Theory of Planned Behavior Implementation on the Factors Affecting Self-Care Management in Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: Diabetes mellitus (DM) is one of the largest global health emergencies in the 21st century. Diabetes self-management education (DSME) is a continuous process of knowledge transfer in order to improve skill and ability of diabetic patient to perform self-care management, which reduces blood glucose level and prevent diabetic complications. The success of DSME is determined by behavior changes of diabetic patients, which can be assessed using behavior theories including Theory of Planned Behavior (TPB). This study aimed to analyze the factors affecting self-care management in patients with type 2 DM using TPB.

Subjects and Method: A randomized controlled trial study was carried out in 7 community health centers in Tarakan City, North Kalimantan, from March to May, 2018. A sample of 126 type 2 DM patients was selected by simple random sampling. The dependent variable was self-care management. The independent variables were intention, attitude, subjective norm, self-efficacy, and education level. The data was collected by questionnaire and analyzed by path analysis.

Results: Self-care management was positively and directly affected by education $\geq$senior high school (b= 7.10; SE= 3.22; p= 0.028) and strong intention (b= 2.40; SE= 0.75; p= 0.001). Self-care management was indirectly affected by self-efficacy, attitude, and subjective norm trough intention.

Conclusion: Self-care management in type 2 DM is directly affected by education and strong intention. These findings support the TPB implementation in self-care management.

Keywords: self- care management, type 2 DM, Theory of Planned Behavior

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BACKGROUND

Diabetes mellitus (DM) is a metabolic disorder which is characterized by an increase of blood glucose levels (Ogurtsova *et al.*, 2017) due to insulin deficiency or insulin resistance in adipose and/or skeletal muscle tissues (Holman et al., 2015). Type 2 DM is the most common type of diabetes over the world and the prevalence of type 2 DM increases in line with the high prevalence of obesity, decreased physical activity and increased unhealthy food consumption (IDF, 2017).

In Indonesia, the prevalence of DM reaches 10.3 million in 2017 in adult people and is expected to increase to 16.7 million in 2045(IDF, 2017). The East Kalimantan province nationally belongs to the fourth top ranks of DM number in Indonesia (2.3%) (Badan Penelitian dan Pengembangan Kesehatan, 2013). Nowadays, 5 regencies and Tarakan City become a new province of North Kalimantan and are separated from the East Kalimantan. However, total data of DM prevalence in the North Kalimantan are still joining the

Province of East Kalimantan. Furthermore, Tarakan City has the highest percentage of DM patients (2.1%) compared to other regencies in the province of North Kalimantan (Damayanti *et al.*, 2013).

Self-management of DM is a variety of changing lifestyle behaviors such as diet, physical activity, weight loss, medication adherence and regular blood glucose monitoring (Powers *et al.*, 2015). Self-management is needed to reduce the burden and complications of DM. Therefore people with DM should actively participate in various self-management activities (Sherifali *et al.*, 2018).

Behavioral theories are expected to be able to improve behavior changes in the self-management of DM. Theory of planned behavior (TPB) is frequently used for promotion of some non-communicable diseases and consists of three main components: attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991; Lee *et al.*, 2017). Several studies have reported TPB implementation in health behavioral changes (Robin *et al.*, 2011), such as eating healthy foods (Omondi *et al.*, 2010, 2011; Rahmati-najarkolaei *et al.*, 2017) and performing physical activities for people with type 2 DM (White *et al.*, 2012; Kurnia et al., 2015; Masoud *et al.*, 2016). Such study in self-management of DM has been carried out in Malang, East Java and it used the theory of Pender's health promotion model. They have reported that perceived self-efficacy and social support influence type 2 DM self-management (Kurnia et al., 2017). On the other hand, another study used the TPB theory to predict food consumption of low saturated fat among patients with type 2 DM and or cerebrovascular diseases. They reported that subjective norms and attitudes affected intention to consume foods with low-saturated fat in those patients. Therefore, the aim of this study was to analyze the factors that influence self-management in type 2 DM patients, using the TPB.

SUBJECTS AND METHOD

1. Study design
A randomized controlled trial study was conducted in 7 community health centers in Tarakan City, North Kalimantan, from March 28 to May 20, 2108. The protocol of this study was approved by the Medical Research Ethics Committee, Faculty of Medicine, Universitas Sebelas Maret, Surakarta No 47/UN27.6/KEPK/2018 with protocol ID 01/18/03/047.

2. Population and sample
A sample of 126 type 2 DM patients who lived in Tarakan City was selected by a randomized block design technique. Each community health centers provided 18 selected study subjects. All study subjects were divided randomly into 2 groups. Study subjects were excluded from the study if they used insulin injection and had at least 1 complication. Selected study subjects agreed to join this study and signed the informed consent.

3. Study Variables
The dependent variable was self-care management in type 2 DM patients. The independent variables were intention, attitude, subjective norm, self-efficacy, and education.

4. Data Collection
Self-care management was measured by Summary Diabetes Self Care Activities (SDSCA) questionnaire. The other variables were measured by questionnaire.

5. Data analysis
All collected data were presented in frequency and percentage. Bivariate analysis was tested by product moment correlation. The path analysis was carried out to determine direct and indirect effects of intention, attitude, subjective norm, self-efficacy,

education, and self-care management in type 2 DM patients.

RESULTS

1. Study subject characteristics

Table 1 showed general characteristics of the study subjects. The control group had a higher percentage of age ranged 55-64 years and 45-55 years in the intervention group. Percentage of gender, education level, duration of diabetes illness and blood glucose levels was almost the same between the control and intervention group.

Table 1. General characteristics of study subjects based on age, gender, education level, duration of diabetes illness and blood glucose levels

	Control group	Intervention group	Total	
	n (%)	n (%)	N	(%)
Age (years)				
< 45	5 (1.9)	6 (9.5)	11	8.7
45 − 54	23(36.5)	29 (46)	52	41.3
55 -64	28 (44.4)	20 (31.7)	48	38.1
65 − 70	7 (11.1)	4 (6.3)	11	8.7
> 70	-	4 (6.3)	4	3.2
Gender				
Male	17 (27)	13 (20.6)	30	23.8
Female	46 (73)	50 (79.4)	96	76.2
Education level				
<Senior high school	47 (74.6)	45 (71.4)	92	73
≥Senior high school	16 (25.4)	18 (28.6)	34	27
Duration of diabetes illness (years)	38 (60.3)	39 (61.9)	77	61.1
< 5	14 (22.2)	10 (15.9)	24	19
≥ 5 − 10	11 (17.5)	14 (22.2)	25	19.8
> 10				
Blood glucose levels (mg/dL)	30 (47.6)	25 (39.7)	55	43.7
≤ 200	33 (52.4)	38 (60.3)	71	56.3
> 200				

The product moment correlation test was used to determine the relationship between intention, attitude, subjective norm, self-efficacy and education level and self-management (Table 2). All variables were weak, positive, and significant association with self-care management.

Table 2. Correlation between intention, attitude, subjective norms, self-efficacy and education level with self-management

Independent Variable	r	p
Intention	0.33	0.016
Attitude	0.19	0.035
Subjective norm	0.33	<0.001
Self-efficacy	0.22	0.012
Education level	0.21	<0.001
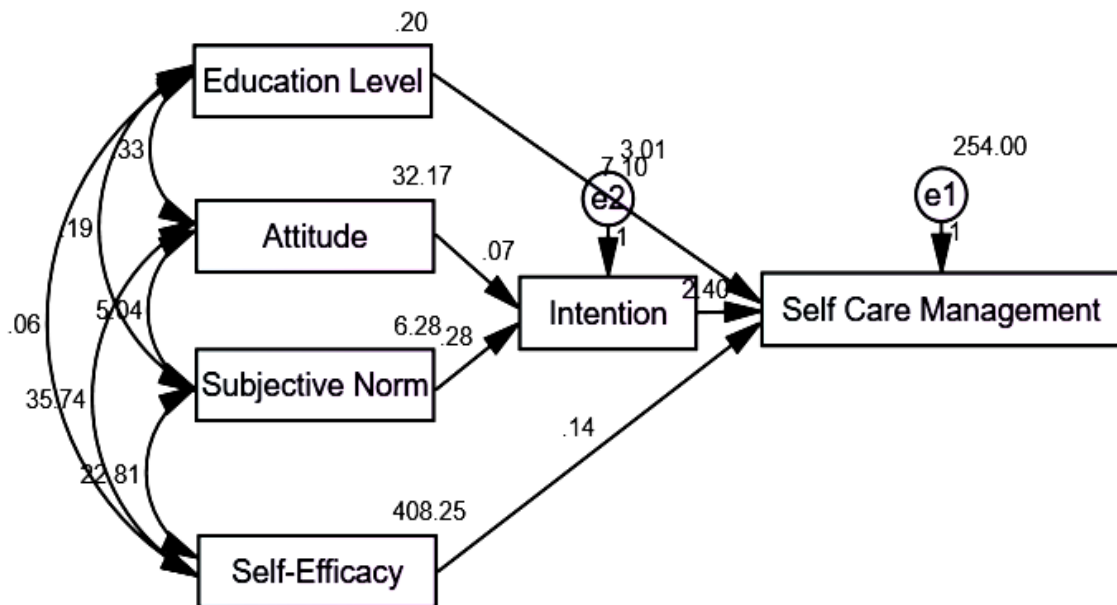
**Figure 1. Path diagram of Factors Affecting
Self-care Management in Type 2 DM Patients**

The path analysis model was carried out using the AMOS 23 program, in accordance with the application of the TPB model (Figure 1), which consisted of 6 endogenous variables and 2 exogenous variables. The model in Figure 1 corresponded to the structural model in the path analysis because of the degree of freedom (df)>0 (5), the minimum sample discrepancy function (CMIN)= 3.11, Goodness of Fit Index (GFI)= 0.99, Normed of Fit Index (NFI)= 0.97, The Root Mean Square Error of Approximation (RMSEA)<0.001, and Akaike Information Criterion (AIC)= 37.11, Bayesian Information Criterion (BIC)= 85.32 with a probability level of 0.540.

Table 3. Results of the path analysis of factors affecting self-care management in type 2 DM patients

Dependent Variable		Independent Variable	b	SE	p	β
Direct effect						
Self-care management	←	Education level	7.10	3.22	0.028	0.18
	←	Intention	2.40	0.75	0.001	0.27
	←	Self-efficacy	0.13	0.07	0.062	0.16
Indirect effect						
Intention	←	Subjective norm	0.28	0.07	<0.001	0.35
	←	Attitude	0.07	0.03	0.019	0.20

N observation= 126
Fit model:
b = Unstandardized path coefficients   NFI = 0.97
β = Standardized path coefficients   GFI = 0.99
CMIN = 3.11 P = 0.540 (≤ 0.005)   RMSEA = <0.001

Table 3 showed results of the path analysis between education level, intention, self-efficacy, attitude, and subjective norm and self-management in type 2 DM patients. Education level (b= 7.10, SE= 3.22, p= 0.028), intention (b= 2.40, SE= 0.75, p= 0.001), and self-efficacy (b= 0.13, SE= 0.07, p= 0.062) directly correlated with self-care management and their correlations were statistically significant. While indirect correlations to self-management were found in subjective norm (b= 0.28, SE= 0.07, p<0.001) and attitude (b= 0.07, SE= 0.03, p= 0.019) trough intention.

DISCUSSION

A study of diabetes self-care management in type 2 DM patients was firstly conducted at the Tarakan city, North Kalimantan. There are 2 aspects that greatly influence diabetes self-management: education level and intention. The education level has a stronger direct relationship than intention towards self-management because the education level greatly influence the understanding of self-management concepts, which consist of healthy diet, physical activity improvement, monitoring blood glucose level, diabetic treatment adherence, and foot care (Akbar et al., 2015). Our finding is in line with a study conducted by Fan and Sidani (2017) that well-educated individuals are more likely to have better understanding of self-management so that they can easily discuss with their diabetes educators. They used study subjects with education levels from 6-19 years of formal education and the education level mean was 14.09 years. In contrast, the majority of study subjects in our study had low education level (73%) so that their diabetes self-management is poor.

Another finding in our study indicates that intention also has a direct relationship to the diabetes self-management. More-over, intention is directly affected by subjective norm and attitude. It is not surprising that stronger intention can increase the diabetes self-management of study subjects with DSME. Individuals with strong intention are able to take action faster than individual with weak intention (Akbar et al., 2015). Our results are in accordance with the previous study conducted by Robin et al. (2011) that almost 50% intention of study subjects contributes to health behaviors and only 36% for behavior itself. From the multiple linear regression test, increased attitude and subjective norm of diabetic women in Iran significantly increased 0.203 and 0.199 their intention respectively (Didarloo *et al.,* 2012). Therefore, it clearly indicates that intention has an important role in diabetes self-management.

Although intention directly influences diabetic self-management in patients with type 2 DM in Tarakan city, we cannot evaluate whether or not the values of TPB constructs during intervention are higher than values the TPB constructs before intervention and lower than the values of TPB constructs after intervention. The TPB questionnaire is only distributed to study subjects in the mid intervention.

Overall, education level and intention together influence self-management of patients with type 2 DM, which support all constructs of the TPB. Our results provide valuable information for health care providers in the Tarakan city to improve individually self-management for patients with type 2 DM. Furthermore, these findings can be used by Indonesian diabetic patients to take care of them self although it needs some considerations.

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