

Application of the Social Cognitive Theory to Predict Self-Care Behavior among Type 2 Diabetes Patients with Limited Health Literacy

ABSTRACT

Background and Objective: Although compliance with self-care behaviors is necessary for the successful management of diabetes, patients with diabetes often refuse favorable self-care. This study was conducted to determine the factors influencing self-care behaviors among type-2 diabetic patients who had limited health literacy based on social cognitive theory (SCT).

Materials and Methods: A cross-sectional study was conducted among 293 diabetic patients with limited health literacy that was identified by S-TOFHLA. The data were collected using the summary of diabetes self-care activities, diabetes management self-efficacy scale, outcome expectancies questionnaire, and a researcher-made questionnaire for collecting data related to self-regulation and social support constructs. Data were analyzed by SPSS ver.22 using multiple linear regression to determine the predictors of self-care behaviors.

Results: In the case of patient's adherence to self-care tasks, they had the best adherence to medication regime and the worst adherence to physical activity. Employment status ($P<0.032$, $\beta=3.57$), supplementary insurance ($P<0.018$, $\beta=1.74$), and history of participating in diabetes education classes ($P<0.044$, $\beta=1.63$) were predictors of self-care behaviors in the studied patients. Among the SCT constructs, perceived self-efficacy ($P<0.001$, $\beta=0.21$) predicted self-care ability. The mean score of self-care increased around 0.21 by increasing one single unit of self-efficacy. Overall, these factors predicted 67% ($R^2 = 0.67$) of self-care changes.

Conclusions: The results of this study showed that self-efficacy and demographic variables are significant predictors to improve self-care ability among diabetic patients with limited health literacy.

Paper Type: Research Article

Keywords: Self-Care Behavior; health literacy; diabetes; Social Cognitive Theory

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Introduction

Diabetes is not only a chronic ailment but also a worldwide health concern. The prevalence of diabetes has been rapidly increased and has become a major worldwide health problem in this century (1). The International Diabetes Federation (IDF) reports are indicative of 425 million diabetic patients existing worldwide in 2017. According to the prediction of this organization, the number of such people in 2045 will be about 629 million, 79% of which live in low and middle-income countries (2).

According to the IDF statistics, five million diabetics were in Iran in 2017 and up to 2030, this country will be one of the highly prevalent areas of diabetes in the world. There is a rising consideration to diabetes and its impact on human health because of the chronic complications and problems that emerge over time in such patients leading to high disability and mortality rates. In 2017 alone, diabetes has caused 4 million deaths in the world according to IDF (2).

Diabetes is a chronic disease can lead to many health problems and imposes significant costs for the individual, family, health service provider, and community. However, studies show that diabetic patients do not control their disease at a desirable level. As a result, studies reported that the high prevalence of uncontrolled blood glucose among people with diabetes. Patients' compliance with self-care behaviors is the best approach for controlling and maintaining the blood glucose in the optimal range (1).

Patients with type-2 diabetes mellitus (T2DM) must learn to adopt lifestyle modifications such as healthy eating, having routine physical activity, following a prescribed medication regimen and self-monitoring of their blood glucose level as self-care behaviors (1, 3, 4). Studies on Iranian T2DM patients have shown that only 15.1% of these patients had appropriate self-care activities

(5). It was evidence that patients with limited health literacy show poor self-care behaviors (6, 7).

Limited health literacy influences the self-care performance of the patients in various ways such as decreasing the ability to read and comprehend written health recommendations and prescriptions. Limited health literacy is linked to worse chronic disease control, increased utilization of the emergency department and hospital care, and increased mortality (8). In diabetic patients, lower health literacy has been associated with worse diabetes-related knowledge, poor compliance with medication regimens, and reduced adherence to medication refills.

There is really limited information available on factors affecting self-care behaviors of diabetic patients with limited health literacy. In the current study, Social Cognitive Theory (SCT) was used to explain the factors influencing the self-care behaviors of these patients. SCT is one of the best-practiced behavior change theories that have been successfully applied in numerous studies that examined healthy behavior determination and modification (9).

SCT specifies a core set of psychosocial determinants (i.e., self-efficacy, outcome expectations, self-regulation, and social support) for effectively understanding a broad range of health behaviors, including self-care behaviors (10). According to Bandura, self-efficacy is the key construct within SCT and is suggested to have a direct effect on behavior as well as indirect effects through all other theory constructs (11). It affects behavior by serving as incentives (positive outcomes) or disincentives (negative outcomes) (12). Outcome expectations provide the motivation for behavior while self-efficacy provides the confidence to overcome barriers.

Individuals are more motivated to engage in behaviors if they believe there will be beneficial consequences (more positive outcomes and fewer negative outcomes) from those behaviors (1). Social support describes resources that can influence behavior. Social support recourses can be informational (e.g. advice, instruction), instrumental (e.g. equipment and financial donations), and emotional (e.g. encouragement and praise) provided by people in the social network (e.g. friends, family, and healthcare providers)(13). Self-regulation is the ability to monitor behavior in order to achieve goals and can be a useful resource to assist individuals in adopting and maintaining regular behavior (14).

Hence, this study was conducted to determine the factors influencing self-care behaviors in T2DM patients with limited health literacy based on Social Cognitive Theory. Results of this study would be helpful for the design and implementation of self-care improvement interventions in patients with limited health literacy.

Material and Methods

Study design and data collection procedure

This cross-sectional study was conducted on 293 patients with limited health literacy that had been referred to the Salman Farsi and Eisaar diabetes clinic in Bushehr city, south of Iran. This study was approved by the Ethics Committee of Bushehr University of Medical Sciences (IR. BPUMS.REC.1397.3). Diabetic Patients who met the initial entry criteria in these centers were identified and invited to participate in the study by convenience sampling method. Entering criteria consist of over 30 years of age, passing more than 6-months of a definite diagnosis of diabetes, not having a serious complication due to diabetes (Diseases such as cardiovascular disease, neuropathy, nephropathy, retinopathy,

and stroke). In the next step, a short version of the Test of Functional Health Literacy in Adults (S-TOFHLA) was used to examine the level of health literacy in diabetic patients. Patients who entered the study become aware of the purpose of the study, the study participants' rights, and the confidentiality of participants's information and they signed the informed consent prior to the interview. All selected patients completed the study questionnaires. Of the 375 participants identified on the basis of initial entry criteria and convince sampling method, 293 had limited health literacy and completed the questionnaires.

Instruments and measures

Health literacy: A shortened version of the Test of Functional Health Literacy in Adults (S-TOFHLA) was used in this study. This tool included two reading passages (36 items) and 4 numeracy items (7 points) to assess the ability to read and understand health-related forms and labeled prescriptions. Possible scores on the S-TOFHLA range from 0 to 100. Based on the cut of points in this questionnaire, scores from 0 to 66 indicates limited health literacy. The Persian version of the scale shows adequate internal reliability for numeracy (Cronbach's $\alpha=0.69$) and reading comprehension (Cronbach's $\alpha=0.78$)(15).

Diabetes Management Self-Efficacy Scale (DMSES): Self-efficacy was used to assess the patient's judgment ability to perform recommended self-care skills. The original scale consisted of 20 items with response options ranging from "0 = I" (cannot do at all) to "10 = I" (strongly can do). The answers were summed to obtain an overall self-efficacy score, which can be ranged from 0 to 200. Higher scores represented a greater self-efficacy to perform self-care skills related to control diabetes. The DMSES was previously validated for use in Persian patients with T2DM (16). The Persian

version includes 19 items, which measure the degree of confidence an individual with T2DM to perform self-care activities. It had an adequate internal consistency score (0.83). The test-retest reliability was also adequate, with a moderate agreement between the test-retest scores ($r = 0.86$, $p < 0.001$). In our study, an adequate alpha coefficient (Cronbach's $\alpha = 0.87$) suggests that the scale is internally reliable. Likewise, the outcomes of reliability analyses show that the DMSES is stable over time ($r = 0.83$, $p < 0.001$).

Outcome expectations: A 20-item questionnaire previously used by Skelly et al, (17) assessed participants' beliefs about the consequences of performing regimen behaviors. Three items addressed the general benefits of adherence, and the remaining items assessed blood-glucose testing (five items), diet (four items), exercise (four items), and medication (four items). Participants were asked how much they agreed or disagreed with each statement. For each item, patients chose a response ranging from 0 (totally disagree) to 100 (totally agree). The total score was a summation of the items' scores. Higher scores reflected strong beliefs that diabetes-related behaviors would lead to specific outcomes. The Cronbach's alpha coefficient for this instrument was 0.92.

Self-regulation and social support constructs: In order to assess these constructs, a researcher-made questionnaire was used. Items were developed to examine self-regulation and social support based on self-care behaviors in diabetes patients. In this tool, 26 items with 5-point Likert answers were used (16-items for self-regulation and 11 items for social support). The items of perceived social support were designed with 5-point Likert scale answers (strongly agree to strongly disagree). The minimum score of patients based on this questionnaire was 19 and the maximum was 95. The questions related

to self-regulation also had 5-choice answers and patients were asked to choose the "never" option if they did not use a special mechanism for self-care or did not participate in self-care activities in the past month, otherwise select "Rarely", "Sometimes", "Most of the time", and "Always" according to their history of behavior. For scoring, the "never" option was given a score of 1 and the "always" option was given a score of 5. Due to the absence of a negative question in this questionnaire, the answers were summed to obtain an overall score.

For the determination of content validity, faculty members and Ph.D. candidates who were quite familiar with these constructs evaluated all items. Inappropriate questions were omitted or changed in the format according to received comments. Then, the mean Content Validity Index (CVI) and Content Validity Rate (CVR) of the Self-regulation questionnaire were calculated as 0.84 and 0.81, respectively. CVI and CVR of the social support questionnaire were also 0.9 and 0.81, respectively. The reliability of the scale was calculated, and Cronbach's alpha values were 0.72 and 0.70 for self-regulation and social support, respectively.

Self-care behaviors: we used the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire to measure diabetes self-care behaviors (18). This instrument assesses self-care behaviors in diabetic patients during the last seven days. The adherence of patients to perform self-care behaviors was assessed based on 12 questions. The answer to each question is placed in a range from 0 to 7, the minimum and maximum scores obtained by the patients are ranged from 0 to 84. To compare the number of days of self-care behaviors in patients, the score of each behavior was estimated from 7 points. To compare the number of days of self-care behaviors in patients, the score of each behavior

was estimated from 7 points. The questionnaire is also validated and used in Persian (19) and other languages, and its validity and reliability have been proven in previous studies (20). In our study, the Cronbach's alpha internal consistency coefficients were 0.79.

Socio-demographic characteristics: Socio-demographic attributes, including age, gender, marital status, and education level, history of diseases, health insurance, diabetes education classes, economic situation, and diabetes duration were collected.

Data analysis

The data were obtained from a total of 293 diabetic patients with limited health literacy. Descriptive statistics including frequency tables, means, and standard deviations were used to describe the characteristics of the sample. Independent samples t-test and analysis of variance were performed to examine the relationship between demographic variables and self-care behaviors. Multiple linear regressions were applied to examine the predictors of self-care activates. All statistical analysis was performed through SPSS 22.0 software. The significance level was set at .05 in all analyses.

Results

A total of 293 diabetic patients with limited health literacy were studied. Their demographic features are shown in Table 1. The mean age of the patients was 50.6 ± 10.5 , ranging from 31 to 77 years. In this study, 54.9% of participants were women and most of them (80.5%) were married. Most of the participants (191, 65.2%) had received previous diabetes patient education, 92 patients (33.7%) had health insurance, and they reported health professionals (72.3%) and the Internet-based messaging application such as Telegram and WhatsApp (16.0%) are the most important sources for receiving health

information.

The mean SDSCA score was 3.47 ± 0.7 , indicating that patients carried out self-care tasks about four days a week. The mean subscale scores were 3.42 ± 0.58 for diet, 2.33 ± 1.05 for physical activity, 2.47 ± 1.00 for blood-glucose testing, and 3.92 ± 1.14 for foot care, and 5.62 ± 1.00 for medication adherence. Our finding showed that patients had the best adherence to diet and worse adherence to physical activity during a week.

There was a significant correlation between the social-demographic characteristics (number of years of schooling ($r=0.34$, $p<0.001$), marital status ($p=0.001$), employment status ($p<0.001$), health insurance facilities ($p=0.006$), attending to diabetes education courses ($p=0.042$), and socio-economic status ($p=0.013$)) and self-care behaviors. There was no significant relationship between age ($p=0.070$) and duration of disease ($p=0.437$) with self-care (Table 1).

Results of Pearson correlation analysis of self-care behavior with social cognitive theory constructs and knowledge are presented in Table 2. Based on this data, self-care behaviors significantly and positively correlated with self-efficacy ($r=0.759$, $p<0.001$), outcome expectations ($r=0.355$, $p<0.001$), self-Regulation ($r=0.565$, $p<0.001$), and Social Support ($r=0.502$, $p<0.001$). Although, significant relationship was not observed between knowledge and self-care ($r=0.091$ and $p=0.140$).

Multiple linear regression with the Stepwise method showed that health insurance, Job status, diabetes education classes variables, and perceived self-efficacy were predictors of self-care in the studied patients and they explained 67% of the variation in self-care behaviors ($R^2=0.67$). A unit of increase in patient's self-efficacy leads to increase in average self-care score by 0.21, it was adjusted for all other predictors constant (β

Table 1. The mean score of self-care behaviors based on demographic variables (n = 293)

variable		Frequency (%)	Self-care Mean±SD	p-value
Gender	Female	161(54.9)	41.27±8.73	0.581
	male	132(45.1)	41.84±8.11	
Marital status	Never married	16(5.5)	47.62±7.97	< 0.001
	Married	236(80.5)	41.89±8.32	
	Divorced	41(14)	37.18±7.59	
Job status	unemployed	182(62.1)	40.51±8.29	< 0.001
	employed	7(2.4)	49.17±10.38	
	self-employed	87(29.7)	41.69±7.56	
	retired	16(5.5)	49.73±8.64	
Another disease	yes	164(56)	39.97±8.68	< 0.001
	No	129(44)	43.55±7.73	
Health insurance	yes	92(33.7)	44.176±8.633	0.006
	No	181(66.3)	40.497±8.187	
Diabetes education classes	Yes	191(42.2)	42.24±8.93	0.042
	No	102(40.1)	40.15±7.13	
Economic situation	weak	100(34.1)	39.28±8.52	0.009
	medium	156(53.2)	42.25±7.72	
	good	29(9.9)	43.96±10.32	

Table2: Matrix of correlation between knowledge and the structures of SCT with self-care

Variable	Knowledge	Outcome Expectancies	Self-Regulation	Self-Efficacy	Social Support	Self-care
Knowledge	1					
Outcome Expectancies	0.168*	1				
Self-Regulation	0.208*	0.595*	1			
Self-Efficacy	0.278*	0.325*	0.646*	1		
Social Support	0.108	0.361*	0.556*	0.599*	1	
Self-care	0.091	0.355*	0.565*	0.759*	0.502*	1

= 0.21, $p = 0.001$). The average self-care score of those who have health insurance facilities was 1.74 higher than others ($\beta = 1.74$, $p < 0.018$) and the average self-care score of those who participated in diabetes class was 1.63 higher than

others, if all other predictors remain constant ($\beta = 1.63$, $p < 0.044$). Retired patients also had better self-care behaviors than unemployed patients, adjusting for all other predictors constant ($\beta = 3.57$, $p < 0.032$) (Table 3).

Table 3: The final model of predictors of social cognitive theory variables on self-care based on regression model

Variables	Coefficient β	Standardized Coefficient B	SD	p-value
Number of years of Education	0.060	0.023	0.132	0.652
Marital status				
Never married	referent			
Married	-2.646	-0.127	1.580	0.095
Divorced	-3.272	-0.587	1.896	0.086
Gender				
male	referent			
female	1.777	0.104	0.650	0.007*
Job status				
unemployed	referent			
employed	0.714	0.040	2.509	0.776
self-employed job	-1.862	-0.135	1.037	0.074
retired	3.574	0.210	1.653	0.032*
Health insurance				
No	referent			
Yes	1.744	1.756	0.730	0.018*
Economic situation				
weak	referent			
medium	-0.790	-0.647	0.774	0.308
good	0.184	0.133	1.196	0.878
Another disease				
no	referent			
yes	0.829	2.748	0.783	0.291
Diabetes education classes				
no	referent			
yes	1.637	0.636	0.806	0.044*
Self-Regulation	0.089	0.004	0.062	0.152
	-0.011	-0.002	0.066	0.867
Outcome Expectancies	0.095	0.005	0.070	0.177
Self-Efficacy	0.210	0.015	0.018	< 0.001*
Social Support	-0.017	-0.0139	0.066	0.797

*Predictor is significant at the 0.05 level

Discussion

Blood glucose control in diabetic patients is considered as a long-standing challenge. This can be more challenging when diabetic patients have limited health literacy. Therefore, the aim of this study was to determine the factors related to self-care behaviors as the most important way to control high blood glucose among diabetic patients with limited health literacy based on social cognitive theory. Based on findings, low health literacy diabetic patient's adherence to self-care tasks was about four days a week, and in the seven days, they had the best adherence to medication regime and the worst adherence to physical activity.

Regarding the fact that patients generally consider taking medication as the best act to control the disease, it seems that this mentality has been effective in better compliance of patients with this self-care behavior. Several health authorities such as the American Diabetes Association states reported that 30 minutes of physical activity, at least 5 days a week, can improve blood glucose control in diabetic patients (21). In this study, the behavior that had the least amount of compliance was physical activity. Therefore, insufficient physical activity is a topic that needs more attention from physicians and healthcare providers. However, it seems that they have ignored it.

The results of the present study showed that among demographic variables, marital status, education, occupational status, economic status, having other diseases, and history of participation in diabetes education classes were associated with the level of self-care behaviors in diabetic patients with limited health literacy but in the regression model, only the history of participation in diabetes education classes, supplemental insurance status, and employment status were predictors of self-care behaviors in

the studied population. Patients with a history of participation in diabetes education classes, patients with supplemental health insurance, and retired patients reported better adherence to self-care behaviors. Consistent with the results of the present study, Hamdzadeh et al. (22), Taghipour et al. (23) and Vosoghi Karkoslo et al. (24) reported that patients with history of attending in diabetes education classes had better self-care behaviors. In the Moadab et al study (25), patients who had a history of receiving education were more than twice as likely to perform self-care behaviors. Also, numerous studies such as Peña-Purcell et al. (26), Reisi et al. (27), and Razmaray et al. (28) have reported that the positive impact of education on promoting and improving self-care behaviors in diabetic patients. It seems that education, by influencing patients' knowledge and attitude, empowers them for better self-care and enhances their self-care ability (24). That's why education has a key role in the self-care process of diabetic patients and is an important and valuable factor to improve the diet, physical activity, and even medication use. Treatment will be effective when the patient understands the nature of his or her illness well and takes positive steps to face it. If the three main pillars of treatment for diabetes are diet, physical activity, and medication, then the fourth pillar will certainly be education (29). Therefore, it is necessary to provide diabetes education opportunities, especially for patients with limited health literacy who are more likely to have adverse consequences on their health compared with other people.

Consistent with the results of the present study, Barati et al reported better self-care behaviors in patients with supplemental health insurance (30). In the study of Atrian et al., self-care was also better in women with insurance coverage

(25). In the study by Nelson et al., patients who did not have health insurance performed less frequent routine tests such as eye checkups, leg examinations, three-month blood glucose testing, and self-care behaviors (31). Research has shown that the costs of care and treatment could be the main determinant of self-care behaviors in patients, especially adhering to behaviors such as medication, etc. (32). Therefore, economic barriers and bottlenecks can lead to reducing self-care behaviors. Therefore, the development of services and facilities and facilitating access to diabetes services by increasing insurance coverage and free facilities can act as incentives and help patients toward the better performance of self-care behaviors. It requires greater assistance and collaboration from health practitioners, planners, and policymakers.

Our finding showed a significant relationship between self-care behaviors and employment status that was consistent with the other studies by, Fallah and colleagues (33), Xu et al. (34), and Linda et al. (35). In the present study, self-care behaviors was better in retirees because retirees have more leisure time and source of income that lead to better and more self-care behaviors away from job stress.

Other results of the present study showed that knowledge, outcome expectancy, perceived self-efficacy, self-regulation, and perceived social support was related to self-care in the studied patients, but in the regression model only perceived self-efficacy was significantly predicted self-care in diabetic patients with limited health literacy. This finding is consistent with the study by Wu et al. (20), which considered self-efficacy as an important factor in predicting self-care behaviors in diabetic patients and predicted 23% of the changes in self-care behaviors. In the study of Rahimian Boogar et al., self-efficacy was identified as a most important predictor of

self-care activities in diabetic patients, which predicted 47% of self-care changes (36). In the study of Reisi et al., (1), in line with the results of the present study, self-efficacy predicted 28% of self-care in type 2 diabetic patients. In the study of Didarlo et al., (37), Henrietta (38), and Wen et al. (39), self-efficacy was identified as the most important predictor of self-care behaviors in diabetic patients. Likewise, Sharifi Rad et al., indicated that self-efficacy ($\beta = 0.42$) was the most important predictor of self-care behaviors ($\beta = 0.42$) among type 2 diabetic patients (40). In a study of 352 diabetic women by Didarloo et al., self-efficacy ($\beta=0.32$) was the strongest indirect determinant of diabetes self-management behavior through behavioral intention (41).

Although self-efficacy is considered to be an important determinant in most patients with limited health literacy because these patients due to their limitations are generally have insufficient self-confident and unable to make decisions and implement health behaviors such as self-care behaviors, and this belief can lead to poor performance. Therefore, focusing on promoting self-efficacy can be beneficial in implementing educational programs and interventions for these patients and can provide significant results.

Due to the limited sample size and convenience sampling method of the current study, the findings may not be generalized to all Iranian T2DM patients with limited health literacy. Also, the self-reported questionnaire was used for self-care behavior report that may be subjected to recall bias or memory failure. The cross-sectional design of the study makes us unable to discover cause-and-effect relationships between SCT and self-care behaviors. The S-TOFHLA, as a health literacy assessment tool, could not give any information about the communication skills of the patients that have an important role in the way he/she act in gathering information and

connect with others in today's complex age of communication.

Conclusion

The findings of the study showed that self-efficacy was the most important predictor of self-care behaviors in diabetic patients with limited health literacy. Thus, higher self-efficacy in these patients leads to better self-care. Although patients with limited health literacy experience many challenges in health care, they would better adherence to self-care behaviors if they believed in their ability to perform self-care behaviors. Therefore, it seems necessary to consider this crucial factor in the design of educational interventions and policies to promote self-care in type 2 diabetic patients with limited health literacy.

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Conflict of Interests: The authors declare that they have no conflict of interests.

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