ORIGINAL ARTICLE

HEALTH BELIEFS PREDICT SELF-CARE PRACTICES AND GLYCAEMIC CONTROL IN MALAYSIAN PATIENTS WITH INSULIN-TREATED DIABETES: A LONGITUDINAL STUDY

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ABSTRACT

The practice of diabetes self-care plays an important role in achieving and maintaining good glycaemic control. However, not all patients with insulin-treated diabetes engage in their self-care activities. There is some evidence that self-care practices in patients with insulin-treated diabetes can be understood and predicted by their health beliefs, although studies are often hampered by methodological weaknesses, and the fact that less is known about adults with insulin-treated diabetes in Malaysia. This study was conducted to examine whether health beliefs (as specified in the Health Belief Model: HBM) can predict self-care practices and glycaemic control in patients with insulin-treated diabetes in Malaysia. Longitudinal design with self-reported questionnaire measures was administered at baseline (Time 1:T1) and six months later (Time 2: T2). Participants were recruited from three endocrinology clinics in Malaysia. The measures included self-care practices (diet, insulin intake, exercise and self-blood glucose monitoring: SMBG), health beliefs and diabetes knowledge. Participants' glycaemic control was examined based on their glycated hemoglobin (HbA1c) results. Data analysis was performed at different points of the study times; T1, T1-T2 and T2. Diabetes knowledge and demographic data were controlled for in predictive statistical analyses. A total of 159 patients with insulin-treated diabetes (aged 18-40 years) completed the measures at T1. Of these, only 108 (67.9%) completed follow-up measures at T2. However, demographic characteristics were not significantly different between those who completed and dropped out of the study (p>0.05). The HBM was significantly predictive of diet self-care at T2, insulin intake practice at T1 and HbA1c at T1-T2 andT2. Of the HBM constructs, perceived benefits significantly predicted good dietary habits at T1 (OR 1.92) and T2 (OR .23) and adherence to insulin injection at T1 (OR 3.17) and T1-T2 (OR 2.68). With the exception of perceived severity, all other HBM constructs significantly predicted HbA1c [perceived susceptibility (B .169) at T1, perceived barriers (B -.206) and perceived benefits (B -.397) at T2 and cues to action (B -.233) at T1-T2]. Health beliefs predict self-care practices and glycaemic control in young to middle-aged adults with insulin-treated diabetes in Malaysia. Diabetes educators could use this knowledge in their efforts to improve diabetes self-care in this patient groupby modifying those beliefs through their diabetes education.

***Keywords**: Insulin-treated diabetes, health beliefs, Health Belief Model, longitudinal design, self-care, diet, exercise, insulin adherence, self-monitoring blood glucose, glycaemic control.*

INTRODUCTION

Treatment for diabetes includes self-care practices which are often lifelong[1] and are vital for management of the condition. The self-care practices include medication adherence, dietary changes, exercise habits and self-blood glucose monitoring (SMBG). It is well-established that those who follow their diabetes self-care regimens achieve better glycaemic control[2-3]; those who are less adherent, exhibit a deterioration of glycaemic levels[4-5]. Nevertheless, not all patients with insulin-treated diabetesfollow their self-care regimens or perform their self-care activities as recommended[6-7]. There is a need to better understand the factors that predict self-care practices, and ultimately glycaemic control in this patient group.

Health Belief Model (HBM) has been shown to explain and predict patients' self-care practices as reported by patients and/or as indicated by their glycaemic control[8-15]. The model proposes that the likelihood for an individual to follow the recommended health-related actions is influenced by perceived severity, perceived susceptibility, perceived benefits, perceived barriers and cues to action[16].In particular, an individual is more likely to adopt a particular behaviour when perceived susceptibility and perceived severity are high, and

when perceived benefits of the behaviour in question outweigh any barriers, as well as when a stimulus orcue to action is present[16]. Earlier studies have shown that self-care practices may be related to the HBM and/or its constructs in patients with insulin-treated diabetes[8-11,13,15]. However, these findings remain inconclusive. First, previous studies have utilised cross-sectional data from a single survey, and have not allowed for assessment of whether HBM predicts self-care practices and glycaemic control over time. This is important as health beliefs may change after particular behaviours are adopted[17]. Second, few prior studies have measured or tested the HBM as a whole modelor tested the model on each component of diabetes self-care practices[8]. Third, the majority of prior study samples are limited to adolescents[10,14] or in some cases, a combination of adolescents and adults in a single study[15]. The knowledge generated from these studies cannot be directly transferred to adult populations as there is evidence to suggest that health beliefs may differ between adolescents and adults[18]. A prior study using adult insulin-treated patients[8]is likely to be obsolete due to dynamic changes in diabetes management. Fourth, despite the increased prevalence of insulin users among Type 2 diabetes[19], almost all prior studies have excluded patients with Type 2 diabetes who use insulin, even though they are also recommended to practice similar self-care strategies. Fifth, and to the best of the researchers' knowledge, no studies have been conducted in Malaysia, which may be important given that self-care practices and health beliefs may not be directly generalized as they can be influenced by the culture of a particular society.

Health beliefs can be amendable to change, so understanding more about their relationships with self-care practices would allow for targeted interventions in the future, aimed at improving adherence to diabetes care regimes. Therefore, based on the HBM, the present study was conducted to examine the predictors of self-care practices and glycaemic control in patients with insulin-treated diabetes in Malaysia using a longitudinal approach. The study also determined which HBM constructs were the most predictive of the self-care practices and glycaemic control.

RESEARCH DESIGN AND METHODS

Setting and participants

This longitudinal study was conducted in three endocrinology clinics in Malaysia; Pusat Perubatan Universiti Kebangsaan Malaysia (Site A), Putrajaya Hospital (Site B) and Melaka Hospital (Site C). Eligible participants were between 18-40 years old, clinically diagnosed with Type 1 or Type 2 diabetes for longer than 1 year, on insulin injections for more than six months and able to read and write. Those who were pregnant during the study or who already had major diabetes complications were excluded from the study. The study required a minimum sample size of 126 participants based on the study power set at .8, alpha level at 0.05 and medium effect size 0.25. Nevertheless, all those meeting eligibility criteria were invited to take part in the study.

Measures

Diabetes Self-Care Activity Questionnaire

Self-care practices included diet self-care, insulin intake practice, exercise self-care and SMBG practice. These were measured using a modified version of the self-care activities section in the Diabetes Self-Care Activity Questionnaire (DSCAQ)[20]. The DSCAQ was developed specifically for Malaysian population and was available in both English and Bahasa Malaysia. Modification involved removal of 7 items that were not relevant to the current study (items 1 and 2 in diet, exercise and SMBG and item 8 in the medication activities: relating to recognition of the importance of self-care practices and advice received regarding self-management); minor re-wording of 3 items in the diet section (items 4, 5 and 6); replacement of the word 'medicine' with 'insulin injection' in 2 items in the medication section (items 9 and 10) since the current study focuses only on adherence to insulin injection. For the purpose of this study, an additional physical activity score was generated from this measureby summing 3 items fromthe leisure activity section to become a new variable 'exercise self-care' (generated from item 14, intensity of exercise; item 15, frequency of exercise; and item 16, duration of each exercise). Exercise self-care was defined here as 'regular' if the research participants chose moderate exercise, at least five days and <30 minutes for each exercise (as per national physical activity recommendations at the time the study was conducted) or strenuous exercise, on at least three days and 16-30 minutes for each exercise. Lastly, the response for item 2 and 3 in the SMBG section was changed from categorical to numerical format by asking the study participants to provide their own numbers for the frequency of SMBG. Item 2, then, was collapsed into two categories; at least three times per day vs < 3 times per day. The internal reliability of this modified version of the DSCAQ for the current study was 0.73 (dietary self-care), 0.68 (medication intake practice), 0.66 (physical activity self-care) and 0.64 (SMBG practice).

Participants' glycaemic control was included as an objective measure of diabetes control indicating likelihood of adherence with self-care practices, in

order to enhance the validity of the self-reported data. This was assessed based on the participants' glycated haemoglobin (HbA1c)test results. HbA1c is routinely taken at 3-monthly intervals within usual clinical care for diabetes patients in these settings. The HbA1c results were obtained from the participants' clinic records.

Diabetes Health Belief Questionnaire

The Diabetes Health Belief Questionnaire (DHBQ)[9] was used to measure five HBM constructs as predictor variables (perceived severity, perceived susceptibility, perceived barriers, perceived benefits and cues to action). The DHBQ comprises 27 items: four items relating to perceived severity of diabetes and its complications; four items relating to perceived susceptibility to diabetic complications; seven items relating to perceived benefits of adherence to diabetic regimen; eight items relating to perceived barriers of adherence; and four items relating to cues to action. All items used a 5-point Likert scale. Internal reliability for the DHBQ was α 0.66-0.78 for each subscale, except α 0.10 for cues to action subscale[9].

For this study, the DHBQ was translated into Bahasa Malaysia by a certified translator (Associate Prof. Dr. Muhammad Yazid Bin Jalaludin). Content validity was established by a panel of diabetes experts consisting of three endocrinologists and one diabetes nurse educator. Internal reliability of the translated DHBQ was 0.64, 0.92, 0.73, 0.75 and 0.25 for perceived severity, perceived susceptibility, perceived barriers, perceived benefits and cues to action respectively.

Diabetes Knowledge Test

Participants' knowledge of diabetes was also assessed in this study as one of the control variables. This was measured using Diabetes Knowledge Test (DKT)[21]. DKT has 23 items relating to general diabetes knowledge. A score of 1 is given for a correct answer or 0 for an incorrect or unknown answer. The total score ranges from 0-23, with a higher score indicating higher level of diabetes knowledge. Internal reliability of DKT is coefficient alpha 0.87[21]. Some minor changes to the DKT has been undertaken by previous researchers in order to suit the Malaysian population[20]. The current study utilised the revised version which was first translated to Bahasa Malaysia (α 0.60).

Procedures

The study instrument comprising of the aforementioned measures was pilot tested on 15 patients with diabetes who were treated with insulin injection and were not involved in the actual study. Minor re-wording was done to items in perceived susceptibility subscale (1b, 1c, 2b, 2c, 3b, 3c, 4b, 4c) to improve the clarity. The questionnaire took approximately 30 to 45 minutes to complete.

Eligible participants were identified by the researcher through the clinics' appointment schedule. Data were collected twice over a six-month period between October 2010 and July 2011. Recruitment took place over a 3-4 month period. Data collection at baseline (Time 1:T1)took place at the participant's routinely scheduled endocrinology clinic visit, with the study researcher. The data collection was undertaken in either English or Bahasa Malaysia according to the participant preference.

At six months follow up (Time 2:T2), the questionnaire was sent to the participants by the researcher either by mail or via email depending on their preference stated at the baseline assessment. A postage-paid envelope was attached to the mailed questionnaire. The participants were invited to return the completed questionnaire to the researcher according to their preferred method of receiving it. The mailed questionnaire was sent out to the participants five days prior to their 6-month follow-up date to ensure that it reached the participants one or two days prior to their scheduled date, whilst the questionnaire sent via email was sent two days in advance of their scheduled follow-up date by the researcher. A brief text message reminder was sent to all participants one week prior to their follow-up date to encourage them to complete the form on its arrival. The researcher telephoned each participant on their follow-up date, to confirm receipt of the questionnaire, and for those who did not receive it,a second copy was sent. Participants that did not return the form (but had not withdrawn) received up to three telephone reminders at two week intervals. HbA1c was collected by the researcher from the clinic records, for all participants for the date falling as close as possible to T1 and T2 data collection points.

Statistical methods

Missing data were imputed using SPSS EM imputation. Independent t-test was utilised to examine the demographic characteristic differences between those who completed and dropped out from the study. Comparatives analyses between T1 and T2 were performed using McNemar's test for each of the self-care practice while paired t-test was used for glycaemic control and health beliefs. A series of sequential logistic regression and multiples regression analyses were performed to predict the outcome variables at different points of time: at T1 (T1 health beliefs to predict T1 self-care practices), T1-T2 (T1 health

beliefs to predict T2 self-care practices) and at T2 (T2 health beliefs to predict T2 self-care practices). However, SMBG practice was excluded from these analyses as it violated the adequacy of expected frequencies within each cell. In each regression analysis, the participants' demographic data at baseline (age, gender and race) and diabetes knowledge at the particular point of time were controlled for. Statistical significance was set at $p<0.05$.All data analyses were performed using IBM SPSS version 19.0.

Ethical approval

The study was approved by two ethics committees; the UKM Research Ethics Committee (UKMREC) (Reference number: UKM 1.5.3.5/244/SPP3) for Site A, and the Medical Research and Ethics Committee Ministry of Health Malaysia (MREC-MOH) for Sites B and C (Reference number: KKM/NIHSEC/08/0804/P10-240).

RESULTS

Participants' characteristics

From the total of 169eligible patients approached, 10 patients declined to participate due to time constraints. The questionnaire was completed by 159 patients at T1, and 108 patients (67.9%) at T2.51 patients that did not complete follow-up at T2are referred to as 'drop-outs' (although 34 of these had HbA1c data available for analysis). Reasons for attrition are shown in Table 1. Participants' characteristics were not significantly different between those who completed Time 2 follow-up and those who dropped out (see Table 2).Due to attrition, data analyses in this study were performed on different sample sizes; N=159 or N=108.

Table 1: Reasons for attrition

	N	%
Not contactable	19	11.9
Refused		
Too busy; no time	3	1.9
Not interested	2	1.3
Admitted to hospital	2	1.3
Non-return		
Email	15	9.4
Mail	10	6.3

Descriptive and comparative data

At T1, only HbA1c had missing data (n=3, 1.9%) while at T2, missing data involved four variables; insulin intake practice (n=1, 3.1%), perceived barriers (n=1, 1.8%), perceived benefits (n=1, 1.8%) and Hba1c (n=5, 4.6%). All these data were imputed. However, data imputation for HbA1c at T2 had also included 17 participants who dropped out from the study since the total missing data for this variable was only 13.8% (n=22) and missing data analysis confirmed that it was missing completely at random (MCAR) (Little's MCAR $p>$ .05).

The descriptive and comparative findings of the study variables are presented in Table 3. Results of comparative analysis showed that, except knowledge, all the variables remained relatively stable from T1 to T2. There were no significant difference in health beliefs, self-care practices and HbA1c between T1 and T2.

Regression analysis

Results for regression analyses are presented in Table 4. After controlling for demographic and knowledge variables, HBM predicted diet self-care at T2 (x^2 [5, N = 108] = 16.766, p = .005) and insulin adherence at T1 (x^2 [5, N = 159] = 13.30, p < .05). Among the individual HBM constructs, only perceived benefit was significantly predictive of good dietary habits at T1 (OR 1.92) and T2 (OR .23) and adherence to insulin injection at T1 (OR 3.17) and T1-T2 (OR 2.68).

HBM significantly predicted glycaemic control at T1-T2 (R square changed = .069, F change [5, 149] = 2.74, p = <0.05) and T2 (R^2 change .226, F change [5, 98], p < 0.001) after controlling for age, gender, race and diabetes knowledge. Except perceived severity, all other HBM constructs significantly predicted HbA1c [perceived susceptibility (ß .169) at T1, perceived barriers (ß -.206) and perceived benefits (ß -.397) at T2 and cues to action (ß -.233) at T1-T2]. However, when the analysis excluded attrition and was performed on 108 participants only, the model and cues to action was no longer predictive at T1-T2.

Table 2: Completers vs droppers

Baseline characteristics	Completers (N = 108) Mean (S.D)/%	Droppers (N=51) Mean (S.D)/%	Test statistic*	P value
Age (year)	30.1 (6.9)	29.5 (6.6)	-0.514	0.610
Duration of diabetes	9.1 (7.0)	8.8 (6.7)	-0.245	0.810
Gender				
Male	41.7	49.0	0.491	0.480
Female	58.3	51.0		
Race				
Malay	71.3	54.9	3.45	0.060
Non-Malay	28.7	45.1		
Education				
School	43.5	51.0	0.505	0.480
Higher Education	56.5	49.0		
Current job status				
Working only	77.8	84.3	0.559	0.460
Non-Working only	22.2	15.7		
Marital status				
Single	46.3	58.8	1.70	0.200
Not Single	53.7	41.2		
Living arrangement				
Family	85.2	78.4	0.693	0.410
Non-Family	14.8	21.6		

*Note: *t test for continuous variables and x^2 for categorical variables*

DISCUSSION

To the best of the researchers' knowledge, this is the first study, particularly in Malaysia, to examine the predictive ability of the HBM in self-care practices in patients with insulin-treated diabetes using longitudinal approach. Overall, as reported by the study participants, not all of them practiced good dietary habits and adhered to their insulin regimen while many did not engage in regular exercise and almost all did not perform SMBG at least 3times per day. The HbA1c level, on average, was found to be poor (mean = 9.8%). The self-care practices and the glycaemic control remained relatively stable across a six-month period. The HBM modelwas only able to predict diet self-care at T2 and insulin intake practice at T1. On the other hand, the HBM was consistently predictive of glycaemic control, yet the variance of the prediction was only between 6.9% - 22.6%. Among the HBM constructs, perceived benefits consistently predicted diet self-care and insulin intake practice for over a six-month period. For glycaemic control, all the HBM constructs (perceived susceptibility at T1, perceived barriers and perceived benefits at T2 and cues to action at T1-T2), with the exception of perceived severity, were predictive. However, the direction of relationship of some of the constructs (perceived benefits and diet self-care; perceived barriers and glycemic control; perceived susceptibility and glycaemic control) was contradicted to the direction proposed by the HBM.

This study shows that the HBM, as a model, was not consistently predictive of self-care practices. While the prediction for glycaemic control occurred twice, the variance was considered low to moderate. It is possible that the model may not be powerful enough to make predictions in all analyses in this study due to the low perceived susceptibility held by the study participants. Perceived susceptibility to diabetes complications has often been rated low to moderate by patients with diabetes[22-23]. In fact, some studies found that the majority of their participants did not even believe that they would be susceptible to diabetes complications[24-25].On the other hand, they rated high perceived susceptibility to diabetes complications for other individuals with diabetes[14]. It is possible that the type of questions posed to the participants to estimate the percentage of chance they themselves would get diabetes complications could lead to anxiety. This, in turn, may trigger the participants to react to their susceptibility with denial, in which, in reality they perceived high susceptibility to the complications. Alternatively, they might have lacked the

understanding of the pathophysiological process of diabetes and its complications, and therefore not able to relate themselves to the risk of getting such complications[26].

Table 3: Predictor and outcome variables

	T1 (N=159)	T1 (N=108*)	T2 (N=108)	Statistical value	*p* value
Diabetes knowledge	67.35 (13.78)[a]	69.81 (13.38)[a] (13.9913.99	73.39 (12.38)[a]	-3.05	0.003[c]
Health beliefs					
Perceived severity	3.87 (0.69)[a]	3.84 (0.68)[a]	3.89 (0.72)[a]	-0.715	0.476 [c]
Perceived susceptibility	2.48 (1.11)[a]	2.45 (1.11)[a]	2.48 (1.04)[a]	-0.335	0.738[c]
Perceived barriers	2.03 (0.62)[a]	2.03 (0.62)[a]	1.97 (0.62)[a]	0.941	0.349[c]
Perceived benefits	3.87 (0.73)[a]	3.90 (0.73)[a]	3.92 (0.68)[a]	-0.216	0.829[c]
Cues to action	3.22 (0.66)[a]	3.25 (0.62)[a]	3.30 (0.62)[a]	-0.894	0.373[c]
Diet practice					
Good dietary habits	66.7 (106)[b]	67.6 (73)[b]	68.5 (74)[b]	N.A	1.000[d]
Poor dietary habits	33.3 (53)[b]	32.4 (35)[b]	31.5 (34)[b]		
Insulin intake practice					
Adherence	73.6 (117)[b]	74.1 (80)[b]	77.8 (84)[b]	N.A	0.572[d]
Non-adherence	26.4 (42)[b]	25.9 (28)[b]	22.2 (24)[b]		
Exercise self-care					
Regular	7.5 (12)[b]	7.4 (8)[b]	7.4 (8)[b]	N.A	1.000[d]
Not regular	92.5 (147)[b]	92.6 (100)[b]	92.6 (100)[b]		
SMBG practice					
At least 3 times per day	0.6 (1)[b]	.9 (1)[b]	0.9 (1)[b]	N.A	1.000[d]
< 3 times per day	99.3 (158)[b]	99.1 (107)[b]	99.1 (107)[b]		
Glycaemic control	9.83 (2.60)[a]	9.57 (2.55)[a]	9.44 (2.48)[a]	0.625	0.533[c]

*Note: *Excluded attrition; [a]Mean (SD); [b]% (N); [c]Paired t-test; [d]McNemar's Test; N.A=Not applicable. All comparative analyses were performed on 108 participants only*

Of the HBM constructs, only perceived benefit was predictive for the self-reported behaviours (good dietary habits and insulin adherence only). The association between perceived benefits and dietary habits in patients with diabetes has been reported previously[11]. Most importantly, in the present study, this construct was predictive over time which indicates that it is the particular component of the HBM that plays an important role in both of the self-care behaviours. This is supported by a previous review indicating that perceived benefits is the component of the HBM most strongly related to health behaviour[27]. Nevertheless, perceived benefit was not uniformly associated with good dietary habits adherence in the direction proposed by the HBM. At Time 1, as the perceived benefits increased, the participants were more likely to report good dietary habits, a finding consistent with the HBM. At Time 2, however, it became negative in which the participants were less likely to practice good dietary habits as their perceived benefits increased, a finding that is contrary to the HBM. Perhaps, despite having higher perceived benefits,

the participants might no longer be motivated to practice good dietary habits because they did not see the actual benefits of doing so. In this study sample, participants' glycaemic control remained poor from the beginning of the study until the six-month follow-up.

Table 4: Regression analyses

Variables	B	Wald	df	p value	OR	95% C.I.
Good dietary habit						
T1						
Perceived benefits	0.651	5.121	1	0.024	1.918	1.091, 3.372
T2						
Perceived benefits	-1.472	9.875	1	0.002	0.229	0.092, 0.575
Insulin adherence						
T1						
Perceived benefits	1.153	11.776	1	0.001	3.168	1.640, 6.122
T1-T2						
Perceived benefits	0.986	4.343	1	0.037	2.681	1.060, 6.779
Variables	**B**	**SE**	**β**	**t**	**p value**	**95% C.I.**
HbA1c						
T1						
Perceived susceptibility	0.395	0.185	0.169	2.130	0.035	0.028, 0.761
T1-T2						
Cues to action	-0.897	0.306	-0.233	-2.932	0.004	-1.502, -0.293
T2						
Perceived barriers	-0.794	0.381	-0.206	-2.087	0.040	-1.550, -0.039
Perceived benefits	-1.453	0.348	-0.397	-4.176	0.000	-2.144, -0.763

Note: Only significant results are presented; OR = Odd ratio; C.I = Confidence interval; B = Unstandardized coefficient; SE = Standard error; B (Beta) = Standardized coefficient; t = Coefficient/Standard error

Regarding glycaemic control, the best predictors of glycaemic control were perceived susceptibility (T1), cues to action (T1-T2), perceived benefits and perceived barriers (T2; perceived benefit was stronger than perceived barriers). Cues to action, nevertheless, became non-significant when the analysis was repeated to exclude those participants who dropped out from the study. Perhaps, those who dropped out from the study were more motivated individuals with higher cues to actions. The relation between the constructs and glycaemic control has been observed in earlier studies regardless of the types of diabetes or its treatments[9,22]. However, contrary to the HBM, higher perceived susceptibility and lower perceived barriers were associated with higher HbA1c, which signifies poorer glycaemic control instead of lower HbA1c or better glycaemic control. The negative relationship between perceived susceptibility and glycaemic control has already been reported by several studies[9-10,28-29]. Brownlee-Duffeck et al.[9]suggests that the finding may simply reflect a realistic appreciation by the participants, who are in poor glycaemic control and that they are more susceptible to complications. Other studies relate this finding with theories of fear communication where fear message does not necessarily lead to positive behaviour outcomes[10].

It is to be noted that the opposite relation between perceived barriers and glycaemic control is unexpected as it is inconsistent with the findings of many existing studies[9,28,30]. According to Turner et al.[31], those who have already taken their medication for a long time may not perceive barriers to take their medications. In the present study, on average, the participants had already had diabetes for nine years and so they should have been engaging in their diabetes self-care

activities for quite some time. Patients with diabetes may potentially have lost motivation to self-control their diabetes since there was no improvement in their glycaemic control[32]. Nevertheless, a further investigation is needed to clarify whether the relation remains or reverses over time.

Perceived severity was the only construct that was not a significant predictor in any of the analyses. The failure of this construct to predict the participant's self-care practices is not surprising as the construct has been found to be weak in predicting behaviours[27]. However, the failure to find a significant relation of the construct to glycaemic control is unexpected as this construct was found to be predictive of glycaemic control over time in a longitudinal study[22]. However, this finding may not be comparable due to several discrepancies such as the duration of diabetes which is longer in the current study (9 years vs 6 months-3 years). It is possible that the participants in the current study believed in the fact that diabetes and its complications are severe regardless of the level of their HbA1c level as they already had the disease for a long time.

Although there is evidence demonstrating the relation between the HBM constructs and exercise self-care in patients with non-insulin treated diabetes[33-34], neither the model nor its constructs made any predictions relating to exercise self-care practices throughout this study. According to Janz and Becker[35], the HBM is a psychosocial model and as such, it is not intended or able to account for the variance in individual behaviours which are not related to attitudes and/or beliefs. This leads to an assumption that the participants in this study exercised for reasons that are not related to their health beliefs. For example, they might exercise for body image such as to lose weight in females or for body fitness in males as determined in Balfe[36].

Despite the strength of the study design, the comparative findings should be interpreted with caution due to the attrition. There was a possibility that the patients who did not return the questionnaire at Time 2 were no longer interested to continue their study participation, and that their self-care practices might be different from those who responded. Another limitation could be that this study utilised the original version of the HBM. This version does not include other constructs such as health motivation and self-efficacy in which could predict better self-care practices and glycaemic control.

Implications for clinical practice and research

In this study, adherence to insulin prescription and good dietary habits were predicted by perceived benefits while good glycaemic control was predicted by perceived susceptibility, perceived barriers, perceived benefits and cues to action. Actively promoting the benefits of adhering to self-care practice and having good glycaemic control may help to increase the likelihood of adherence to insulin and dietary regimes. Nurses, especially diabetes educators should educate their patients about the pathophysiology of diabetes and ensure it is well understood by the patients before promoting the benefits of adhering to self-care practice. In addition, educating the patients to understand that they are at risk, identifying and addressing their barriers to self-care, focusing on the benefits of self-care practices and well-managed diabetes, and increasing their cues to action, might be a more useful approach for this population than focusing on the negative aspects (such as the severity of the condition and its complications). More research, nevertheless, is needed to investigate the relationships between health beliefs and self-care practices and glycaemic control in Malaysian adults with insulin-treated diabetes. The use of the extended version of the HBM which includes health motivation construct is highly recommended since the original version has failed to predict exercise self-care. In addition, a qualitative study is also warranted to gain a more nuanced understanding of why patients with diabetes often perceive low susceptibility to diabetes complications.

CONCLUSIONS

Patients' engagement in diabetes self-care activities is required to achieve and maintain good glycaemic control which in turn to reduce the likelihood of diabetes complications. Nonetheless, diabetes self-care practices remain a significant problem as many do not engage in adequate self-care. In this study, some components of the patient's self-care practices, and glycaemic control, were related to and predicted by their health beliefs. This information may assist diabetes educators to develop supportive interventions to facilitate their patients to engage in the self-care activities. More research is needed to investigate the roles of health beliefs in Malaysian patients with insulin-treated diabetes.

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CONFLICT OF INTEREST

None declared

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