks, although they realize the importance of controlling their diabetes and overall health.[13] This was in line with our study, in which complications associated with diabetes had a significant impact on diabetes self-care. We found that those who did not have neuropathy were better at self-care compared to those with neuropathy. It is possible that those with neuropathy may have had more difficulty in performing self-care tasks, such as physical exercise. However, it is also possible that patients who had better diabetes self-care were less likely to develop neuropathy.

Contrastingly, we also found that patients without CKD exhibited less diabetic self-care compared to those with CKD. In other words, those with CKD had higher diabetic self-care than those without CKD. One possible reason for this finding could be that those with CKD received more attention, which motivated them to pay better attention to their diabetes and focus on their disease.[30] Self-efficacy is important for health promotion and disease prevention among older adults. According to Bandura, self-efficacy refers to an individual's assessments of their effectiveness or competency to perform a specific behaviour successful.[31] In Type 2 diabetes patients, self-efficacy is an essential factor influencing self-care behaviour.[10] Thus, it is reasonable to hypothesize that patients with CKD would be more likely to engage in self-care behaviours if they had more confidence in their ability to carry out these behaviours. This finding may also explain why more than half of the elderly involved in this study had CKD (65%), as the lower the diabetes self-care, the higher the likelihood of developing CKD.

Conclusion

Overall, elderly patients with Type 2 diabetes in HUSM exhibit moderate diabetes self-care practices. Diabetes self-care practices are significantly associated with race, social support, care-takers during periods of illness, diabetes knowledge, and diabetic microvascular complications. Being non-Malay, having better family support, having family members as caretakers during illness periods, and possessing acceptable and good diabetes knowledge increased diabetes self-care. The presence of neuropathy negatively impacted self-care, while diabetes nephropathy had a positive impact on the Type 2 elderly diabetic patients in this study.

Recommendations

This study had several limitations; thus, future research should be attempted to overcome such limitations. Larger studies involving multi-ethnic populations from different parts of Malaysia need to be conducted in order to obtain representative results for diabetes self-care research among elderly patients. We also encourage future researchers to utilize the MEDSCaQ to assess diabetes self-care in elderly patients.

Based on our study results, Kelantanese Malays were noted to have lower levels of diabetes self-care. Although this result might be biased due to our disproportionate racial distribution, it is worth noting that culturally tailored diabetes education needs to be developed by local health care providers, for better understanding among the local elderly diabetics, to promote compliance with self-care activities. Additionally, family involvement during health education sessions is important, to gain social support and reinforce more information regarding self-care activities for elderly diabetic patients.

Ethical approval

This study was approved by the Ethical Committee of USM on 15th January 2015. The study protocol code is USM/JEPeM/1406221 (Appendix b).

Funding

Authors' contributions

NHI conceived and designed the study, conducted the research, and acquired and interpreted the data. SSMY substantially contributed to the conception and design of the study and data analysis of this manuscript, wrote the initial and final draft of the article, and provided logistic support. AAK and RAR helped develop the questionnaire and provided advice on study design and methodology, and in

organizing the data. All the authors have critically reviewed and approved the final draft of this manuscript and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The authors have no conflict of interest to declare.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jtumed.2017.03.008.

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