ORIGINAL ARTICLE

Determinants of Glucose Control among Elderly Diabetics in Kulim

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ABSTRAK

Prevalens penyakit diabetes melitus serta kadar jangka hayat seseorang semakin meningkat secara global. Memandangkan penyakit diabetes melitus seringkali dikaitkan dengan golongan warga emas, adalah amat penting untuk memastikan paras glukos berada pada tahap yang terkawal, agar komplikasi diabetes dapat dikurangkan, dan mempertingkatkan kualiti kehidupan. Kajian hirisan lintang yang dilakukan di kalangan pesakit diabetes melitus warga emas di daerah Kulim ini bertujuan untuk menentukan prevalens paras glukos terkawal dan faktor-faktor yang mempengaruhinya. Sebanyak tiga ratus dua puluh sembilan responden telah dipilih menggunakan kaedah rawak berstratum yang melibatkan kesemua tujuh buah klinik kesihatan di daerah Kulim. Responden ditemubual secara perseorangan dengan menggunakan borang soal selidik berstruktur. Nilai HbA1c 6.5% dan ke bawah dianggap sebagai kawalan glukos yang baik. Prevalens kawalan paras glukos yang baik adalah 22.5%. Faktor yang mempunyai kaitan signifikan dengan kawalan paras glukos yang baik adalah lelaki ((prevalens nisbah ods terlaras=1.75, 95% SK: 1.02-3.00), berumur 70 tahun dan ke atas (prevalens nisbah ods terlaras=2.48, 95% SK: 1.40-4.39) dan tempoh mengidap diabetes melitus kurang dari lima tahun (prevalens nisbah ods terlaras=2.10, 95% SK:1.21-3.64). Kesimpulannya, hasil daripada kajian ini menunjukkan bahawa prevalens paras glukos terkawal yang rendah dipengaruhi oleh faktor gender, umur dan jangkamasa mengidap penyakit tersebut.

Kata kunci: diabetes melitus, kawalan glukos, warga emas

ABSTRACT

Globally, the prevalence of diabetes mellitus and the average life expectancy is on the rise. As diabetes mellitus is commonly associated with old age, it is very important to ensure good glucose control to reduce complications and improve quality of life. A cross sectional study was conducted among elderly diabetics in Kulim with the aim to determine the prevalence of glucose control and its associated factors. Three hundred and twenty nine respondents were chosen through stratified random sampling in all the seven health clinics in Kulim. Respondents were interviewed personally using a structured questionnaire. HbA1c level of 6.5% and below was considered as good

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glucose control. Prevalence of good glucose control was 22.5%. Being male (Adjusted prevalence odds ratio, APOR = 1.75, 95% CI: 1.02-3.00), age of 70 years and above (APOR = 2.48, 95% CI: 1.40-4.39) and duration of diabetes less than five years (APOR = 2.10, 95% CI:1.21-3.64) were found to have significant association with good glucose control. As a conclusion, this study showed that the low prevalence of good glucose control was determined by gender, age and duration of illness.

Key words: diabetes mellitus, glucose control, elderly

INTRODUCTION

Lifestyle factors are associated with chronic diseases such as hypertension, coronary heart disease, cancer and diabetes mellitus (DM). Globally, the prevalence of DM is on the increasing trend (Wild et al. 2004). In Malaysia, the third National Health and Morbidity Surveys in 2006 showed that the prevalence of DM for those aged 30 years and above was 14.9% compared to 8.3% in a similar survey in 1996.

DM is more prevalent among the elderly, as there is an increased in elderly population. In Malaysia, 5.2% of the populations were elderly in 1970, 6.3% in 2000 and projected to 10.0% in 2020 (Population Ageing Trends in Malaysia 2005).

DM is more common in the elderly because as a person grows older, the deposition of body fat increases. For those aged above 30 years, postprandial glucose will increase five mg/dL for every 10 years of age. The rate of glucose absorption and insulin production becomes slower after meals. Insulin resistance increases because of reduction in body mass and increase in body fat (Hall & Zweig 2005).

Glucose control is important, as hyperglycaemia is one of the risk factors for the development of DM complications. For those who are 60 to 69 years old, the life expectancy will be reduced by four to five years, and for those who are more than 70 years old, type 2 DM reduces life expectancy by three years (Hall & Zweig 2005). Microvascular diseases are the main cause of blindness and 50% of the amputation cases not caused by injuries or accidents are due to DM. Twenty five percent of new cases of haemodialysis are caused by DM. The risk of ischaemic heart diseases and stroke increased by two to four times. Nearly 80% of elderly diabetics die due to heart diseases and other vascular diseases (Roos & Samos 2002).

However, there are multiple issues in the management of elderly diabetics including polypharmacy, lack of health knowledge and financial problems (Haas 2006). Furthermore the diabetes population is also associated with geriatric syndrome such as functional disabilities, depression, fall, urinary incontinence, pain and dementia, which occur due to the ageing and diabetic complications. These often lead to frailty, loss of independence and low quality of life (Araki & Ito 2009). Therefore, this group of people often needs help from their family members.

Good glucose control requires the commitment and motivation of their families. It may reduce the risk of diabetes complications and ensures a better quality life for the elderly (Hall & Zweig 2005). Lack of social support may lead to the aggravation of geriatric symptoms such as functional disability, malnutrition, depression and cognitive impairment

among elderly diabetics (Araki & Ito 2009). Higher level of social support has a role for better glucose control (Okura et al. 2009). Reblin & Uchino (2008) found that social and emotional support from others can be protective for the persons' health status. However, this finding was different from White et al. (2009) which showed that the elderly who needed more social support was associated with poorer health outcome.

Glucose control is measured by glycosylated haemoglobin (HbA1c). For every 1% rise in HbA1c, there is a 35 mg/dL rise in blood glucose. Red blood cell will be replenished for every 8 to 12 weeks, making HbA1c the best method of measuring glucose control over the long term (Alam et al. 2005).

The objective of this study was to determine the prevalence of glucose control among elderly diabetics and its associated factors. Factors studied were grouped into socio-demographic, history of diseases, diabetes knowledge and family support. In this study, HbA1c of 6.5% or less was considered as good glucose control (CPG DM 2004).

MATERIALS AND METHODS

This cross sectional study was conducted from February until May 2009 in Kulim. It involved 329 elderly diabetics, chosen through stratified random sampling from seven government health clinics in Kulim. Respondents were chosen based on the proportion of the registered diabetic patients in each clinic. The inclusion criteria were elderly diabetics aged 60 and above, and who had been diagnosed with DM for at least one year. The exclusion criteria were aphasic respondents, patients who were on haemodialysis and dementia.

Respondents were interviewed personally by the researcher using a structured questionnaire. For diabetes knowledge assessment, the questions were based on the Diabetes Knowledge Test prepared by Diabetes and Hormone Center of the Pacific. Evaluation for family support was through a questionnaire adopted from the Duke-University of North Carolina Functional Social Support Questionnaire, with some modification made to suit the Malaysian community. The questionnaire was validated and the Cronbach's Coefficient Alpha for the scale of DM knowledge was 0.69 and for family support was 0.85. To determine the HbA1c level, two ml of blood was collected from each respondent.

Statistical Package of Social Science (SPSS) software, version 12.0 was used in processing and analyzing the data. The significant level at $p < 0.05$ and 95% confidence interval (CI) were used in this study. The Research and Ethics Committee, Universiti Kebangsaan Malaysia as well as the Ministry of Health (NMRR-08-1194-1453) approved this study. Written and verbal consent were taken from each respondent.

RESULTS

The prevalence of good glucose control in this study was 22.5%. Three hundred and thirty one respondents were approached and 329 agreed to participate in this study. The response rate of this study was 99.4%. Women made up 52.9% of the respondents. Ethnicity distributions were Malays 58.4%, Indians 28.6%, Chinese 12.2% and others 0.9%. The majority of the respondents was in the 60 to 69 years old age group (73.9%), married (68.7%) and attained up to primary education (76.3%).

The majority of the elderly were diagnosed as DM for more than five years (68.1%). With regards to co-morbidities, 79.6% had hypertension, 46.5% dyslipidaemia, 23.1% ischaemic heart diseases, 10.9% cataract and retinopathy, 9.1% joint and bone problems and 2.1% history of stroke. Those who had hyper-

tension, dyslipidaemia, ischemic heart diseases and stroke were grouped as having co-morbidities. Overall, 85.7% had co-morbidities. Bivariate analysis showed that age (odds ratio 2.24, 95% CI: 1.29-3.89) and diabetes duration (odds ratio 1.90, 95% CI: 1.11-3.24) had significant association with glucose control as shown in Table 1.

DM knowledge covered aspects of diabetes symptom, dietary control, exercise, complications and risk factors. Mean DM knowledge score of the respondents was 16.96±2.25 (maximum score was 20.0). Family support was assessed with regards to physical, emotional and information support. The majority of the respondents had good family support in all the three aspects. Mean family support score of the respondents was 29.55±4.99 (maximum score was 40.0). However, there were no significant associations between glucose control and diabetic knowledge (t=0.757, 95% CI: -3.60-0.75) and family support (t=-0.823, 95% CI: -1.84-0.75) as shown in Table 2.

Logistic regression was used in multivariate analysis and results showed the factors that influenced the good glucose control were gender (Adjusted prevalence odds ratio, APOR=1.75, 95% CI:1.02-3.00), age (APOR=2.48, 95% CI:1.40-4.39) and DM duration (APOR=2.10, 95% CI:1.21-3.64) as stated in Table 3.

DISCUSSION

Glucose control is an important aspect of diabetes management, as it is one of the risk factors for diabetic complications. Furthermore, it influences the patient's quality of life and increases the financial burden of diabetes management. In this study, the prevalence of good glucose control was 22.5%. It showed that the majority of the respondents had poor glucose control. This finding was similar to previous studies, done in Kulim and Kelantan in Malaysia, and Bangkok in Thailand which showed that the prevalence of good glucose control ranged from 21.7% to 33.0% (Shahidan et al. 2003; Eid et al. 2003; Ngarmukos et al. 2006; Howteerakul et al. 2007).

However, there were a few differences between this study and the previous ones. The previous studies used HbA1c≤7.0%, but this study used HbA1c≤6.5% for the level of good glucose control (based on CPG DM 2004). Another difference was that the present study involved only elderly diabetics who sought treatment at the primary level, whereas the previous studies involved both young and elderly individuals at the tertiary level (Eid et al. 2003; Ngarmukos et al. 2006).

This study showed that males had two times the probability of having good glucose control compared to females. This finding was similar to that of Mercado & Vargas (1990) and according to them, this was probably due to the fact that someone else prepared the food for the males, where as females prepared it themselves. Food preparation by someone else has an association with glucose control (Epple et al. 2003). Furthermore, males were physically more active than females. Physical activity may reduce blood glucose level (Durak 1996).

The majority of the respondents in this study were aged 60 to 69 years old. However when assessing the association of age factors and glucose control, it showed that, those who were 70 years old and above, were twice as likely to have good glucose control than those aged 60 to 69 years old. This finding was similar to several previous studies which found that the older age groups were more likely to have good glucose control (Trief et al. 1998; Eid et al. 2003; Choi & Rankin 2009). The older patients are likely to practice a healthy diet and

Table 1: Association of glucose control with socio-demographic factors and history of diseases

Socio-demographic factors	Glucose control				χ^2	P value	Prevalence odds ratio (95%CI)
	Good (n=74)		Poor (n=255)				
	f	%	f	%			
Gender							
Male	42	27.1	113	72.9	3.56	0.059	1.65 (0.98–2.78)
Female	32	18.4	142	81.6			
Ethnicity							
Malay	37	19.3	155	80.7	2.74	0.098	0.64 (0.38–1.09)
Non Malay	37	27.0	100	73.0			
Age (*years)*							
≥ 70	29	33.7	57	66.3	8.42	0.004*	2.24 (1.29-3.89)
60-69	45	18.5	198	81.5			
Marital status							
Married	47	20.8	179	79.2	1.19	0.275	0.74 (0.43–1.27)
Single#	27	26.2	76	73.8			
Education ##							
High	20	25.6	58	74.4	0.58	0.446	1.26 (0.70–2.27)
Low	54	21.5	197	78.5			
Duration of DM							
≤ 5 years	32	30.5	73	69.5	5.64	0.018*	1.90 (1.11-3.24)
> 5 years	42	18.8	182	81.3			
Co-morbidities							
Yes	66	23.4	216	76.6	0.94	0.332	1.49 (0.66-3.34)
No	8	17.0	39	83.0			

* significant at $p < 0.05$

\# Single: widowed & divorcee

Education: High – Secondary & tertiary

Low – Never attained school & primary

comply with their treatment compared with younger patients (Wahba & Chang 2007). This study also found that there was no association between glucose control and other socio-demographic factors, which was similar to the study by Suhaiza et al. (2004) in a primary health centre in Kelantan.

Those who had DM for five years or less, were twice as likely to have good glucose control compared to those who had DM for more than five years, which was similar to study by Herraez et al. (1999) and Eid et al. (2003). The longer the DM duration, the harder it will be to control glucose level. This is probably due to drug resistance, resulting in higher doses and more drugs used in diabetes treatment (Benoit et al. 2005; Choi & Rankin 2009).

The commonest co-morbidity was hypertension, similar to a study by Niefield et al. (2003). Co-morbidities are challenges in the management of DM in the elderly (Crandall 2003). When assessing the association between glucose control and co-morbidities, this study found that there was no association between them. However, this finding contradicted from the study by Crandall (2003) and Suh et al. (2008) which showed that, good glucose control was more likely among those who did not have any co-morbidity compared to patients with co-morbidities. The difference could be due to the small percentage of

Table 2: Association of glucose control with knowledge and family support

Factors	Glucose control		t	p value	95% CI
	Good (n=74)	Poor (n=255)			
	Mean ± s.d	Mean ± s.d			
Knowledge score	17.13 ± 2.17	16.91 ± 2.28	0.757	0.450	-3.60-0.75
Family support score	29.14 ± 4.72	29.68 ± 5.08	-0.823	0.411	-1.84-0.75

* significant at $p < 0.05$

Table 3: Logistic regression analysis on factors associated with glucose control (n=329)

Variables	Regression co-efficient (β)	Std error	Wald	P value	Adjusted prevalence odd ratio	95% CI
Constant	-2.06	0.26	62.14	0.000	0.127	
Gender						
Male (1)	0.56	0.27	4.21	0.040*	1.75	1.02-3.00
Female (0)						
Age						
≥ 70 years old (1)	0.91	0.29	9.80	0.002*	2.48	1.40-4.39
60-69 years old (0)						
DM Duration						
≤ 5 years (1)	0.74	0.28	6.90	0.009*	2.10	1.21-3.64
> 5 years (0)						

* significant at $p < 0.05$

(0) – reference group

respondents in this study who did not have co-morbidities.

Generally, the respondents in this study had a good knowledge score. The mean score was 16.96±2.25 (maximum score was 20.00). When assessing the association of good glucose control and DM knowledge score, this study found that there was no association between glucose control and knowledge score, which was similar to the study by He & Wharrad (2007). Although this present study showed that the diabetes knowledge among the respondents was good, other factors such as poor diet adherence and lack of physical activity are likely to have influenced the glucose control (Eid et al. 2003).

For family support, the mean score was 29.55±4.99 (maximum score was 40.00).

This finding showed that the respondents received good family support. However, when assessing the association between glucose control and family support, this study found that there was no association between them. This was in contradiction to the study by Epple et al. (2003) and Choi & Rankin (2009), which found that, there was a significant association between family support in the nutritional aspect and glucose control. The difference could be due to the different aspects of family support studied in this recent study, which include physical, emotional and informational support.

There were a few weaknesses found in this study. As this was a cross sectional study, the cause and effect could not be

established by the factors studied. The respondents did not include elderly patients who sought treatment at private clinics and hospitals. This will limit the generalization to all elderly diabetics. There was also the likelihood of information bias from the respondents as they might not give the true answer; either they have forgotten or refused to reveal the truth.

CONCLUSION

The prevalence of good glucose control in this study was still low. Elderly diabetics who were involved in this study are at high risk of developing diabetic complications. It will affect their quality of life and increases financial burden in diabetes management. The factors associated with good glucose control were gender, age and duration of diabetes. Therefore, awareness, exposure and health education on the nutritional aspects, diabetes treatment and complications should be emphasized at the early stage of diabetes diagnoses.

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