Journal of Current Medical Research and Opinion 1:1 Feb. (2018)

Contents lists available at www.cmro.in
JOURNAL OF CURRENT MEDICAL RESEARCH AND OPINION
Journal homepage: http://cmro.in/index.php/jcmro

Effects of Self-Management Support And Family Participation Enhancing Program For Delayed Progression of Diabetic Nephropathy In Thai Adults With Type 2 Diabetes

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ARTICLE INFO

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Keywords: Word health organization, Diabetes, Survey.

ABSTRACT

According to the World Health Organization (WHO), diabetes mellitus (DM) is a serious disease and a costly health condition in the world [1]. In 2014, more than 90% of the estimated 382 million people worldwide who had DM were diagnosed with type 2 diabetes (T2DM) according to the International Diabetes Federation [2]. There were over 4 million cases of DM in 2014 in Thailand [1]. The prevalence of impaired fasting glucose (IFG) was 10.06% and diabetes was 7.5% for all Thai adults age 20 or older [3] based on the Thai National Health Examination Survey IV conducted in 2009.

INTRODUCTION

DM complications can lead to a lot of medical conditions which includes diabetic nephropathy (DN) that was found to be the most common complication [4]. When DN progresses to the later-stage or chronic kidney disease (CKD), the person with DM can have a disability. This will have a big impact on the person, family and society. Therefore, it is very important to prevent DM complications to avoid economic burden to the family [5].

The Bureau of Policy and Strategy in the Ministry of Public Health in Thailand (2013) reported that 70 percent of kidney disease cases resulted from complications of DM. Hyperglycemia and hypertension are considered to be the indicators of CKD progression [6]. DN can be prevented by early detection with sensitive tests and using preventive measures on its early course. In general, the goal for glycemic control is a blood glucose level as close to normal (HbA1c < 7%) and blood pressure should be < 130/85mm Hg consistently especially at the start of renal damage [7]. Both glycemic control and strict control of blood pressure have considerable affects on prevention and progression of DN.

Studies showed that programs such as blood pressure control [8] and glycemic control [9] can effectively delay the progress of DN. However, the said programs focus only on the promotion of disease-specific knowledge and skills, and rarely involve the support of family members in delivering care. The self-management and social support preliminary studies showed that greater levels of social support correlated with better diabetes self-management [10]. In a study about the effect of a self-management program on patients with early CKD conducted in Taiwan, it was found that the CKD self-management program was effective in improving self-efficacy, self-management behaviors and improved physiological outcomes in terms of lowered SCr levels and stable eGFR among the subjects [11]. However, their study didn't employ the support of the family in enhancing self-management activities of the patient with T2DM.

Self-management is based on social cognitive theory [12] which stresses that personal factors (especially beliefs and other cognitions) and environmental factors (both physical and social) interact to influence behavior. The Social Cognitive Theory (SCT) emphasizes the social aspect of the learning in the form of interaction between the individual, environment, and behavior [13]. When SCT is applied to self-management activities for individuals with DM, the theory can provide a valuable perspective in enhancing social support.

Since the experience of the disease is unique to every patient, each of them will decide how to manage their disease and likewise decide how satisfied they are with the outcomes. For the most part, self-efficacy, an individual's confidence in his or her ability to undertake specific self-management behaviors, has been highlighted as the main influence on successful self-management [14]. Self-efficacy refers to an individual's perception of his or her ability to conduct certain acts without other people's help. Strong desire, motivation, and ability are a few aspects of self-efficacy. While self-

efficacy is more emphasized in the West, family support is more common in the East [15].

In Asia including Thailand, most patients will rely on their family members to "take care" of them when they are ill or getting old. Parents expect their adult children to take care of them when they are in need furthermore; there is emphasis on the family as a basic support unit for the individual with chronic disease [16]. When one person in a family is diagnosed with a chronic disease, everyone in the family has an obligation to help him or her especially with emotional and instrumental support. 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 [17].

In self-regulation theory, care providers can influence the patient's interpretations and their approach to controlling their disease. However it is the patients' judgment and choices that directs their behavior [18]. In the research based in self-regulation theory of patients' coping with events that occur with physical illness, the goal for the emotional pathway in the model has been emotional comfort and for the functional pathway, minimization of disruption of usual life activities [19]. These outcomes are important to achieving higher level goals such as quality of life. This level in the hierarchy of goals applies to many different health care situations and they are outcomes that can be observed and measured for both clinical and research purposes. The role of the family in supporting the patient with T2DM is vital in promoting self-management therefore minimizing the complications of CKD.

The aim of this study is to (1) develop a self-management support program based on self-regulation theory with the participation of family members, and (2) to evaluate its effect on self-efficacy, self-management activity and clinical outcomes in delaying the progress of diabetic nephropathy in adults with T2DM.

Methods

This Quasi-experimental research used the convenience sampling. Subjects were recruited from Wangthong hospital in Phitsanuloke province, Thailand. The sample comprised of 50 adults who are 20-year-old and above with diagnosed Type 2 diabetes for at least 5 years. The first 25 patients were assigned to the control group, who received usual care, and the other 25 patients were assigned to the experimental group and received the self-management support and family participation enhancement program for 4 weeks.

Data Collection and Instruments

Data were collected between September 2016 and November 2016. Approval for this research involving human subjects was obtained from the Naresuan University Institutional Review Board before data collection. Of the 50 subjects recruited, 25 people consented to participate in this study as the experimental group. After informed consent was obtained, participants completed the questionnaires (demographic, self-management activity and self-efficacy). The subjects were asked to provide the results of their routine blood pressure and blood test for clinical outcome which includes Glomelular Filtration Rate (eGFR), Serum Creatinine (SCr) and Glycated hemoglobin (HbA1c) on week 1 and again on week 12. To determine their self-management activity and self-efficacy scores, they were asked to answer the Self-Management Activity Questionnaire (SMAQ) and Self-Efficacy Questionnaire (SEQ). A pilot study was done to test the reliability of the questionnaires (SMAQ and SEQ) on 30 respondents with the similar sample criteria in another district in Phitsanuloke province. The two questionnaires were developed by the author and have undergone content validity which was good; the reliability of the questionnaires was examined using the Cronbach alpha coefficient with a score of 0.80 for SMAQ and 0.74 for SEQ. The subjects were pretested to establish baseline values (T1) on week 1, and two posttests were then administered at week 8 (T2) and week 12 (T3) after the self-management support and family participation program intervention.

Intervention

The researcher designed a self-management program based on self-regulation theory [20]. Each subject in the experimental group was scheduled to attend a weekly self-management support and family participation enhancing program that included face-to-face sessions and focus group session for the duration of 4 weeks. After subjects watched a CKD self-management video, the lead investigator led a focus group discussion with a family member in which they learned about self-regulation processes. Self-management activities were developed and used as models by study participants. The activities of self-management used by participants include as follows: propose personal target problem to be addressed in disease management, observe and judge causes producing problem, set up workable personal goals, develop specific strategies to achieve goals, self-evaluate the effectiveness of strategies to achieve goals, and recognize one's own outcome performance. By watching the examples in the video, participants could learn new self-management strategies.

Variables	Control group (n=25)	Experime (n=
Sex		

Male	3
Female	22
Religion	
Buddhism	24
Islam	1
Marital status	
Married	16
Widow	9
Education	
None education	2
Primary school	21
Secondary school	2
Bachelor's degree	0
Monthly income	
less than 10,000 Baht	22
10,000-20,000 Baht	2
20,000-30,000 Baht	0
more than 40,000 Baht	1
Occupation	
Unemployed	4
Agriculture	15
Employee	4
Other	1
Person who cooks	
His/herself	22
Daughter/ son	1
Neighborhood	1
Other	1
Underlying disease	
Yes	22
No	3

At the end of each session, participants were instructed to monitor and record their daily activities using a self-monitoring manual, from which they could identify possible causes or circumstances producing problems related to their disease management. Family members were encouraged to support and monitor the subjects' self-management activities and to record them on the manual. From weeks 5 to 12, the experimental group participants were followed up by phone weekly by the lead investigator. On weeks 8 and 12, all of the participants were asked to attend the group session and to answer the questionnaires (SMAQ and SEQ). They were also asked to provide their clinical outcome (eGFR, SCr, HbA1c, blood pressure) on week 12.

Results

The aims of this research were to develop 12 weeks self-management support and family participation enhancing education program based on self-regulation theory and social cognitive theory, and to evaluate its effects on self-efficacy, self-management activity and clinical outcomes in delaying CKD progression among patients with T2DM.

Table 1 presented the demographics of the study participants included in the experimental and control groups (N=50). Most participants were female (86.27%) and the main occupation was agriculture (66.67%); average age was 61.2 years old. The majority of the sample was married (72.55%) and completed only primary school (82.35%). Family income was distributed in four main groupings but the majority of 92.16% have low income, < 10,000 baht per month. As expected, a strong majority reported Buddhism for their religious preference (98.04%). The majority of participants reported that they cook their own food

(82.35%) and has underlying diseases aside from T2DM and hypertension (84.13%).

Table 1 Demographic Characteristics of Participants (N=50)

Table 2 reveals that the means of self-management activities at week 1 and week 8, week 1 and week 12, and week 8 and week 12 had significant differences (p-values < 0.05). Mauchly's test indicated that the assumption of sphericity had been violated, χ_((2))^2 = 39.32, p-value < 0.05, therefore degrees of freedom were corrected using Greenhouse-Geisser estimate of sphericity (0.644). The results show that there was a significant difference in self-management activities among three points of time (week 1, week 8, and week 12), F (1.29, 64.44) = 21.314, p-value < 0.05.

Table 2 Effect of self-management program on self-management activities (N=25)

Time		Mean dif.	Std.Error	*P*	95%CI	
T1	T2	-.647	.155	.000*	-1.032	-.262
	T3	-1.961	.354	.000*	-2.838	-1.083
T2	T1	.647	.155	.000*	-.262	10.032
	T3	-1.314	.362	.002*	-2.212	-.416
T3	T1	1.961	.354	.000*	1.083	2.838
	T2	1.314	.362	.002*	.416	2.212

Adjusted for sex, age, marital status, education level, occupation, religion and *p <.05

Table 3 reveals the effect of self-management program on self-efficacy found that at week 1 and week 8, week 1 and week 12, and week 8 and week 12 had significant differences (p-values < 0.001) Mauchly's test indicated that the assumption of sphericity had been violated, = 26.82, p-value < 0.001, therefore degree of freedom were corrected using Greenhouse-Geisser estimate of sphericity (0.703). The results show that there was a significant difference in self-efficacy among three points of time (week 1, week 8, and week 12), F (1.41, 70.34) = 18.34, p-value < 0.001.

Table 3 Effect of self-management program on self-efficacy (N=25)

Time		**Mean dif.**	Std.Error	*p*	95%CI	
T1	T2	-1.275	.599	.000*	-2.659	-.112
	T3	-1.039	.360	.000*	-3.921	-1.057
T2	T1	1.275	.599	.000*	.112	2.659
	T3	-1.314	.362	.000*	-2.212	-.360
T3	T1	1.039	.360	.000*	1.057	3.921
	T2	1.314	.362	.000*	.360	2.212

Adjusted for sex, age, marital status, education level, occupation, religion and *p <.001

Table 4 reveals that the mean difference of HbA1C for the experimental group at week 12 has significantly decreased (0.725 mg) from week 1 (0.73 ± 0.14). Also the eGFR between week 1 and week 12 has significantly increased (3.65 ± 0.72). When we looked at the mean difference of serum creatinine level at week 12, it also significantly decreased (0.04 ± 0.01). And finally, the mean differences of SBP and DBP level at week 12 have also significantly decreased from week 1 (SBP: 3.63±3.92, DBP: 1.09±0.44)

Table 4 Effect of self-management program on HbA1c, serum creatinine level and glomerular filtration rate (N=25)

	Week 1 Mean ± SD	Week 12 Mean ± SD	Mean difference ± SD	T
HbA1C	7.79 ± 1.82	7.06 ± 0.89	0.73 ± 0.14	5.080
eGFR	54.24 ± 15.50	57.89 ± 14.78	3.65 ± 0.72	3.633
Creatinine	0.97 ± 0.60	0.93 ± 0.58	0.04 ± 0.01	3.376
SBP	128.06±10.62	124.43±9.43	3.63±3.92	6.602
DBP	91.91±8.18	90.82±6.99	1.09±0.44	2.468

*Paired t-test was used to test the means difference of BP,HbA1C, eGFR, and SCr at week 1 and week 12, *p <.05

	Week1 **Mean ± SD**	Week12 **Mean ± SD**	T	*P*
HbA1C				
Control group	7.82 ± 1.06	7.89 ± 1.08	.52	.61
Experimental group	7.79 ± 1.82	7.06 ± 0.89	5.08	<.001
eGFR				
Control group	57 ± 15.6	56.9 ± 16.95	.06	.95
Experimental group	54.24 ± 15.50	57.89 ± 14.78	3.63	.001
Creatinine				
Control group	1.03 ±0.38	1.03 ±0.38	.17	.85
Experimental group	0.97 ± 0.60	0.93 ± 0.58	3.376	.001
Blood Pressure Level				
SBP				
Control group	129.80± 7.22	128.04± 14.06	1.32	.16
Experimental group	128.06 ± 10.82	124.43 ± 9.49	6.60	<.001
DBP				
Control group	92.00±6.45	92.00±6.07	.10	.91
Experimental group	91.91 ± 8.18	90.82 ± 6.99	2.47	.017

Table 5 reveals that after attending the self-management and family participation enhancing program (week 12), the experimental group had a higher score on self-management activities and self-

efficacy than their baseline values (week 1). This also shows that the control groups scores for self-management activities and self-efficacy has also slightly increased after 12 weeks with usual care. However, the experimental groups' scores increased more than those of the control groups' scores.

Table 5 Compare means of Self-management activities and self-efficacy score between experimental and control group.

	Week 1		Week 12		*P*
	Mean	SD	Mean	SD	
Self-management activities					
Control group	49.85	9.57	50.80	7.24	.080
Experimental group	51.92	6.63	53.88	5.42	.0000*
Self-efficacy					
Control group	60.61	14.93	61.63	13.84	.058*
Experimental group	61.37	10.13	1	9.34	.0000*

Adjusted for sex, age, marital status, education level, occupation, religion and *p <.05

Table 6 by looking at the significant values of the mean of Hemoglobin A1c level, serum creatinine level and glomerular filtration rate between experimental and control group had significant differences. It showed that after attending the self-management support and family participation enhancing program (week 12), the results of the experimental group have significantly changed and showed better outcomes than that of the control group. The experimental groups' HbA1c, SCr, SBP and DBP levels decreased; eGFR levels increased. On the other hand, the control groups' HbA1c levels increased; eGFR and SBP levels decreased; and SCr and DBP levels remained unchanged after 12 weeks.

Table 6 Comparing means of Hemoglobin A1c level, serum creatinine level and glomerular filtration rate between experimental and control group.

*Paired t-test was used to test the means difference of BP, HbA1C, eGFR, and SCr at week 1 and week 12, *p <.05

Discussion

The purpose of this investigation was to examine the effects of self-management support and family participation enhancing program on self-efficacy, self-management activities, social support and critical outcome in T2DM for delayed progression of diabetic nephropathy. There were many research studies conducted which examine self-management practices and diabetes outcomes [21] as well as adherence to proscribed self-management activities [22]. To our knowledge, this study was the first to examine the feasibility and effectiveness of a theory-driven

intervention aimed at patients with T2DM for delayed progression of diabetic nephropathy. A few studies have evaluated self-management programs based on self-regulation in these patients, although none have been conducted in Thailand that examine the potential intervention based on self-regulation theory for delayed progression of diabetic nephropathy on T2DM. Thus, the purposes of this study were to evaluate the feasibility and effectiveness of self-management support and family participation enhancing program on self-efficacy, self-management activities, social support and critical outcome in these patients.

Our subjects' self-management activities and self-efficacy scores showed that after 12 weeks both the experimental group and the control groups' scores have increased. However, the experimental group showed a higher increase than that of the control group. This could be attributed to the knowledge the experimental group have received from the focus group discussions and the support that they have gotten from their families. The effect of self-management is achieving the goal of fullest functioning through self-regulation by persons with chronic disease [23]. Successful disease management can be achieved by a person if with a chronic disease by self-regulation. Self-regulation theory includes three key strategies: self-monitoring, self-judgment, and self-reaction [20]. Self- regulation puts the patient in control of their own care. The patient should identify and modify their behavior and come up with self-management strategies for their disease [14]. The process of self-regulation within the scope of social cognitive theory as discussed by [12] Bandura (1986) supports the effectiveness of our self-management program in terms of self-management activities and self-efficacy enhancement to delay the progression of diabetic nephropathy in Thai adults with T2Dm as measured by the SMAQ and SEQ.

Self-efficacy also positively moderated the relationship between self-management activities as measured by the SEQ. [24] 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. A person's perception of his/her ability to overcome the difficulties in specific tasks such as those required for T2DM, will predict future attempts to engage in various behavioral changes related to the specific tasks.

The experimental group showed a significant decrease in their HbA1c levels, on the other hand the control group's HbA1c levels showed a marginal increase after 12 weeks. Moreover, the SBP and DBP levels of the experimental group significantly decreased but the control groups' SBP slightly decreased and their DBP

remained constant. The experimental groups' average HbA1c level was at 7.06% and their average SBP/DBP levels were at 124.43/90.92 mmHg. The goal for glycemic control is a blood glucose level as close to normal (HbA1c < 7%) and blood pressure should be < 130/85mm Hg consistently [7]. The results showed that after the program, the experimental group showed more positive results regarding glycemic control than those from the control group. These data could be attributed, once again, to the effectiveness of the self-management support and family participation enhancing program since they gained more knowledge and support in managing their blood glucose and blood pressure.

The GFR and the SCr are widely recognized indicators of renal function. A decreased eGFR or increased SCr level indicates the progression of renal damage [25]. In this study, after adjusting for confounders, the average of the eGFR was higher and the SCr levels were lower at 12 weeks than their baseline values, with a marginal degree of significance. Both trends may be due to the effect of self-management support and family participation enhancing program, which appears to have retarded or even reversed the deterioration of kidney function. Based on the documented records of diabetes patients, [26] Yoshida et al. (2008) proposed rates of eGFR decline ranging from 1.64 to 2.7 mL/min per 1.73 m2 per year. In our subjects, eGFRs increased an average of 3.65mL/min per 1.73 m2 after the 12 week follow up period, showing evidence of the efficacy of our intervention program. The lowering of SCr levels and increasing GFR levels observed in this study suggest that the self-management support and family participation enhancing program helped in delaying the progression of kidney damage among adults with T2DM. The limitations of this study should be considered. The small size of the sample may have restricted the capacity to provide statistically strong inferences. Also, the effort and determination of the support of family members in monitoring the self-management activities of the subjects has not been measured. However, this study provides a first step to test the effectiveness of a self-management support and family participation enhancement program based on social cognitive theory and self-regulation theory for persons with diabetic nephropathy.

Conclusion

The results of this cross-sectional study, verified that a self-management support and family participation enhancing program resulted in significant improvement in the subjects' self-management activities and self-efficacy in the 12 week period and improved physiological outcomes in terms of a marginally significant increase in eGFR and the reduction of SCr, HbA1c and blood pressure. These empirical data reveal

that the self-management support and family participation enhancing program designed in this study had a potential effect on delaying the progression of diabetic nephropathy in adults with T2DM. The implications of this study are 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 health centers as this study revealed that family participation and support enhances health outcomes for persons with diabetes. Therefore, healthcare professionals should encourage persons with T2DM to learn self-regulation strategies with their families so they can manage their own disease and delay the progression of diabetic nephropathy.

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