

An Exploratory Study of Predictors of Self-Care Behavior in Adolescents with Type 1 Diabetes based on Social Cognitive Theory

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Abstract

Background: Diabetes Mellitus is the fourth leading cause of death worldwide, bringing enormous costs to communities and the health care system. Self-care behavior has a major influence on type 1 diabetes (T1D) health outcomes, and with successful management, children and adolescents with T1D can lead long and healthy lives. This study aimed to investigate the predictors of self-care behavior in adolescents with T1D based on social cognitive theory (SCT).

Materials and Methods: This study is a descriptive-analytical cross-sectional study in adolescents with diabetes mellitus type 1. A self-administered questionnaire based on SCT and self-care behavior was completed by 200 girls and boys, aged between 14 and 19 years old in Isfahan Endocrinology and Metabolism Research Center, Iran. The data were analyzed by descriptive statistics and hierarchical multiple regression analysis in SPSS software version 23.0.

Results: The mean age of the participants was (16.61±2.67 years). The majority of participants were woman (n=123) and single (n=152). The results of regression analysis showed that SCT constructs (self-efficacy, outcome expectations and self-regulation) were able to explain self-care behavior significantly ($R^2=0.4$, $p<0.001$), and the self-regulation was the strongest predictor of self-care behavior ($\beta=0.5$, $p<0.001$).

Conclusion: Considering the explanation of self-care behavior by SCT constructs in the present study, and the effective role of self-regulation in explaining self-care behavior in adolescents with diabetes mellitus type 1, it is recommended to consider strategies for improving the self-regulation in these adolescents in future interventions.

Key Words: Adolescents, Diabetes Mellitus Type 1, Self-Care, Social Cognitive Theory.

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1- INTRODUCTION

Diabetes Mellitus is an endocrine disease characterized by malfunction in glucose metabolism and impairments in the production or utilization of insulin (1). The prevalence of diabetes is about 6.4% worldwide, and it is expected that 366 million individuals will be affected by diabetes by 2030 (2). Five to ten percent of patients with diabetes mellitus are categorized as Type 1 diabetes mellitus (T1DM) (3). About 40% of patients with T1DM are under 20 years of age and the most common age of onset is puberty age. Patients with T1DM experience drastic changes in their lifestyle so that their daily requirement for external insulin injection, glycemic control, consideration of physical activity and daily nutrition will increase (4, 5). Although diabetes is one of the most costly diseases, a successful management can delay or prevent its complications (2).

In patients with diabetes, more than 95% of the treatment process is performed by the patient and the treatment team has little control over the patient through the intervals between visits (7). Cognition and awareness of patients with diabetes on proper nutrition principles and strict adherence to treatment and health care patterns play an important role in the regulating of their metabolism and the metabolic control, and can prevent short-term complications and delay the progression of long-term complications of diabetes (7). One of the best approaches in this regard is to promote self-care behavior in patients with diabetes. Self-care increases the effective coping ability of patients in dealing with health problems and increases the possibility of making practical health-related decisions and commitment to participate in the care and treatment of the long-term diseases, leading to leading to improvement in patient general health and his active participation in the care process (8). Self-care in diabetes includes proper and timely

injection of insulin, diet adherence, proper physical activity, blood glucose testing, and improved quality of life (9). Since the ultimate goal in patients with diabetes is to increase their ability of self-care, using a model as a framework to identify the factors involved in patient's poor self-care and designing self-care education programs seems necessary (10). Most interventions and studies emphasized on empowering and promoting self-efficacy (SE), self-regulation (SR), and peers support in self-care behaviors of patients with diabetes (7). One of the most effective theories in promoting self-care in patients with diabetes is Bandura Social Cognitive Theory, which emphasizes the role of perceived self-efficacy associated with self-regulation and outcome expectancies (OE), and it can play an important role in promoting behaviors that lead to health in patients (11, 12).

Given the high prevalence of T1DM and the low rate of self-care behavior (SCB) in adolescents (13), and the importance of the disease impact on the quality of life and the future of adolescents, more widespread studies are needed to identify the factors associated with low self-care behavior in adolescents (8, 14). This study which is in line with the requirements of Isfahan Endocrine and Metabolism Research Center (IEMRC) on determining the factors associated with poor self-care in adolescents, aimed to investigate the predictors of self-care behavior in adolescents with Type 1 diabetes based on social cognitive theory (SCT).

2- MATERIALS AND METHODS

2-1. Study design and population

The present study is a descriptive-analytical cross-sectional study conducted on adolescents in Isfahan, Iran. After necessary coordination with the authorities of diabetes in Isfahan Endocrine and Metabolism Research Center (IEMRC), all adolescents with T1DM who were

routinely referred to this center were contacted to complete the questionnaires from Jan to Dec 2018. Inclusion criteria were age group of 10-19 years and confirmation of the disease by physician of IEMRC, and exclusion criteria were unwillingness to cooperate in completing the questionnaire. Participants were assured that their information is used exclusively for research purposes and remains confidential with the research team.

2-2. Measuring tools

To assess the self-care behaviors in patients with diabetes, a Summary of Diabetes Self-Care Activities questionnaire (SDSCA) developed by Toobert and Glasgow and for evaluation of SCT construct, the self-administered questionnaire based on SCT constructs and the Management Self-Efficacy Scale (DMSES) were used (15-17). Regarding the age group of adolescents participating in the present study, some of the questions

in these questionnaires were changed according to the opinion of experts and professors of the IEMRC and faculty of Isfahan University of Medical Sciences (Health School). To assess the validity and reliability and cross-cultural adaptation of the questionnaires, the comments of seven faculty members including two endocrinologists and five health specialists were used; all the items were assessed based on the necessity, importance and relevance. According to the Lawshe Table, items with a content-validity ratio (CVR) lower than 0.62 and a CVR lower than 79% were omitted. The remaining items were assessed for the impact of maximum, minimum, skewness, corrected item-total correlations (CITCs), and finally for assessment of the reliability, Cronbach's alpha in a pilot study of 30 adolescents was measured, the reliability, item reliability range, and the number of remaining items in each construct were reported in **Table.1**.

Table-1: Cronbach's alpha and CITC range for SCT constructs and SCB.

SCT Constructs (Number)	Total Cronbach's α	Cronbach's α range for items	CITC range
Self-efficacy (19)	0.87	0.85 – 0.87	0.38 - 0.62
Outcome expectations (20)	0.68	0.65 – 0.68	0.25 – 0.39
Self-regulation (22)	0.87	0.86 – 0.87	0.35 – 0.59
Social support (18)	0.90	0.89 – 0.90	0.42 – 0.70
Self-care behavior (15)	0.74	0.69 – 0.74	0.37 – 0.56

SCB: self-care behavior, SCT: social cognitive theory, CITC: corrected item-total correlation.

2-3. Ethical considerations

Before completing the questionnaire, the study was registered in Iranian Registry of Clinical Trials (IRCT20190113042341N1). For ethical reasons, a cover letter was attached to each questionnaire, emphasizing that participants' responses were anonymous

and would remain confidential. Participation was voluntary and participants had the opportunity to review the study questionnaire before indicating whether they wanted to participate. All adolescents gave written informed consent from their parents to participate in the study. Also, consent to publish from adolescents was not applicable to our

manuscript, since we did not disclose any of the personal details of the teens in the manuscript, but the publication license was issued from Isfahan University of Medical Sciences, Iran.

2-4. Data Analyses

After completing the questionnaires, the gathered data were analyzed using SPSS software version 23.0, and descriptive statistical tests and analytical statistical techniques were used to determine relationship between scores of self-care behavior with underlying variables, the independent t-test (gender), Pearson correlation coefficient (duration of disease), and Spearman correlation coefficient (educational level), as well as

linear and hierarchical regression analysis was used to determine the explanatory value of self-care behavior by each one of the constructs. P-value less than 0.05 was statistically significant.

3- RESULTS

A total of 200 adolescents with diabetes aged 10-19 years participated in this study (mean age: 16.61±2.76). Baseline characteristics of adolescents including gender, marital status, and educational level, hereditary background for the disease, disease complications, physical health status and economic status of participants is shown in **Table.2**.

Table-2: Frequency of the baseline characteristics of adolescents with Diabetes Mellitus type 1.

Variables		Frequency	Percentage
Gender	Female	123	61.5
	Male	77	38.5
Marital status	Single	152	76
	Married	48	24
Educational level	Elementary	17	8.5
	First grade of high school	27	13.5
	Second grade of high school	86	43
	Bachelor degree	59	29.5
	Others	11	5.5
Hereditary background disease	Positive	88	44
	Negative	112	56
Disease complications	Yes	43	21.5
	No	157	78.5
Physical health status	Poor	4	2
	Medium	72	35
	Good	100	51
	Excellent	24	12
Economic status	Poor	26	13
	Medium	100	50
	Good	69	34.5
	Excellent	5	2.5

Each of the SCT variables used linear regression analysis to determine the predictive value of self-care behavior. The ANOVA test showed that the predicted model using SCT variables significantly explained self-care behavior ($R^2=0.4$, $p<0.001$), and all variables were

significant in explaining self-care behavior in adolescents except social support construct (**Table. 3**). Among all of the variables self-regulation plays a more effective and stronger role in explaining self-care behavior ($\beta=0.5$, $p<0.001$).

Table-3: Indicators of Linear Regression Analysis Based on the Variables of SCT Model Prediction.

Prediction variables	B	SE	Beta	P-value	Total R ²
Self-efficacy	.139	.051	.180	.007	0.4
Outcome expectancies	.136	.058	.135	.020	
Self- regulatory	.320	.052	.477	.000	
Social support	.005	.042	.008	.905	

SCT: social cognitive theory.

Hierarchical regression analysis was used to investigate the role and confounding effect of demographic factors. SCT variables in the first step and baseline characteristics were entered in the second step in explaining self-care behavior. The

results showed that although the inclusion of baseline characteristics had a significant effect on the model explanation ($p = 0.01$) the effect was negligible ($\Delta R^2 = 0.06$, $\Delta F = 3.5$) (**Table.4**).

Table-4: Hierarchical Regression results for predicting self-care behavior by SCT Constructs and demographic characteristics.

Model	R ²	Adj R ²	ΔR^2	F Change	P-value
Step1	.402	.390	.402	32.782	0.00
Step 2	.463	.434	.061	3.550	0.00

Step1: SCT construct, Step 2: SCT and demographic variables.

4- DISCUSSION

This study aimed to investigate the explanatory value of self-care behaviors by each of the social cognitive theory constructs in adolescents with T1DM. Results showed that SCT with the emphasis on variables of outcome expectancy, self- regulation, self -efficacy and social support can explain significantly the self-care behavior in adolescents with T1DM, and self-regulation was the strongest predictor of SCB. As self-regulation involves the coordination of behaviors with emotion and cognition, it may draw from teens' broader emotion and cognitive regulation abilities (20). Self-regulation construct and application of strategies for success in achieving the goals resulting from adherence to self-care behaviors are very helpful. According to the findings of the data analysis, self-regulation was more

effective and the strongest explanatory variable for self-care behavior and management of diabetes in our study, and it can be claimed that with increasing self-regulation factor, self-care behaviors in patients with diabetes will increase. Research examining diabetes management and self-regulation in youths has emphasized the contributions of self-regulation to individual processes such as problem-solving, goal setting, and affects regulation (21, 22). The results of Berg et al.'s study showed that in addition to individual differences in self-regulation, day-to-day fluctuations in self-regulation failures independently predicted daily adherence. Thus, even those with good self-regulation abilities may experience fluctuations in their ability to regulate blood glucose on a daily basis (23). Also, the results of the study by Wiebe et al. indicated that adolescents displayed higher daily adherence and lower blood glucose

levels on days when they had higher-than-their-average levels of daily goal planning and daily goal effort (24). However, the results of the present study are consistent with Bandura's outlook that self-regulation is associated with health promotion (25), and also consistent with the study by Stamp et al. (12). Self-efficacy was another meaningful predictor of SCB in our study. In an investigation by Buck et al. conducted on 628 individuals, a significant correlation was observed between self-efficacy and self-care behaviors ($p < 0.001$) (18). In a study by Zhou et al. ($n = 249$), there was a direct association between self-efficacy and physical activity level with self-care behavior ($p < 0.010$, $r = 0.18$) (19).

The results of Tang et al. (26), and Skinner et al. (27) are not consistent with the results of our study. Conducted on social support and self-care in patients with diabetes, a significant positive association was shown between these two variables. The differences between two studies may be resulted due to our description of social support. Because in our study we just focused on family as a social support and it is one of our limitations. We should have considered other influential groups such as peer group as a social support. According to the results of current study, there was no significant association between gender and self-care behavior. In a study by Parham et al. (2013), self-care behaviors were not significantly different between men and women with diabetes (28).

The study by Vosoghi et al. (2012), in patients with diabetes, it was shown that the mean ability of self-care in women was higher than men, but this difference was not statistically significant (29), which is in line with the present study. According to the result in our study, there was a significant association between education level and self-care behavior. The studies by Sloan et al. (30), and Parham et al. (28), showed that education level was a

predictor of self-care behavior in patients with diabetes, which is consistent with the present study.

5- CONCLUSION

The results of this study showed that self-regulation in adolescents with Type 1 diabetes is the strongest predictor of self-care behavior and it can be claimed that with increasing self-regulation factor, self-care behaviors in patients with diabetes will increase. Therefore, it is strongly suggested to design and implement intervention based on self-regulation theory and also there should be more focus on the creative strategies to promote SR in adolescents with T1DM.

6- CONTRIBUTORS

Islami A, Fathian Z, Molavi E were involved in the design and writing of the original protocols of the study. Hasanzadeh A, Molavi E and Fathian Z analyzed the data. Islami A, Fathian Z, Amin al-RoayaA and Molavi E were involved in the design and construction of the questionnaire. Amin al-RoayaA and Molavi E carried out the study. Molavi E has studied previous studies and wrote the first draft of the article, and the first draft of the article was subsequently reviewed by Islami A, and Fathian Z.

7- CONFLICT OF INTEREST: None.

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