

HOSTED BY



Contents lists available at ScienceDirect

International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Original article

The moderating effect of social cognitive factors on self-management activities and HbA1c in Thai adults with type-2 diabetes

Somsak Thojampa^{a,*}, Barbara Mawn^b^a Faculty of Nursing, Naresuan University, 99 Moo 9, Thapho, Muang, Phitsanulok 65000, Thailand^b School of Nursing, University of Massachusetts Lowell, 113 Wilder St., Suite 200, Lowell 01854-3058, MA, USA

ARTICLE INFO

Article history:

Received 25 August 2016

Accepted 9 December 2016

Available online 30 December 2016

Keywords:

Self-management activities

Social support

Self-efficacy

Buddhist values

Type-2 diabetes mellitus

ABSTRACT

Background: Diabetes mellitus (DM) has become a serious chronic disease. Self-management strategies help persons with DM make choices which will develop skills needed to reach their goal of blood glucose control and allow them to be successful in reaching goals.

Objective: To examine the impact of self-management activities on HbA1c for persons with DM and to examine the impact of social support, self-efficacy and Buddhist values as moderators on the relationship between the self-management activities and HbA1c.

Method: This study is a cross-sectional design. The sample included 401 Thai adults diagnosed with type 2 diabetes, aged 20–65 years old who had at least one HbA1c test in the last three months were recruited. Participants completed four questionnaires to measure self-management activities, as well as self-efficacy, Buddhist values and social support as moderating factors on self-management activities and HbA1c.

Results: The self-management activities were negatively associated ($\beta = -2.05, p \leq 0.001$) with HbA1c. The Social support, self-efficacy and Buddhist values had a significant interaction effect between self-management activities and HbA1c ($\beta = -0.97, p \leq 0.05, \beta = -0.18, p \leq 0.05$ and $\beta = -2.76, p \leq 0.001$).

Conclusion: The diabetes self-management activities were more strongly associated with HbA1c under conditions of high social support, self-efficacy and health beliefs with Buddhist values. Future interventions for T2DM self-management programs should incorporate mechanisms to measure and support these factors.

© 2017 Chinese Nursing Association. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

The World Health Organization (WHO) reports that diabetes mellitus (DM) has become a serious disease and costly health condition in the world [1]. WHO notes that DM is especially serious and becoming increasingly common in developing countries and among disadvantaged minorities [1]. Thailand is a low to middle income developing country. In Thailand, it was reported that the diagnosis rate of DM was higher for people aged 55 and over (63% in this age group vs. a 37% prevalence in persons <54 years old) and for women. Among those diagnosed with diabetes in Thailand, 65% are female [2]. Research has shown that DM has been one of the major causes of morbidity as well as mortality in Thailand [3]. Just

over 3% of total deaths in men, and 8.3% of total deaths in women were caused by DM in Thailand in 2010.

A study by [2] Deerochanawong & Ferrario (2013) found that the prevalence of severe DM complications exists both in urban and rural areas in Thailand. Chronic hyperglycemia is a major concern in Thailand since it can lead to the progression of complications for persons with DM. The risk of DM complications can be reduced when persons with DM maintain or control their blood glucose at an optimal level [4].

Diabetes self-management is essential for achieving this control [5]. Self-management (SM) refers to individuals with DM taking actions to manage their symptoms, treatment, and adapt behavioral changes based on recommendations by health care professionals (HCP) [6]. Diabetes self-management is designed with strategies to develop a healthy lifestyle leading to the best possible DM control. Adequate SM strategies will help persons with DM make their choices to enhance their skills needed to reach their goal of blood glucose control and allow them to be successful in

* Corresponding author.

E-mail address: somsakth@outlook.com (S. Thojampa).

Peer review under responsibility of Chinese Nursing Association.

reaching self-care goals [6].

The social cognitive theory (SCT) emphasizes the social aspect of the learning in the form of interaction between the individual, environment, and behavior [7]. When SCT is applied to self-management activities for individuals with DM, the theory can provide a valuable perspective from social support, self-efficacy as well as health beliefs based on religious values.

The Buddhist values accounted for a significant proportion of the variance in the HbA1c level. The study conducted by [8] Sowattanagoon and colleagues (2009) found that for persons with DM in Thailand, their perceptions and management of the disease are the synthesis of their knowledge, health beliefs, Buddhist and socio-cultural values. It was evident that both Western medicine and Thai religious culture influenced the way that a person with DM understands the cause of his or her DM, as well as how he/she lives and manages with the disease in Thailand. Thai adults with T2DM who showed higher Buddhist values had higher engagement in medication and dietary self-care and health care use, and lower A1C levels [9]. In this study, Buddhist values are defined as beliefs and attitudes in Buddhist teachings, chanting, meditation and mindfulness to relieve stress and anxiety.

The purposes of this study are: (a) to examine the impact of self-management activities on HbA1c among Thai persons with DM, (b) to examine the impact of social support as a primary moderator, (c) to examine the impact of self-efficacy as a second moderator, and (e) to examine the impact of health beliefs related to Buddhist values as a third moderator on the relationship between self-management activities and HbA1c in Thai persons with DM.

2. Methods

2.1. Design and participants

This study used a cross-sectional design to investigate the moderating effects of self-efficacy, health beliefs with Buddhist values and social support on diabetes SM activities as they relate to HbA1c for Thai adults with T2DM. The convenience sample included Thai adults who were diagnosed as having T2DM. The researcher recruited the sample from four clinical sites in Thailand. Inclusion criteria included: male and female Thai adults (20 years or older) who had been diagnosed with T2DM for at least one year by a physician, the ability to read and understand Thai language, and willingness to participate in the study. In addition they must have available medical documentation of a recent (within 3 months) HbA1c lab result from their HCP.

2.2. Instruments

The instruments consisted of a general demographic questionnaire generated by the researcher and approved by the research team and four questionnaires that measured various concepts related to disease management, social and/or cognitive functions. The general data collection questions were distributed to participants using a simple paper form to be filled out by the participants. The demographic and descriptive data on the form included information such as age, sex, education, marital status, occupation, household income, religion, living in rural area or in a city, and years living with DM. The instruments for investigation include (a) Diabetes Self-management Questionnaire (DSMQ), (b) Buddhist Values Questionnaire (BVQ), (c) Diabetes Self-efficacy Questionnaire (DSEQ) and (d) The Social Support Scale for Self-care in Middle-Aged Patients with Type II Diabetes (S4-MAD). All questionnaires were developed and published in English and they were translated to the Thai language except for the Buddhist Values Questionnaire (BVQ) which was originally in Thai.

The DSMQ was developed to assess DM patients' self-care activities associated with blood sugar level control. The data collected and analyzed by [10] Schmitt et al. (2013) presented a strong case that good self-care management in persons with both type 1 and type 2 diabetes was inversely associated with hemoglobin (HbA1c) levels. Their studies showed an excellent internal consistency of 0.84. The DSMQ contains 16 items in four categories: glucose management, dietary control, physical activity, and health care use. The rating range from 0 (does not apply to me) to 3 (applies to me very much).

In this study, self-efficacy was measured by the DSEQ, an 8-item questionnaire that measures a person's capability to manage his or her daily diabetes self-care activities, which include dietary regulation, physical activities, medication adherence, blood glucose monitoring, and general diabetes care. The questions are rated from 1 (Not confident at all) to 10 (Totally confident) based on their confidence in doing the self-care activities. The researchers reported an alpha coefficient of 0.828 in the original study by the [11] Stanford Patient Education Research Center (1996).

As a moderating factor to self-management, an instrument called S4-MAD measured social support. It was developed for evaluating social support for self-care in middle-aged (30–60 years old) T2DM patients. The original developer of S4-MAD instrument reported that the scale was a valid and reliable instrument for measuring social support for self-care in middle-aged T2DM patients where it was tested in Iran on the original study by [12] Naderimagham et al. (2012). The support can come from family and friends, significant others, physicians and HCPs. Each of the 30 items on the S4-MAD is rated on a 5-point Likert format, from 0 (never: no support at all) to 4 (always: strongest level to support).

Thai DM researchers developed the Buddhism Value Questionnaire (BVQ) in 2008 to examine the associations of Buddhist values with medication and dietary self-care, healthcare use, and HbA1c level among Thai T2DM patients. The original study found that Buddhist values may promote positive self-care behaviors among Thai people with T2DM [9]. The BVQ contains seven items about beliefs in Buddhist teaching and practices and could be rated from 1 (Not at all) to 5 (A great deal) based on their adherence to those practices.

This study used experts to translate the English instruments into Thai language, evaluate content validity and conducted reliability analysis in a pilot study consisting of 30 persons with T2DM and the final study sample of 401 persons with T2DM. Experts concluded that the majority of the translated items were culturally relevant. The results of both measurements, I-CVI and k^* , were in line with each other, with items meeting the I-CVI criterion of 0.90, 0.85, 0.93 and 1 along with excellent k^* values, indicating that both methods resulted in the same conclusion and strengthened the evidence for adequate content validity. The internal consistency of the four instruments in both the pilot and final study was found to be relatively high; the alpha coefficients for DSMQ were 0.73 and 0.94. The alpha coefficient of the pilot study was slightly lower but the final study result was higher than the alpha coefficient found by [9] Schmitt et al. (2013) (0.84) and is still considered acceptable. The DSEQ Cronbach's alpha results were 0.94 and 0.94, which are higher than the alpha coefficient (0.83) found by [8] Stanford Patient Education Research Center (1996). For the S4-MAD, the alpha coefficients were 0.91 and 0.94; the original study conducted by [12] Naderimagham et al. (2012) also reported a coefficient of 0.94. For the BVQ, the alpha coefficients were 0.75 and 0.80 for this study. These are slightly lower than the alpha coefficient (0.81) found by [9] Sowattanagoon et al. (2008), but still adequate. Furthermore, the relatively high alpha values on the four scales confirmed the good internal consistency of the instruments.

3. Results

The final sample of this study consisted of 401 adults with T2DM from four diabetes clinics located in different regions of Thailand: Phitsanulok in the North; the central capital city of Bangkok; Songkhla in the south; and Chaiyaphum in the northeast. Each participating site had recruitment flyers. Staff at each site assisted in the identification of eligible participants. The majority of participants were in the 51–60 year age group (66.08%). The majority of the sample was married (87.53%) and female (74.81%). Sixty-seven percent of the participants completed only primary school (67.58%). Just over one-third (34.67%) had been diagnosed with diabetes for six to ten years. As expected, a strong majority reported Buddhism for their religious preference (98.75%). The non-Buddhists did not fill out the BVQ questionnaire. The majority of participants reported three to four persons living in the home. While 65.10% of the sample reported that they did not have any other chronic diseases, 34.91% of the participants did note that they had at least one chronic condition including hypertension, lipidemia, early stage kidney disease, neurosis and gout. 62% of the sample reported that they lived in a rural area in Thailand.

Table 1 shows that the total self-management activities score (DSMQ) was negatively associated with HbA1c ($\beta = -2.05$, $P < 0.001$). In addition, each of the subscales within this tool also had a statistically significant negative association with HbA1c. The total self-management activities score and its subscales all have a negative linear relationship with HbA1c.

Table 2 shows that social support, self-efficacy and Buddhist values all resulted in significant interactions between self-management activities and HbA1c while controlling for sex, age, duration of known diabetes, and education level. The interaction term between social support and self-management activities was added to the regression model, which accounted for a significant proportion of the variance in the HbA1c level of person with diabetes ($\beta = -0.97$, $P < 0.05$). Moreover, the interaction between self-efficacy and self-management activities accounted for a significant proportion of the variance in HbA1c level of person with diabetes ($\beta = -0.18$, $P < 0.05$). The last interaction terms examined were between the Buddhist values and self-management activities. When added to the regression model, they accounted for a significant proportion of the variance in HbA1c level of person with diabetes ($\beta = -2.76$, $P < 0.001$). The findings show that social support, self-efficacy and Buddhist values are significant moderators of self-management activities (DSMQ) and HbA1c.

4. Discussion

This study was a cross-sectional study, which verified that the relationship between diabetes self-management activities and HbA1c varies depending on the strength of three moderating

factors. The diabetes self-management activities were more strongly associated with HbA1c under conditions of high social support, self-efficacy and health beliefs with Buddhist values.

Social support accounted for a significant proportion of the variance in the HbA1c level. With enhanced social support in diabetes self-management, persons with DM can improve their metabolic control, achieve self-management goals and facilitate the psychosocial adjustment to the disease. Social support can also foster adherence to recommended healthy activities for person with T2DM. A study in Thailand revealed that interventions for behavioral change or adherence to self-care requirements should include the family members of the person with DM as part of the self-management program [13](Khuwatsamrit et al., 2006).

Self-efficacy also positively moderated the relationship between diabetes SM activities as measured by the DSMQ and HbA1c. [14] Mishali and her colleagues (2011) measured the importance of self-efficacy for persons with DM. Their results showed that self-efficacy affects adherence to treatment and thus has a direct impact on clinical outcomes. [15] Sousa et al. (2005) studied the relationships between self-care agency, self-care, self-efficacy, and glycemic control. They found that greater self-care agency and self-efficacy leads to improved self-care management, in turn leading to optimal glycemic control. They also reported that beliefs or capabilities for self-care alone are not sufficient to improve glycemic control.

This study found that the Buddhist values positively moderated the relationship between diabetes self-management activities as measured by DSMQ and HbA1c. The specific aspects of Buddhist values, which impact self-management activities, are dietary practices and medication self-care [8] (Sowattanagoon et al., 2008). [16] Wattanakul (2012), a Thai researcher who studied the factors influencing diabetes self-management behaviors among persons with T2DM, also concluded that Buddhist values have a significant correlation with self-management behaviors in a positive way. Neither Wattanakul nor prior Thai researchers have examined other potential moderating factors of self-efficacy and social support along with Buddhist values among Thai persons with diabetes. Thus this study contributed a unique perspective to the understanding of self-management practices and potential moderators that can affect positive outcomes for persons with T2DM.

5. Conclusions and recommendations

The results of this investigation led to the conclusion that diabetes self-management activities, as measured by the DSMQ, are strongly associated with HbA1c. In this study the strong association between self-management activities and HbA1c actually means a negative or inverse relationship, which means that higher self-management activities led to a lower value of HbA1c while controlling for age, sex, education and duration of diabetes.

Table 1
Regression analysis: Relationship between self-management activities and HbA1c.

	β	Std.Err.	t	P	N/R-square
Self-management activities total	-2.055	0.131	-15.61	0.000*	Number observed = 401 R-squared = 0.416
Glucose management	-2.633	0.143	-18.17	0.000*	Number observed = 401 R-squared = 0.486
Dietary control	-1.463	0.104	-14.08	0.000*	Number observed = 401 R-squared = 0.371
Physical activity	-1.794	0.163	-10.98	0.000*	Number observed = 401 R-squared = 0.273
Health care use	-1.438	0.117	-12.22	0.000*	Number observed = 401 R-squared = 0.483

Note: Control variable include; sex, age, duration of known diabetes and education level.

Table 2

Interactions between the social support, self-efficacy and Buddhist value with self-management activities and HbA1c.

	β	Std.Err.	t	P	N/R- square
Self-management activities with social support	−0.976	0.372	−2.62	0.009*	Number observed = 401 R-squared = 0.428
Self-management activities with self-efficacy	−0.188	0.074	−2.53	0.012*	Number observed = 401 R-squared = 0.426
Self-management activities with Buddhist value	−2.760	0.441	−6.26	0.000*	Number observed = 396 R-squared = 0.483

Note: The regression analysis was controlled for; sex, age, duration of known diabetes disease and education level.

The implications of this study for health promotion and clinical practice suggests that nurses, physicians and other health practitioners should welcome and include family members of persons with diabetes whenever feasible in all educational sessions in the clinic as well as formal educational programs as this study revealed that family support enhances health outcomes for persons with diabetes. Practitioners can also bring into their brief clinic discussion the parallel values of taking care of one's health related to diabetes and the Buddhist values. The results of this study can help develop a quality self-management program, which will help persons with DM change their health behaviors and improve their clinical outcomes. Thus it has real clinical value and significance in promoting the health of persons with T2DM in Thailand.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.ijnss.2016.12.006>.

References

- [1] World Health Organization (WHO). Diabetes mellitus. 2014. Retrieved from: <http://www.who.int/mediacentre/factsheets/fs138/en/>.
- [2] Deerochanawong C, Ferrario A. Diabetes management in Thailand: a literature review of the burden, costs, and outcomes. *Glob Health* 2013;9. <http://dx.doi.org/10.1186/1744-8603-9-11>. 11–11.
- [3] Reid G, Sherwood L, Stonall R, Morgan B, Harrison S, Heffy J. Chronic physical illness: self-management and behavioral interventions. *Int J Ther Rehabil* 2009;16(12):685–6.
- [4] Porapakham Y, Rao C, Pattaraarchachai J, Polprasert W, Vos T, Adair T, et al. Estimated causes of death in Thailand, 2005: implications for health policy. *Popul Health Metr* 2010;8. <http://dx.doi.org/10.1186/1478-7954-8-14>. 14–14.
- [5] Hausmann LR, Ren D, Sevick MA. Racial differences in diabetes-related psychosocial factors and glycemic control in patients with type 2 diabetes. *Patient Prefer Adherence* 2010;4:291–9.
- [6] Choi S, Song M, Chang SJ, Kim S. Strategies for enhancing information, motivation, and skills for self-management behavior changes: a qualitative study of diabetes care for older adults in Korea. *Patient Prefer Adherence* 2014;8: 219–26. <http://dx.doi.org/10.2147/PPA.S58631>.
- [7] Bandura A. Social cognitive theory. In: Vasta R, editor. *Annals of child development. Six theories of child development*, vol. 6. Greenwich, CT: JAI Press; 1989. p. 1–60.
- [8] Sowattanagoon N, Kotchabhakdi N, Petrie KJ. The influence of Thai culture on diabetes perceptions and management. *Diabetes Res Clin Pract* 2009;84(3): 245–51. <http://dx.doi.org/10.1016/j.diabres.2009.02.011>.
- [9] Sowattanagoon N, Kochabhakdi N, Petrie KP. Buddhist values are associated with better diabetes control in Thai patients. *Int J Psychiatry Med* 2008;38(4): 481–91.
- [10] Schmitt A, Gahr A, Hermanns N, Kulzer B, Huber JÖ, Haak T. The diabetes self-management questionnaire (DSMQ): development and evaluation of an instrument to assess diabetes self-care activities associated with glycemic control. *Health & Qual Life Outcomes* 2013;11(1):1–14. <http://dx.doi.org/10.1186/1477-7525-11-138>.
- [11] Stanford Patient Education Research Center. Diabetes self-efficacy scale. 1996. Retrieved From: <http://patienteducation.stanford.edu/research/sediabetes.pdf>.
- [12] Naderimaghani S, Niknami S, Abolhassani F, Hajizadeh B, Montazeri A. Development and psychometric properties of a new social support scale for self-care in middle aged patients with type II diabetes (S4-MAD). *BMC Public Health* 2012;12:1035–44.
- [13] Khuwatsamrit K, Hanucharurnkul S, Chyun DA, Panpakdee O, Tanomsup S, Viwatwongkasem C. Social support, self-efficacy, and adherence to self-care requirements in patients with coronary artery disease. *Thai J Nurs Res* 2006;10(3):155–64.
- [14] Mishali M, Omer H, Heymann AD. The importance of measuring self-efficacy in patients with diabetes. *Fam Pract* 2011;28(1):82–7. <http://dx.doi.org/10.1093/fampra/cmq086>.
- [15] Sousa VD, Zauszniewski JA, Musil CM, Lea PJP, Davis SA. Relationships among self-care agency, self-efficacy, self-care, and glycemic control. *Res Theory Nurs Pract An Int J* 2005;19(3):217–30. <http://dx.doi.org/10.1891/rtnp.2005.19.3.217>.
- [16] Wattanakul B. Factors influencing diabetes self-management behaviors among patients with T2DM in rural Thailand. 2012. p. 2012240069.