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HEALTH LITERACY AMONG PATIENTS WITH DIABETES IN RIPAS HOSPITAL, BRUNEI.

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ABSTRACT

Introduction: Health literacy in diabetes is related to patients' understanding of diabetes and self-care skills necessary in the management of diabetes. By enhancing health literacy, better glycaemic control may be achieved which could translate to improved diabetes outcomes. The study objectives were to investigate the knowledge level of patients with type 1 and type 2 diabetes on their condition, and to evaluate the association between health literacy and glycaemic control. **Methods:** Patients attending Diabetes Outpatient Clinic at Raja Isteri Pengiran Anak Saleha Hospital were recruited. The data collection tool consisted of demographic information, the Michigan Diabetes Knowledge Test, a validated self-administered questionnaire to test respondents' knowledge of their condition, and the level of glycaemic control (measured as HbA1c). Quantitative data were analysed using Statistical Packages for Social Sciences version 23.0. **Results:** One hundred and eighteen patients participated in the study. The majority (69.5%) of respondents had inadequate diabetes knowledge level. Chi-square tests revealed patients' education level ($\chi^2=8.646$, $P=0.013$) and monthly income ($\chi^2=12.686$, $P=0.02$) were significantly associated with their diabetes knowledge level. No association was found between diabetes knowledge level and glycaemic control. **Conclusion:** Educational programmes are warranted to improve health literacy and knowledge of diabetes among patients attending the Diabetes Outpatient Clinic. The effectiveness of patient education interventions should be assessed to ensure translation to clinical outcomes such as glycaemic control.

Keywords: Brunei, Diabetes Mellitus, Health literacy, Outpatients, Patient Education

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INTRODUCTION

Diabetes Mellitus (DM) is a non-communicable disease with increasing prevalence worldwide. The International Diabetes Federation estimated that 415 million adults have DM while

318 million adults have impaired glucose tolerance and susceptibility of developing DM.¹ A further 193 million people worldwide are undiagnosed and at increased risk of developing diabetic complications.¹

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DM is a chronic disease which places a substantial economic burden on healthcare systems and is associated with significant morbidity and mortality. In the UK, DM spending costs the National Health Service (NHS) almost £10 billion per year.² The estimated

cost of DM care in the U.S. is USD327 billion per year.³ In Malaysia, the estimated spending is RM2.04 billion per year.⁴ Globally, healthcare expenditure on DM is estimated to rise to USD490 billion by 2030.⁵

Diabetic patients are required to perform self-care skills such as blood glucose monitoring, foot examination and adherence to medications. Hence a certain degree of health literacy, defined as "the degree to which individuals can obtain, process, understand and communicate about health-related information needed to make informed health decisions" is required.⁶ A low level of health literacy is common among diabetic patients, with estimates ranging from 15% to 40%.⁷ A number of contributing factors such as socio-demographic and socio-economic factors, duration of disease, treatment regimen and DM education status could influenced Health literacy among diabetic patients.⁸ This was highlighted by a prospective observational study which found higher HbA1c levels among diabetic patients after a Diabetes Self-Management Program despite the education given.⁹

In Brunei Darussalam, the reported prevalence of DM (not type-specific) from the 2nd National Health and Nutritional Status Survey in 2011 was 12.5% and DM was the third leading cause of death over the past five years. Worryingly, type 2 DM affected people as young as 20 years old.¹⁰ While Brunei has a high literacy rate of 97% in 2011,¹¹ there is a lack of health literacy data among patients with DM. The aim of this study was to evaluate health literacy of patients with DM in Brunei Darussalam and to compare health literacy with glycemic control.

MATERIALS AND METHODS

This was a prospective cross-sectional study conducted over 4 months between October 2017 and January 2018. All patients with

Type 1 and Type 2 DM aged 18 and over, attending Diabetes Outpatient Clinics at Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital during the study period were eligible for the study. Patients with very poor vision, psychiatric illness, illiteracy, and inability to communicate in Malay language or English, learning disability or dementia were excluded from the study. Questionnaires were excluded from data analysis if less than 75% completed. Data collection comprised of three parts;

1. Socio-demographic data: consisted of age, sex, body mass index (BMI), race, employment status, monthly income and educational level.
2. The 20-item 'True/False' version of the revised Michigan Diabetes Knowledge Test (MDKT). This is a validated test developed by the Michigan Diabetes Research Training Centre (MDRC) to assess patients' general knowledge of DM. A score of 12 or more was deemed adequate health knowledge, while scores below 12 were regarded as inadequate health knowledge.¹²
3. The most recent HbA1c result at the time of patients' clinic review was obtained from their medical records.

A questionnaire was designed to include the socio-demographic data and the revised MDKT tool. Direct translation to a Malay version was undertaken to reflect the original questionnaire semantically. Patients were recruited through convenience sampling based on availability in DM clinic waiting areas. Patients who consented were given a copy of the questionnaire in the language of their choice and were allowed time to complete the questionnaire independently. The researcher was available to explain the contents of the questionnaire if requested by the patient.

Data was entered and analysed using IBM Statistical Packages for Social Sciences (SPSS) Version 23.0. Descriptive statistics

were used to describe patient demographics, disease characteristics and DM knowledge scores. Chi-square test and Fisher's exact test were used to measure the association between these factors and DM knowledge score.

Ethics approval for this study was granted by the Joint Research Ethics committee of Pengiran Anak Puteri Rashidah Sa'adatulk Bolkiah (PAPRSB) Institute of Health Science (IHSREC), Universiti Brunei Darussalam and Ministry of Health (MHREC).

RESULTS

A total of 118 completed questionnaires were completed by patients with DM attending the Diabetes Outpatient Clinics. The mean age of respondents was 49.22 ($\pm$ 10.44) years, ranging between 25 years and 74 years. There were slightly more males (53.4%) than females (46.6%). The majority of patients were Malay (89.0%), followed by Chinese (7.6%) and other ethnic groups (Iban and Indian) (3.4%). In terms of education, 49.2% had secondary school level of education and 28.1% had a higher education. Regarding employment status, almost half (44.9%) were government employees, followed by pensioners (23.7%), private employees (19.5%) and the unemployed (10.2%). In terms of monthly income, more than half earned between BND 1000 to BND 3000 (54.2%); 23.7% earned less than BND 1000, whilst 11.9% earned more than BND 3000.

Eighty-two (69.5%) participants had inadequate DM health knowledge. As illustrated in Table 1, Chi-square test showed that education level ($\chi^2 = 8.646$, $df=2$, $P=0.013$) and monthly income ($\chi^2 = 12.686$, $df=2$, $P=0.002$) were significantly associated with the DM knowledge score. The majority of those with primary school (71.4%) and secondary school education (81.0%) scored less than 12. About half of those with higher education (54.3%) scored less than 12. In terms

of income, a high proportion of patients earning less than \$1000 (89.3%) had inadequate DM knowledge score compared with those who earned \$1000-\$3000 (65.6%) and those who earned more than \$3000 (32.1%).

Table 1 shows the result of analysis between the different knowledge groups. No significant differences ($p \geq 0.05$) were found among the inadequate and adequate knowledge groups in terms of age, gender, ethnicity, glycaemic control and employment status. The majority of respondents (70.4%) had inadequate level of knowledge regardless of glycemic control. Only a small proportion (17.6%) of patients had good glycemic control. The mean number of medications taken was 5.35 with a maximum of 12 medications. The majority of patients were taking insulin (80.5%). There was no association between glycemic control and patients' level of knowledge ($\chi^2=0.578$, $df=2$, $P=0.749$). Table 2 shows the association between glycemic control and level of knowledge.

DISCUSSION

This was a prospective study assessing the health literacy of patients attending Diabetes Outpatient Clinic in a tertiary centre and its relationship to glycaemic control. It was found that over two-thirds (69.5%) of the respondents had inadequate health literacy regarding DM when using the revised MDKT questionnaire. Similar studies conducted in United States⁸ and Malaysia¹³ identified inadequate DM health literacy in 51.5% and 85.8% respectively. The association found between education and DM knowledge was consistently identified in studies using similar DM knowledge questionnaires in Malaysia^{13,14} and internationally.^{8,15} However, not all studies found this association.^{16,17}

The significant association between monthly income and DM health literacy was not surprising. A study identified limited

Table 1: Association between sociodemographic and socioeconomic characteristics of the type 2 diabetes mellitus patients and level of health literacy (N=118).

Variables	Revised Michigan Diabetes Knowledge Test (MDKT)		Test Statistics		
	Less than 12 (INADEQUATE) n=82(%)	Equal to or more than 12 (ADEQUATE) n=36(%)	χ^2	df	P-value
Age Group					
< 50 years	37 (74.0%)	13 (26.0%)	0.832	1	0.362
>50 years	45 (66.2%)	23 (33.8%)			
Gender					
Male	44 (69.8%)	19 (30.2%)	0.008	1	0.930
Female	38 (69.1%)	17 (30.9%)			
Ethnic Group					
Malay	73 (69.5%)	32 (30.5%)	N/A	1	1.000
Others ^a	9 (69.2%)	4 (30.8%)			
Education level					
Primary School	10 (71.4%)	4 (28.6%)	8.646	2	0.013*
Secondary School	47 (81.0%)	11 (19.0%)			
Higher Education	25 (54.3%)	21 (45.7%)			
Monthly Income					
< \$1000	25 (89.3%)	3 (10.7%)	12.686	2	0.002*
Between \$1000 and \$3000	42 (65.6%)	22 (34.4%)			
> \$3000	5 (35.7%)	9 (32.1%)			
Employment status					
Unemployed ^b	8 (66.7%)	4 (33.3%)	0.584	3	0.900
Private%	17 (73.9%)	6 (26.1%)			
Government	35 (66.0%)	18 (34.0%)			
Retired	20 (71.4%)	8 (28.6%)			
Mean 20-item MDKT ± SD	8.89 ± 1.94	12.97 ± 1.11			
Mean HbA1c ± SD (%)	9.58 ± 2.26	9.14 ± 2.01			

Chinese, Iban and Indian categorized as 'Others'

^b Unemployed include housewives

N/A: Not Available

*Significant at $p < 0.05$

health literacy was associated with poverty.^{8,18} A Canadian study identified a similar gradient in DM prevalence; with those in lower quintiles of earnings having higher rates of DM and referrals to DM centres.¹⁹ However, this association was not observed in a Malaysian study.¹³

Higher education and higher income were shown to be associated with better

knowledge of ABC levels (ABC – knowledge of A1c, Blood pressure and LDL cholesterol).²⁰ Several studies identified an association between health literacy and ethnicity.^{8,13} For example, in Malaysia, Chinese had a higher percentage of adequate health literacy, who were also highly educated and literate in English or Malay.¹³ Comparison between ethnicities in this study was not possible as majority of the participants were of Malay ethnicity.

Table II: Glycemic control association with participants' level of knowledge.

Glycemic group	Row Total	Level of knowledge		Test statistics		
		Less than 12 (INADEQUATE)	Scored more than or equal to 12 (ADEQUATE)	χ^2	df	P-value
Good control HbA _{1c} $\leq$ 7.5%	19 (17.6%)	12 (76.9%)	7 (23.1%)	0.578	2	0.749
Suboptimal control HbA _{1c} 7.6-9.9%	53 (49.1%)	38 (71.7%)	15 (28.3%)			
Poor control HbA _{1c} $>$ 10.0%	36 (33.3%)	26 (72.2%)	10 (27.8%)			
Column Total	108 (100%)	76 (70.4%)	32 (29.6%)			

HbA_{1c}: Glycosylated Hemoglobin10 HbA_{1c} readings cannot be retrieved from the database thus excluded from the analysis. .

Lower levels of DM knowledge^{14,21} and inadequate health literacy⁸ were reported in patients with poorer glycaemic control. Even though higher health literacy has been shown to be consistently associated with better DM knowledge,²² the relationship between health literacy and glycaemic control is less conclusive. A study undertaken in a university clinic setting found no association between health literacy and HbA_{1c} albeit a link between DM knowledge and HbA_{1c}.²¹ In our study, no observed relationship was found between DM knowledge and glycemic control. A possible explanation is that patients attending specialist clinics usually have poorly controlled DM which may be unmanageable in primary care or general practice. This is reflected by the low proportion of patients with good glycaemic control and the majority of patients on insulin therapy.

Finally, different aspects of health literacy may need to be evaluated further to discern the disproportionate difference in education level and DM knowledge. For example, the Malaysian Version of Newest Vital Signs evaluates how patients interpret a nutrition label, while the Short Test of Functional Health Literacy in Adults (STOFHLA) evaluates numeracy.^{19,20} These skills may have implications on health literacy and their understanding of DM and management.

Limitations

MDKT is not a validated tool for the assessment of health literacy in a Bruneian population. However, MDKT has been validated in a

Malaysian population¹⁴ and arguably, these two populations are relatively similar. In addition, MDKT measures only one aspect of health literacy i.e. the knowledge level of DM.

CONCLUSION

A large proportion of patients with DM attending Diabetes Outpatient Clinics in a tertiary hospital in Brunei Darussalam had inadequate DM knowledge. Although education level and monthly income were associated with DM knowledge, there was no association found between DM knowledge and glycaemic control. Provision of DM education should take into account patients' education level and socioeconomic status so that effective individualized education can be delivered to empower patient self-management.

Further efforts to improve health literacy among patients with DM are required. Further research is required to identify approaches to improve diabetes self-management in addition to health literacy alone so that glycaemic control can be improved in patients with DM.

DECLARATION OF INTEREST

The authors have no conflict of interest to declare. No funding was obtained for this study.

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