



Self-Care Behaviour among Type 2 Diabetes Patients

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ABSTRACT

Self-care behaviour involves all activities type 2 diabetes patients engage in to care for their disease. In our local population, however, most patients do not manage their disease appropriately. This study aimed to determine the level of self-care behaviour and to examine the differences in self-care behaviour according to type 2 diabetes patients' demographic data and health condition at University Malaya Medical Centre. Sample of this study comprised 388 patients (respondents) and data were collected from December 2010 to February 2011 using self-administered questionnaires. Results showed that the level of self-care behaviour was moderately high (mean = 38.94, SD=11.93). There were significant differences between self-care behaviour and ethnicity [Wilk's Lambda = 0.92, F(12, 1008) = 2.70, p < 0.05], age group [Wilk's Lambda = 0.96, F(4, 383) = 4.39, p < 0.05], education level [Wilk's Lambda = 0.94, F(12, 1008) = 1.85, p < 0.05], type of treatment [Wilk's Lambda = 0.92, F(12, 1008) = 2.84, p < 0.05], health education [Wilk's Lambda = 0.97, F(4, 383) = 3.33, p < 0.05] and smoking status [Wilk's Lambda = 0.96, F(4, 383) = 4.53, p < 0.05]. Respondents who are Indian, elderly, had lower level of education, on insulin treatment, had received health education on diabetes and not smoking had better

self-care behaviour scores. It can be concluded that high risk type 2 diabetes patients should be taught individually so as to help them improve physical and psychological outcome.

Keywords: Self-care behaviour, type 2 diabetes

Article history:

Received: 2 April 2012

Accepted: 26 April 2013

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INTRODUCTION

Type 2 diabetes is a condition of relative insulin deficiency and the most common chronic condition affecting adults and the elderly (Feinglos & Bethel, 2008; Meiner & Lueckenotte, 2006). The incidences and its prevalence continue to rise due to aging and urbanization globally (Wild *et al.*, 2004). In Malaysia, the Third National Health and Morbidity Survey (NHMS III) stated between 1996 and 2006, the prevalence of the disease among adults aged 18 and 30 years old and above rose to 11.6% and 14.9%, respectively (Letchuman *et al.*, 2010). It is important to note that type 2 diabetes patients will have considerable functional impairment associated with their reduced health status (Sinclair *et al.*, 2008). Patients with complications of type 2 diabetes are hospitalized 1.5 – 3 times more than those without the disease (Leonard *et al.*, 2004). The major killer of patients suffering from the illness is macrovascular disease (Rizvi, 2007) such as renal impairment and co-morbidity (Prato *et al.*, 2003). The burden of the disease could potentially overwhelm existing health care systems and may cause an escalation in health care cost. As such, one of the prevention strategies is to improve self-care behaviour in order to prevent and minimize serious and long-term complications. Adherence to self-care behaviour that includes healthy-eating, being physically active, monitoring blood glucose and foot care is an important factor in maintaining the disease process (Song *et al.*, 2012; Feinglos & Bethel, 2008; Austin, 2005).

The findings of this study give an insight into and awareness among type 2 diabetes patients to understand the significance of self-care behaviour in the management of this disease. As a result, nurses who deal with type 2 diabetes patients will develop new techniques in health education, which can improve patients' compliance and confidence level in controlling the disease and increase their self-care behaviour. This will indirectly promote healthy living by improving glycaemic status and reducing any potential complications. Ultimately, it will improve diabetic patients' quality of life and reduce health care cost or hospital burden.

Self-care Behaviour

Diabetes is a self-managed disease as patients usually provide their own care (Feinglos & Bethel, 2008; Toobert *et al.*, 2000). Self-care behaviour refers to active decisions and actions that an individual take to cope with a health problem or to improve his or her health or delay complications (Funnell & Haas, 1995; Weinger *et al.*, 2005). It also encompasses an individual's learning from situations and experiences that have worked in the past. Diabetes self-care behaviour includes all the activities which the patients themselves engage in to care for their illness, promote health, improve physical, social, and emotional resources, as well as prevent the long-term and short-term complications from the disease (Bai *et al.*, 2009; McCollum *et al.*, 2005). It includes the ability, knowledge, skills and confidence to make daily decisions, as well as select and make behavioural changes and the ability to cope with the emotional aspects of their disease within the context of their lives (Barlow *et al.*, 2002). There are a lot of advantages of maintaining good self-care behaviour such as lowering the cost required to get health care, increasing effective collaboration between patients and other health care team, and increasing patients' satisfaction and their perceptions of patients' health condition (The fourth Clinical Practice Guideline, CPG, 2009).

Effective management of type 2 diabetes requires a collaborative health care team approach. However, type 2 diabetes patients themselves are the most important individuals in the team because they are the ones who will do most of the disease management. Thus, having a self-care behaviour is essential for type 2 diabetes patients. Hence, the role of nurses is to assist patients to be as independent as possible in managing their health. In addition, self-care behaviour is seen as an empowerment through which gaining of the self-care skills, patients are able to participate more actively in nurturing their own health and in determining the good conditions that will ultimately influence their own health.

There are some factors that may affect the effectiveness of self-care behaviour among type 2 diabetes patients; these include age, gender, health state, developmental age, socio-cultural, health care variables, family system elements, and patterns of living arrangement (Fawcett, 2002; Munshi & Lipsitz, 2007; Johnston-Brooks *et al.*, 2002; Wu *et al.*, 2007; Wang & Shiu, 2004; Tan & Magarey, 2008; West & Goldberg, 2002; Huang & Hung, 2007; Lee *et al.*, 2009; Bai *et al.*, 2009; Ciechanowski *et al.*, 2004). For example, determinants of non-compliance that may affect glycaemic control in patients includes older age, cost of therapy, complexity of prescribed medical therapies, poor family dynamics (Leichter, 2005), attitudes and health beliefs (Heisler *et al.*, 2005). In addition, culture, ethnicity, socioeconomic status and psychosocial also play a big role in explaining type 2 diabetes patients' self-care and health outcomes (Munshi & Lipsitz, 2007; Weinger, 2007).

A few studies have been carried out to examine level of self-care behaviour and factors associated with them in the Malaysian setting. It is important to help diabetic patients to evaluate their daily self-care behaviours, identify possible barriers and understand why patients are unable to perform certain tasks and identify areas of self-care behaviour in which they need assistance. Thus, this study was done to examine the level of self-care behaviour and to identify the factors influencing self-care behaviour so that new nursing strategies can be implemented in health education for diabetic patients. The research questions put forward in this study are: (i) what is the level of self-care behaviour in type 2 diabetes patients?; (ii) Are there any differences in self-care behaviour according to demographic data (such as gender, ethnicity, age, educational level and monthly income) and health condition (such as HbA1c level, type of treatment, length of time of diabetes disease, health education and smoking status) among type 2 diabetes patients?

METHODS

Design, Sample and Setting

This is a cross-sectional study that was conducted from 1st December 2010 to 28th February 2011 at University Malaya Medical Centre (UMMC). The setting was in the diabetic clinic, as well as in the medical, nephrology, orthopedic, and surgery wards.

Non-probability convenience sampling with specific eligibility criteria was employed. This method is deemed feasible, particularly for a researcher with restricted time and resources (Polit & Beck, 2006). The patients who fulfilled the inclusion criteria were asked to participate in this study.

Sample size was calculated using the method by Raosoft (2004); a sample size of 377 respondents was considered as adequate (“rule of thumb”), with 5% margin of error, 95% confidence interval (CI), 50% response distribution, and an estimated population size of 20,000. Patients (the respondents) eligible for this study were those who had been diagnosed with type 2 diabetes with glycosylated hemoglobin (HbA1c) value within the last six months, aged 18 years old and above, speak and understand English and had no major complications (such as being legally blind, suffered severe strokes and were unconscious) that could interfere with self-care.

Research Instrument

The questionnaires comprising of three parts were prepared in the English language. Part A was intended to gather demographic data on the respondents; this part consisted of five items, namely, gender, ethnicity, age, educational level and monthly income. Part B was included to retrieved information on the respondents’ health condition, and it also has five items (namely, HbA1c level, type of treatment, length of time of the diabetes disease, health education and smoking status).

Part C, the Summary of Diabetes Self-Care Activities (SDSCA) scale (Toobert *et al.*, 2000) was adopted to measure about the frequency of self-care activities reported by patients with diabetes during the past seven days in relation to diet (4 items), exercises (2 items), blood glucose testing (2 items), and foot care (2 items). each respondent was required to circle the answer that best describes his or her self-care behaviour on diabetes management during the past seven days using the Likert scale (0 – 7). The mean number of items is based on the number of days of the week that the behaviour is carried out. The validity reports in this tool were high, with internal consistency of more than 0.50 and test-retest reliability from 0.55 to 0.64 (Glasgow *et al.*, 1989; 1998).

Prior to this study, a pilot study was also conducted involving 10% of the target population. The purpose of the pilot study was to identify and investigate the feasibility of the suggested study and to detect any possible error in the data collection instrument such as ambiguous words and instructions, inadequate time and to confirm whether the variables defined by the operational definitions were actually measurable and observable (Brink, 2006). The Cronbach’s alpha value for the 10 items in SDSCA scale were found to be moderately acceptable ($\alpha = 0.74$). The diet subscale consisted of four items ($\alpha = 0.61$), the exercise subscale consisted of two items ($\alpha = 0.71$), the blood-glucose testing subscale consisted of two items ($\alpha = 0.78$) and the foot care subscale consisted of two items ($\alpha = 0.61$).

Ethical Considerations

The ethical approval (reference number 812.30) was granted on 22nd September 2010 by the Medical Ethics Committee, University Malaya Medical Centre.

The respondents’ participation in this study was on voluntary basis and they also could opt not to be involved in the study if they eventually chose to. The document reviewed was conducted from patients’ records to complete the questionnaire. The variables included most recent HbA1c level (within the last 6 months) and the types of treatment the patients received. It is important to note that full confidentiality and anonymity was maintained.

Data Collection Procedure

Data were collected and this was done in two phases. In Phase 1, the respondents were given as much information regarding the aims of the study and the ethical considerations. All the patients (respondents) taking part in this study were asked to complete the questionnaire.

In Phase 2, data on the latest (within 6 months) HbA1c level of each respondent and the type of treatment received were identified from a review of their medical records.

Data Analysis

The collected data were analyzed using SPSS version 16.0. A descriptive statistics was used to assess the frequency and percentage of the respondents' demographic data (Part A) and health conditions (Part B). Meanwhile, level of self-care behaviour was presented in terms of mean and standard deviation (SD). Multivariate analysis of variance (MANOVA) was used to identify the differences in the respondents' self-care behaviour based on their demographic information and health condition. MANOVA is the extension of ANOVA to more than one dependent variable and this procedure is used to test the significance of differences between the means of two or more groups on two or more dependent variables considered simultaneously (Polit & Beck, 2006). If the results were significant, LSD post-hoc test was performed to determine which group means differed significantly from the others. This helped specify the exact nature of the overall effect determined by the F test.

RESULTS

Respondents' Demographic Data

Data gathered from three hundred and eighty eight respondents data were analyzed (Table 1). Out of the total respondents, 57.5% were men, nearly half of them were Malays (46.9%), and 76% aged 64 years and below. Over half of the respondents (55.9%) had secondary level education. As for monthly income, most of the respondents were having an income below RM1000.

Health Condition

According to the Gribbles Pathology (2011) criteria, majority of the respondents in this study had poor glycaemic control (57.7%). About 43% indicated they are taking oral medication, 53.1% of them have been diagnosed with diabetes for more than ten years, and 65.2% have not received any health education about diabetes and self-management. Majority of the respondents do not smoke (89.4%). An overview of the respondents' health conditions is presented in Table 2.

TABLE 1
Description for demographic data of type 2 diabetes patients

	Variables	Frequency	Percentage
Gender:	Male	223	57.5
	Female	165	42.5
Ethnicity:	Malay	182	46.9
	Chinese	70	18.0
	Indian	122	31.4
	Others	14	3.6
Age:	≤ 64 years (adult)	295	76.0
	≥ 65 years (elderly)	93	24.0
Educational level:	Never	8	2.1
	Primary	49	12.6
	Secondary	217	55.9
	Tertiary	114	29.4
Monthly income:	< RM1000	139	35.8
	RM1001-RM2000	100	25.8
	RM2001-RM3000	54	13.9
	RM3001-RM4000	28	7.2
	>RM4000	67	17.3

TABLE 2
Description for health condition of type 2 diabetes patients

	Variables	Frequency	Percentage
HbA1c level:	Good control	60	15.5
	Satisfactory control	104	26.8
	Poor control	224	57.7
Type of treatment:	Diet control	19	4.9
	Oral medication	167	43.0
	Insulin	81	20.9
	Oral medication + insulin	121	31.2
Length of diabetes:	≤ 5 years	112	28.9
	6-10 years	70	18.0
	>10 years	206	53.1
Health education:	No	253	65.2
	Yes	135	34.8
Smoking status:	No	347	89.4
	Yes	41	10.6

Respondents' Level of Self-care Behaviour

Overall, the respondents' level of self-care behaviour was found to be moderately high (38.94; SD=11.93). For each scale, the highest score was for diet (mean = 4.85; SD=1.25), indicating that the respondents were certainly able to perform this task. It was followed by foot care (mean = 3.57; SD=2.54), exercises (mean = 3.20; SD=2.17), and blood-glucose testing (mean = 3.02; SD=2.48).

TABLE 3
Type 2 diabetes patients' level of self-care behaviour

Variable	Frequency	Minimum	Maximum	Mean	(SD)
Self-care behaviour	388	5.00	70.0	38.94	11.93
Subscale:					
Diet	388	0.00	7.00	4.85	1.25
Foot care	388	0.00	7.00	3.57	2.54
Exercise	388	0.00	7.00	3.19	2.17
Blood-glucose testing	388	0.00	7.00	3.02	2.48

Differences in Self-care Behaviour Based on Demographic Data and Health Condition

This study aimed to examine the differences in the respondents' self-care behaviour according to their demographic data and health condition. Self-care behaviour is the dependent variable which includes of diet, exercise, blood-glucose testing and foot care, whereas demographic data and health condition are the independent variables which consist of gender, ethnicity, age, educational level, monthly income, HbA1c level, type of treatment, length of time of the diabetes disease, health education and smoking status.

Normality of the dependent variable was assessed for each dependent variable and they were found to be normally distributed (Kolmogorov-Smirnov = 0.04; $p > 0.05$). Therefore, the mean score for each dependent variable (self-care behaviour) and for each independent variable (demographic data and health condition) sub-group, subjected to MANOVA, was considered as appropriate.

Ethnicity

The results from MANOVA in Table 4 indicated that there was a significant difference in the self-care behaviour in collective between ethnicity [Wilk's Lambda = 0.92, $F(12, 1008) = 2.70$, $p < 0.05$]. Meanwhile, a follow-up univariate ANOVA revealed significant differences in terms of diet [$F(3, 384) = 6.24$, $p < 0.01$]. The difference was also found in the LSD *post hoc* test, whereby Indians had better self-care behaviour in relation to their diet as compared to other ethnic groups (see Table 4).

TABLE 4
Differences in the self-care behaviour according to type 2 diabetes patients' demographic data and health condition (n = 388)

Variable	N (%)	MANOVA Wilk's Lambda	ANOVA										LSD post hoc	
			Diet		Exercise		Blood glucose testing		Foot care		F			
			M ± SD	F	M ± SD	F	M ± SD	F	M ± SD	F				
Gender														
Male	223 (57.5)	0.99,	4.81±1.28	0.38	3.29±2.14	1.11	2.98±2.44	0.16	3.56±2.58	0.01				
Female	165 (42.5)	F(4,383) = 0.56	4.89±1.22		3.06±2.21		3.08±2.54		3.584±2.48					
Ethnicity		**		***										
Malay	182 (46.9)	0.92,	4.68±1.34	6.24	3.15±2.09	1.26	3.06±2.41	0.53	3.80±2.52	2.40				Indian >
Chinese	70 (18.0)	F(12,1008)	4.74±1.33		3.39±2.38		2.76±2.56		2.86±2.48					Chinese >
Indian	122 (31.4)	= 2.70	5.22±1.00		3.25±2.19		3.03±2.53		3.63±2.59					Malay > Others
Others	14 (3.6)		4.23±0.93		2.18±1.80		3.61±2.74		3.54±2.21					
Age (years)		**		**										
≤ 64	295 (76.0)	0.96,	4.74±1.28	8.92	3.28±2.15	2.05	3.12±2.47	2.18	3.66±2.53	1.59				
≥ 65	93 (24.0)	F(4,383) = 4.39	5.18±1.09		2.91±2.24		2.69±2.51		3.28±2.55					
Education level		*		*										
Never	8 (2.1)	0.94,	5.16±1.49	3.13	3.44±2.60	0.45	2.88±2.46	0.54	3.19±2.87	2.51				Primary >
Primary	49 (12.6)	F(12,1008)	5.30±1.07		2.88±2.65		2.79±2.91		2.68±2.73					Secondary >
Secondary	217 (55.9)	= 1.85	4.72±1.34		3.26±2.22		2.95±2.47		3.76±2.58					Tertiary
Tertiary	114 (29.4)		4.88±1.09		3.17±1.81		3.25±2.32		3.61±2.28					

TABLE 4 (continue)

Smoking status		**	**	**	**	**	**	**
No	347(89.4)	0.96,	4.91±1.20	9.96	3.20±2.16	0.08	2.95±2.46	2.94
Yes	41(10.6)	F(4,383)	4.27±1.56	3.10±2.30	3.65±2.64		3.49±2.50	3.39
		= 4.53					4.26±2.78	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Age Groups

As shown in Table 4, there was a significant difference of the self-care behaviour of the respondents aged 65 years and above (elderly) with those aged 64 and below (adults), with Wilk's Lambda = 0.96, $F(4, 383) = 4.39$, $p < 0.05$). It was also revealed that the elderly had better self-care behaviour in relation to their diet as compared to adults or those in the other age category.

Level of Education

The results of MANOVA for the respondents' level of education and self-care behaviour showed significant difference (Wilk's Lambda = 0.94, $F(12, 1008) = 1.85$, $p < 0.05$). In more specific, self-care behaviour was found to be significantly and collectively differed among the respondents of different levels of education. The follow-up univariate ANOVA revealed significant differences in terms of diet $F(3, 384) = 3.13$, $p < 0.05$). The LSD *post hoc* test also indicated that the respondents with primary education had better self-care behaviour on diet as compared to those with secondary and tertiary education (see Table 4).

Type of Treatment

Referring to Table 4, the result of MANOVA on type of treatment and self-care behaviour was significant (Wilk's Lambda = 0.92, $F(12, 1008) = 2.84$, $p < 0.05$). This showed that self-care behaviour differed significantly between types of treatment. Follow-up univariate ANOVA revealed significant differences on blood glucose testing $F(3, 384) = 8.27$, $p < 0.01$). The LSD *post hoc* test as shown in Table 4 revealed that respondents on treatment with insulin had better self-care behavior which practiced more on blood glucose testing than respondents on diet control and on oral medication.

Health Education

The results in Table 4 revealed that collectively, there was a significant difference of self-care behaviour between those who received or did not receive health education; Wilk's Lambda = 0.97, $F(4, 383) = 3.33$, $p < 0.05$. Univariate ANOVA test found that respondents who have received health education on diabetes had better self-care behaviour on foot care as compared to those who have not received health education on diabetes.

Smoking Status

It was found in Table 4 that there was a significant difference of self-care behaviour between smoking status (Wilk's Lambda = 0.96, $F(4, 383) = 4.53$, $p < 0.05$). Thus, smoking status has influence on self-care behaviour. Respondents who were not smoking had better self-care behaviour on diet as compared to those who were smoking.

DISCUSSION

Level of Self-care Behaviour

Answers to the current research's objectives were obtained using the scale developed by Toobert *et al.* (2000) and the questions in the SDSCA scale measured the respondents' activities for the past seven days. The results showed that patients with type 2 diabetes have a moderately high level (based on the mean scores) of self-care behaviour. The findings in this study are quite similar to those by Ploypathrpinyo (2008) who also reported a moderate level of self-care behaviour in a study carried out on knowledge and self-care behaviour of type 2 diabetes patients among the population in Thailand. However, there is limited research measuring level of self-care behaviour as there is no cut-off point that has been determined to identify adherence versus non-adherence in the SDSCA scale (Eigenmann *et al.*, 2009; Toobert, personal communication, October 6, 2010).

For each scale, the majority of patients were found having good level of self-care behaviour in terms of diet, which meant that they were following healthy eating plan and taking nutritious food (with less calories and from healthier sources of carbohydrates such as *cappati* or *tosei* with *Tandoori chicken*) almost every day. Similarly, Toobert *et al.* (2000) also found that the patients in their study typically reporting higher levels in terms of diet compared to other self-care tasks.

Foot care, which requires inspecting the feet thoroughly to check for abrasions, lesions, and early infections, may be thought of as a relatively solitary activity (Ciechanowski *et al.*, 2004). On the other hand, the patients in this study were more likely to check and care further on their feet. Similarly, Ploypathrpinyo (2008) also found foot care was at a good level among all the aspects of patients' self-care behaviour. It might also due to the fact that some patients had received health education on diabetes and thus, they became more aware of its long-term effects.

In terms of exercise, the patients were found to be less likely to perform this activity. In fact, physical exercise was insufficient in the aspects of self-care behaviour (Ploypathrpinyo, 2008) because it often involved and depended on other important factors such as guidance from health care provider and exercising with a partner or in a group (Ciechanowski *et al.*, 2004). Besides, barriers to doing exercise among patients with type 2 diabetes may due to working commitment (do not have enough time to do exercises) or due to other ailments such as obesity and arthritis (Austin, 2005).

Glucose monitoring is a relatively quick and straightforward procedure (Ciechanowski *et al.*, 2004) but most of the patients were least concern with monitoring their own blood glucose. Most patients in this study were on oral medication and this was similar to NHMS III (2006) which reported the majority of the patients were on oral medication (Letchuman *et al.*, 2010). Type 2 diabetes patients who are on oral medication typically found it unnecessary to check their blood-glucose level everyday (Edelman & Chae, 2009).

Differences in Self-care Behaviour Based on Respondents' Demographic Data and Health Condition

The results revealed the respondents of the Indian ethnic group aged 65 years and above (elderly), with low education level, on insulin treatment, and had received health education on diabetes and non-smoker, had better self-care behaviour scores as compared to adults of other ethnic groups with higher education level, not on insulin treatment, and had not received health education on diabetes and patients who were smoking.

Culture and ethnicity play a large role in explaining diabetic patients' self-care (Munshi & Lipsitz, 2007). This study found that Indian patients are on a better diet plan when compared to the respondents of other ethnicity. This might be due to the fact that the respondents of Indian ethnicity usually consume diets that are high in grains, vegetables and fruits. The dishes are typically served with basmati rice (whole-grain rice) and Indian breads made from wholemeal flour; all these are helpful in training them to plan for a good diet. Moreover, some Indian respondents are on vegetarian diet, while food prepared by those of other ethnic group is usually high in carbohydrates and calories which are based on rice and coconut milk such as *nasi lemak* and *nasi briyani*. Food that contains high fibre is good for health and diabetic patients should increase their intake of whole grain products and maintain a diet low in glycemic index (Qi *et al.*, 2006).

As for age group, the elderly had better self-care behaviour and had better diet compared to younger adults. Similarly, it was found older patients have better self-care behaviour which includes having good diet (Wang & Shiu, 2004). In general, the elderly eat lesser amounts of calorie burning food and eat out less frequently compared to other adults (Harris & Blisard, 2002).

This study also found that the respondents with primary education had better self-care behaviour and scored better on diet than those with secondary and tertiary education. Likewise, Kim *et al.* (2004) stated that in developing countries, the respondents of this group seemed to maintain a healthy lifestyle. Individuals with higher level of education are more likely to socialize and gather with friends, become exposed to unhealthy lifestyle including taking diet that is high in fat and sugar (Kim *et al.*, 2004).

Daily blood-glucose monitoring is important for all patients with diabetes (Austin, 2005). The study found that patients who are on insulin treatment have higher self-care behaviour in term of their blood glucose testing than those on a diet control and on oral medication. Self-monitoring of blood-glucose levels among diabetic patients with pharmacologically treatment was associated with better glycaemic control (Karter *et al.*, 2001). However, self-monitoring of blood glucose in self-care was associated with high costs for diabetes non-insulin treatment (Simon *et al.*, 2008). Patients who are not on insulin treatment need to consider the price of the equipment used such as syringes, needles, blood glucose testing machine, and test strips which are more expensive and may put a burden on them to purchase the equipment (Volman *et al.*, 2008). However, not all type 2 diabetes patients need to check their blood sugar level every day, especially those who are on oral medication and diet control only.

The results revealed that collectively, patients who had received health education on diabetes were better in their self-care behaviour and more likely to perform foot care as compared to those who did not receive health education on diabetes at all. Other studies have also found that patients who had received health education had better self-care behaviour (Wu *et al.*, 2007) and patients who had received education about diabetic foot care were more likely to examine their feet regularly (Lee *et al.*, 2009).

Diabetic patients with poor self-care behaviour were more likely to smoke (Ciechanowski *et al.*, 2004). There was also an association between smoking and poor diet, as previously reported by Maynard *et al.* (2005). Similarly, this study also found that the patients who are non-smokers have better self-care behaviour and are more likely to consume healthy diet as compared to those who are smokers.

CONCLUSION

In conclusion, special attention needs to be given to type 2 diabetes patients who are least likely to exercise regularly and monitor their blood glucose level. Other influential factors such as ethnicity, age group, level of education, type of treatment, health education and smoking status should also be highlighted. These type 2 diabetes patients are at high-risk and thus, special individualized nursing education initiative on self-care behaviour should be carried out regularly. Nurses should work collaboratively with other health care providers to encourage diabetic patients to be more aware of the risks they face and better manage the disease.

In this study, patients who are of other ethnic groups (except for Indians), adults with high level of education and smokers were less likely to consume healthy diet. Firstly, type 2 diabetes patients who smoke should be encouraged to attend smoking cessation programme or advised to stop smoking altogether. Besides, type 2 diabetes patients need to learn how food affects disease control and their overall health. Nurses as a diabetes educator should collaboratively work with dieticians during health education session on diabetes (e.g., setting the goals of health education strategy programme, preparing teaching materials such as pamphlets and booklet, etc.) to assist the patients and their family members to gain knowledge and be more aware of the effects of food on blood glucose, the sources of carbohydrates and fat, appropriate meal preparation, and resources to assist in making food choices. Type 2 diabetes patients should be taught to read labels, as well as to plan, prepare meals and measure food for portion and fat control, and carbohydrate counting (Austin, 2005). In addition, family members' involvement in this session should be encouraged as it would be more beneficial to the patients. Family members should know suitable food choices and the kind of diet to be taken by diabetic patients because this can help increase patients' self-esteem and awareness of their health condition.

This study found that patients who did not receive health education on type 2 diabetes were less likely to perform foot care. Hence, nurses need to help them, especially the newly diagnosed patients by educating them on the preventive strategies to reduce diabetic complications which include regular foot care hygiene and regular foot inspections. Patients also should be advised to visit their doctors according to the appointment given to them to closely monitor the progress of the disease.

This study found that type 2 diabetes patients were less likely to perform blood glucose testing especially those who are not on any insulin treatment. Patients often address barriers in blood glucose monitoring such as physical, financial, emotional, and cognitive issues (Austin, 2005). As health care professionals, nurses and medical doctors should explain to patients about the importance of blood glucose testing and maintaining it at a healthy/normal level. In addition, Type 2 diabetes patients need to be taught of necessary or relevant skills that include self-monitoring sign and symptoms of hypoglycemia or hyperglycemia situation and other things that they should do if they encounter those manifestations. Meanwhile, these professionals must know the financial burdens incurred by the treatment as these will ultimately have an influence on the patients' self-care behaviour, and for this reasons, they should be referred to psychologists for counselling sessions. For instance, relevant government and non-government agencies such as Social Security Organization (SOCSSO), "Pusat Zakat" and Malaysian Diabetes Association may be useful for type 2 diabetes patients to get a personal assistance.

LIMITATIONS AND RECOMMENDATIONS

This study employed a cross-sectional survey and the use of this research design means that causality can not be established. Besides, non-probability convenience sampling approach may cause selection bias and the use of specific entry criteria of respondents into the study sample may not represent the whole population. In addition, the setting of this study was solely at UMMC and hence, the results could not be generalized to all type 2 diabetes patients in Malaysia. It is worth mentioning that some patients in this study felt uneasy to disclose their personal circumstances and health conditions.

A study employing qualitative and mix-method approaches needs to be carried out in the future to explore patients' natural feelings and behaviours. This would also include an intervention programme study design that needs to be implemented so as to achieve better effectiveness of the results. A longitudinal study may also yield better results as researchers can observe the trends and track factors associated that may have effects on the changes in diabetic patients' self-care behaviour.

ACKNOWLEDGEMENTS

Special thanks to the Department of Medicine, Department of Orthopaedic Surgery, Department of Surgery and Medical Ethics Committee, University Malaya Medical Centre, Department of Nursing Science and University Malaya Postgraduate Research Fund, University of Malaya, and Universiti Teknologi MARA.

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