

Self-Care Behaviors in Diabetic Type 2 Patients in the countryside of Tabriz, Iran: Application of the Extended Theory of Reasoned Action (ETRA)

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Key words: Diabetes, Self-care behaviours, Theory of Reasoned Action, Self-efficacy

Parole chiave: Diabete, comportamento di auto-cura, Teoria dell'Azione Ragionata, Autoefficacia

Abstract

Background. Diabetes is a chronic disease that requires a person with diabetes to make a multitude of daily self-management decisions and perform complex care activities. The aim of this study was to explore the determinants of self-care factors among type 2 diabetic patients using the extended theory of reasoned action (ETRA).

Study design. A cross-sectional study.

Methods. This study was conducted among 200 patients with type 2 diabetes. To measure self-care behaviors in type 2 diabetic patients, a questionnaire based on the ETRA was used, which included knowledge, subjective norms, attitudes toward the behavior, behavioral intention, and self-efficacy. The overall Structural Equation Modeling (SEM) was applied to identify the determinant structures of behavioral intentions and finally self-care estimated from attitudes, subjective norms and self-efficacy in type 2 diabetic patients.

Results. Attitude to self-care behaviors (standardized regression weight=0.322; $p<0.001$) and self-efficacy (standardized regression weight=0.625; $p<0.001$) were statistically significant predictors of behavioral intention. Also, of the ETRA variables, only self-efficacy (standardized regression weight=0.482; $p=0.001$) was significantly predictor of self-care behaviors.

Conclusions. Based on our findings, self-efficacy was found effective in improving health behaviors in patients with type 2 diabetes. Therefore, healthcare providers may be considering self-efficacy as an important factor while developing educational intervention aiming at improving self-care behaviors among rural farmers type 2 diabetic patients.

Introduction

Diabetes is one of the most common chronic diseases and a global health problem that affects close to 422 million people

worldwide (1). The most common is type 2 diabetes, which occurs when the body becomes resistant to insulin or doesn't produce enough insulin (2). Based on the statistics reported by the World Health

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Organization (WHO), the global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014(3). According to reports, the overall prevalence of diabetes in the US was 8.5% in 2012 (4) and it was about 9.10% in Iran in 2011(5).

Several studies have shown that glycemic control reduces complications of diabetes, including lower limb amputation (6). Therefore, to control diabetes and prevent its complications, it is necessary to control and keep the blood glucose within the normal range (7). To this end, self-care behaviors are an integral aspect of comprehensive care for patients with type 2 diabetes, including exercise, diet, blood sugar testing, feet care, and adherence to the protocol of oral medications (8). Therefore, self-care behaviors education is a critical element for improving self-care among diabetic patients (9). According to the definition offered by Orem, "Self-care is a learned regulatory function in humans which is based on individuals' ability to take care of themselves" (10). In other words, self-care behaviors are a person's adaptation to life events which results in the promotion of health and independent status (11).

Previous studies have recommended using behavior change theories and models to create positive changes in health-related behaviors. The Theory of Reasoned Action (TRA) is one of those theories applied frequently as a framework for educational interventions. This theory focuses on the individual and inter-personal factors, such as attitudes, subjective norms and the way they influence behavioral intentions and, in turn, behaviors (12). According to the TRA, the most important factor that determines the behavior of the person is the behavioral intention (13). Since behaviors are not entirely voluntary and usually are affected by the people's understanding of their ability to behave (self-efficacy), the TRA cannot be sufficient to examine

the relationship between health beliefs. To this end, researchers used self-efficacy along with other structures of the TRA and named it the "Extended Theory of Reasoned Action" (ETRA). Studies have shown that the TRA, along with self-efficacy, can be valuable in predicting health promoting behavioral including oral health (14).

Therefore, considering different studies in the field of education and the importance of self-care, the present study has been conducted to examine the determinants of self-care behaviors in type 2 diabetic patients in Tabriz city, Iran, utilizing the ETRA theory. Identifying self-care behaviors influential factors in such studies may be useful in developing interventional efforts aiming at self-care behaviors promotion among type 2 diabetic patients.

Methods

Sampling and participants

This cross-sectional study was conducted from February to March 2017 among patients with type 2 diabetes referring to the Health Centers of Tabriz City, East Azerbaijan province, Iran. Drawing upon the previous body of research in similar cases (12), assuming a I type error (error probability) = 0.05 and power (1- error probability) = 0.70, and effect size $d = 0.35$, the sample size calculated by G*Power software resulted equal to 200 participants. The sampling method was as follows: Electronic health records entitled SIB -an abbreviation for the Persian equivalent of "integrated health system" - exist for all Iranian citizens within the SIB system, so from the central server we could extract all the cases of type 2 diabetes followed by the Health Centers of the outskirts of Tabriz city, which finally resulted about 6,000: from them we randomly selected 200 patients who responded to the inclusion (being > 30 years of age and having suffered from type

2 diabetes for more than the last five years, regardless of the level of control or the incidence of complications) and exclusion (pregnancy, being affected by severe and persistent mental health disorders and not having the primary responsibility for caring for the disease by themselves) criteria. The sampling was performed through the Excel software with the “=RANDBETWEEN (1,6000)”. Finally, the 200 selected were invited to take part in the study.

Data were collected from the participant through interviews performed by trained research assistants. The interviews took place in the consulting room of the Health Centers over a period of twelve months. Each interview lasted 15 to 25 minutes. Before completing the questionnaires, the study objectives were explained to the patients and an informed consent form was completed by them.

Data collection

To assess the ETRA structures we used a valid and reliable ETRA-based questionnaire. This instrument was developed by Didarloo et al. (15). The questionnaire was developed in Persian by those aiming to assess the ETRA-based cognitive constructs related to self-care behaviors among women with type 2 diabetes in Khoy City, Iran. In their study, Cronbach's Alpha coefficient of knowledge, subjective norms, attitude, behavioral intention, and self-efficacy variables resulted: 0.77, 0.83, 0.85, 0.95 and 0.92, respectively.

The demographic data form included six items and was developed by researchers to obtain data related to the participants' age, gender, educational level, marital status, occupation and co-morbidities.

The ETRA Questionnaire included four constructs: Attitude (4 items), Subjective norms (4 items), Self-efficacy (4 items) and Behavioral intention (2 items). For all four constructs, the items were rated on a 5-point Likert-type scale ranging from 1 to

5 (1 = complete disagreement through 5 = full agreement). The higher the scores, the more attitude, subjective norms, self-efficacy and behavioral intention toward conducting self-care behaviors were present.

To assess self-care behaviors (such as observing the diet, physical exercise, regularly consuming diabetic medications, self-monitoring of blood glucose) we used the summary scale of diabetes self-care behaviors measure by Tolbert et al., which had been validated and whose reliability was verified by Didarloo et al., in Iran (15).

The study protocol was reviewed and approved by the Ethics Committee of Tabriz University of Medical Sciences. Written consent was obtained from all patients before enrollment.

Data analysis

Central indices were reported with mean (and Standard Deviation) or median interquartile range (IQR). Normal distribution of continuous variables was measured by the Shapiro-Wilk test. Furthermore, if the p-value was greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population could not be rejected. Differences between groups were calculated by independent t-test or Mann-Whitney test. Chi-square test was used to compare the differences between the qualitative variables between groups. The relationship between quantitative variables was checked using the Pearson correlation coefficient (random distribution of data and simultaneously two variables have a normal distribution), and abnormal or ranked quantitative variables were assessed through the use of the Spearman test. A one way ANOVA was used to compare two means from two independent (unrelated) groups using the F-distribution. Kruskal-Wallis test was used to determine the association between scored self-care behaviors and categorized variables. The null hypothesis for the test is that the two means are equal.

The normal-model based ANOVA analysis assumes the independence, normality, and homogeneity of variances of the residuals.

The Structural Equation Modeling (SEM) was used to address the specific aims of the study, as reflected in the ETRA model. Specifically, a full model was fitted on the ETRA to show the relationship among constructs, adjusting for control variables. Based on the bootstrap estimates for the direct relationships such as indirect effects and total effects. In general terms, an indirect effect can be computed as the product of the model coefficients accompanying the paths connecting latent construct.

All analyses were performed by using SPSS 21 (SPSS Inc., Chicago, USA) and among all of the model fit indices that

AMOS provides, and statistical significance was considered at the p -value < 0.05 level or confidence interval that did not include zero hypotheses.

Results

A total of 200 people agreed to participate in the study. The demographic characteristics of the subjects, as well as their associations with self-care behaviors, are shown in Table 1. The mean age of people was 56.85 (sd 9.94), and the majority was in the range of 50 to 59 years old. No significant difference was observed between demographic characteristics and self-care behavior (p -value > 0.05). In terms of education level, 20% of

Table 1 - Demographic characteristics and their associations with self-care behaviors among the study participants

Variables	Subgroups	Frequency (%)	self-care behaviors Mean (SD)	p-value
Age groups **	30-39	12 (6.0)	46.25 (7.72)	0.716
	40-49	31 (15.5)	45.00 (6.81)	
	50-59	73 (36.5)	45.60 (7.70)	
	60-69	66 (33.0)	44.77 (7.49)	
	70 ≤	18 (9.0)	47.44 (7.24)	
Gender *	Female	108 (54.0)	45.64 (8.16)	0.669
	Male	92 (46.0)	45.19 (8.16)	
Education level **	Illiterate	50 (25.0)	46.36 (6.77)	0.058
	Elementary	40 (20.0)	6.36 (1.00)	
	Junior high school	22 (11.0)	6.65 (1.41)	
	High school	23 (11.5)	10.75 (2.24)	
	Diploma and associate diploma	48 (24.0)	7.08 (1.02)	
	Bachelor's degree and higher	17 (8.5)	6.81 (1.65)	
Marital status *	Married	171 (85.5)	44.31 (7.14)	0.377
	Single	29 (14.5)	45.63 (7.48)	
Co-morbidity *	Yes	119 (59.5)	45.84 (7.49)	0.357
	No	81 (40.5)	44.85 (7.34)	
Occupation **	Self-employed	41 (20.5)	45.56 (8.28)	0.286
	Employee	19 (9.5)	43.36 (5.40)	
	Retired	43 (21.5)	44.30 (8.58)	
	Housewife	97 (48.5)	46.29 (8.77)	

* p-value based on independentt-test

** p-value based on one-way ANOVA

Table 2 - Bivariate correlations of the ETRA structures and Self-Care Behaviors

Variables		1	2	3	4	5
1= Attitude	r*	1				
	p- value	1				
2= Subjective norms	r	0.233 **	1			
	p- value	0.001	1			
3= Self-efficacy	r	0.440**	0.235**	1		
	p- value	0.001	0.001	1		
4 = Behavioral intention	r	0.531**	0.226**	0.679**	1	
	p- value	0.001	0.001	0.001	1	
5= Self-care behaviors	r	0.380**	0.078	0.476**	0.576**	1
	p- value	0.001	0.270	0.001	0.001	1

r: Pearson Correlation Coefficient

the subjects had completed elementary school. Fifty-four percent of the participants were female, 85.5% were married and the majority of them (59.5%) had underlying comorbidities associated with diabetes. Fifty-one percent of the subjects were employed. The average time of the duration of their disease was 9.37 (sd 6.96) years.

Table 2 displays the bivariate correlations between ETRA constructs and self-care behaviors. Using Pearson correlation coefficient test, statistically significant positive correlations were found between all the ETRA constructs and self-care behaviors (p-value <0.05) except Subjective Norms (p-value >0.05). The behavioral intention

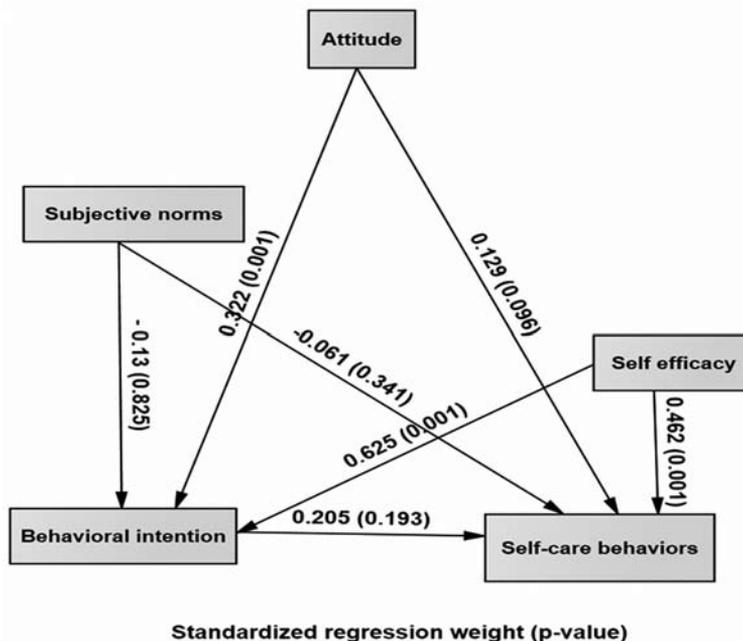


Figure 1 - Self-Care Behaviors Predictors in Type 2 Diabetic Patients based on the Extended Theory of Reasoned Action (ETRA)

Table 3 - The results of the Independent Variables on the Self-care Behavioral via Intermediate Variable (i.e. Intention to behavior)

Independent variable	Total effect	Indirect effect	Mediation effect	Results
Self efficacy	8.69 ^(0.001)	0.517 ^(0.200)	6.42 ^(0.012)	Direct effect
Attitude	2.86 ^(0.096)	- 0.183 ^(0.141)	1.31 ^(0.513)	No effect
Subjective norms	- 0.52 ^(0.341)	0.010 ^(0.606)	-0.51 ^(0.348)	No effect

Dependent variable: Self-care behaviors
Mediator variable: Behavioral intention

($r = 0.576$) had a higher correlation with self-care behaviors than the self-efficacy ($r = 0.476$).

SEM findings displayed that of the exogenous structures which existed in the model, only Self-efficacy had significant association with self-care behaviors (p -value=0.001). The attitude and Self-efficacy structures have a significant association with Behavioral intention at both the proposed model (p -value<0.001).

Since the standard regression coefficients are not dependent on the measurement scale, they can be compared. The goodness of fit of the final model was estimated as CMIN/DF= 2.20, RMSEA= 0.078, CFI= 0.912, GFI= 0.771. The R^2 squared coefficient of multiple correlations for the behavioral intention (i.e. mediator variable) and self-care behaviors (i.e. dependent variable) was 0.70 and 0.30, respectively. So that 70% of the variation of behavioral intention and 30% of self-care behaviors are explained by the final model. The regression coefficient of self-efficacy and self-care behaviors, by keeping other parameters constant, was estimated to be 0.52 (p -value= 0.001) (Figure1).

As it can be seen in Table 3, according to the results of the mediating model, the effect of attitudes and subjective norms on Self-care behaviors in total effect model is not significant. Thus they are not mediated by behavioral intention. The Self-efficacy was significant in total effect. In the final model, after examining the mediating variable i.e. behavioral intention and using

the indirect model, again the Self-efficacy dimension had a direct association with self-care behavioral increasing (p -value= 0.030) (Table 3).

Discussion

Self-care program for patients with diabetes is a key element of the care plan (16). According to the findings of this study, Self-efficacy was the strongest predictor of behavioral intention and Self-care behaviors. This finding is similar to those found by Sarbazi et al. (14), who reported that Self-efficacy was one of the strongest predictors of physical activity behaviors among diabetic patients. As well as, in another study, it has been indicated that the Self-efficacy is effective in enhancing the Self-care and improving the quality of life in the senior people with hypertension (17). Karimi et al. (2018), also, represented that patients with greater Self-care scores had better Self-efficacy, social support, and positive attitude toward Self-care (18). These findings show that self-efficacy has an important role in adhering to self-care behaviors (19). Therefore, considering the promotion of self-efficacy as essential dimensions of empowerment, it is vital for changing the behavior of diabetic patients and adopting self-care behaviors. In order to facilitate the problem-solving process between diabetic patients and to increase self-efficacy in these chronic patients,

focusing on any of the various aspects of the self-care behaviors is required. The differences in self-care practices could be due to the easier access to health-related activities and the higher proportions of the literate population in the present study setting. The self-efficacy directly affects the self-care behaviors. The behavioral intention is under the influence of an individual's self-efficacy, which includes the person's beliefs in his /her ability to organize the activities and successfully conduct the desired behavior to get the intended result in the particular condition. The more these beliefs and faiths, the easier they are to carry out health behaviors.

Among all ETRA constructs, attitude played the most significant role in the prediction of intention. This finding is consistent with previous studies (20, 21). Didarloo et al. in 2011 also found that attitude had the most significant impact on intention (15). As well as, in another study, Polly et al. in 1992 found a significant association between health beliefs and self-care of diabetic patients (22). These findings reflected an intuition that without positive views on the behavior and its potential outcomes, it is difficult for diabetic patients to engage in self-care behaviors. Thus, it is suggested that in the goal of promoting diabetic patients intention/behavior in self-care, emphasis should be put on strategies which reinforce patients who have a more positive attitude, and - on the other hand - change those with a negative one.

In the study, subjective norms were not a significant predictor of the self-care behaviors and behavioral intention. This finding was in line with the results of studies conducted by Plotnikoff et al. in 2010 (23) and Sarbazi et al. in 2019 (14). However, studies carried so far emphasize that the social support plays a key role in promoting health, reduces the susceptibility to disease, and facilitates the improvement of the disease (24).

Conclusion

According to the findings of the current study, it was found that ETRA was a useful model in predicting cognitive determinants of the self-care behaviors among diabetic patients. As well as, our results show that educational materials which target self-efficacy may be particularly effective. Thus, health care providers should pay great attention on self-efficacy while designing educational interventions destined for diabetic patients.

Limitations: Cross-sectional studies are not suitable for describing causal relationships due to lack of temporality (from the Bradford Hill criteria). In the present study, there is a probability of selection bias due to selecting cases from the diabetes clinic. Findings could also differ based on which phase of their illness participants were recruited.

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Author Contribution: Towhid Babazadeh and Hamid Jafaralilou: designing the study, conducting the study, administrative support, drafting and revising the manuscript. Saber Ghaffari-fam, and Vahideh Sadra: designing the study, gathering the data, administrative support, drafting and revising the manuscript. Ehsan Sarbazi: contributed to the study concept and design, interpretation of the data and drafting the manuscript. Shahram Oliaei: editing and writing the final paper. All authors contributed to the study concept and design, reviewed and revised the manuscript and approved the final manuscript as submitted.

Riassunto

Comportamenti di auto-cura da parte di pazienti diabetici di tipo 2 nella campagna di Tabriz, Iran: applicazione della teoria estesa dell'azione ragionata

Premessa. Il diabete è una malattia cronica che richiede a chi ne è affetto una serie quotidiana di decisioni auto-gestite e l'esecuzione di attività di cura complesse. Lo scopo della presente indagine è quella di esplorare i determinanti dei fattori di auto-cura nei diabetici di tipo 2 usando la teoria estesa dell'azione ragionata.

Tipo di studio. Trasversale

Materiali e metodi. L'indagine è stata condotta su 200 diabetici di tipo 2. Per misurare i loro comportamenti di auto-cura è stato utilizzato un questionario basato sulla teoria estesa dell'azione ragionata, includente conoscenza, regole soggettive, attitudine al comportamento, intenzioni di comportamento ed auto-efficacia. È stato applicato il modello dell'equazione strutturale globale per identificare i determinanti strutturali delle intenzioni di comportamento ed, infine, i comportamenti di auto-cura sono stati stimati a partire dalle attitudini, dalle norme soggettive e dall'auto-efficacia.

Risultati. L'attitudine ai comportamenti di auto-cura è risultata un predittore statisticamente significativo delle intenzioni comportamentali (peso della regressione standardizzata = 0.322, $p < 0.001$), così come l'auto-efficacia (peso della regressione standardizzata = 0.625, $p < 0.001$). Inoltre, delle variabili della teoria estesa dell'azione ragionata, solo l'auto-efficacia è apparsa come un predittore statisticamente significativo dei comportamenti di auto-cura (peso della regressione standardizzata = 0.482; $p = 0.001$).

Conclusioni. Sulla base dei nostri risultati, l'auto-efficacia è risultata in grado di migliorare i comportamenti sanitari dei diabetici di tipo 2. Pertanto, i responsabili dei trattamenti sanitari dovrebbero considerare l'auto-efficacia come un fattore fondamentale nell'impostazione di interventi educativi volti a migliorare le capacità di auto-cura nei diabetici di tipo 2 che vivono in zone rurali.

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