Non Communicable Diseases

Predicting role of illness perception in treatment self-regulation among patients with type 2 diabetes

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Keywords

Treatment self-regulation • Illness perception • Chronic disease • Type 2 diabetes

Summary

Background and Objective. *Impaired self-regulation negatively impacts self-efficacy, self-management, blood sugar control, and quality of life among patients with diabetes. Hence, identifying the predictors of self-regulation is a necessity for healthcare providers. The current study aimed to determine the predictive role of illness perception in treatment self-regulation in patients with type 2 diabetes.*

Methods. *The current study is a descriptive cross-sectional study. A total of 200 patients with type 2 diabetes, who were referred to the only specialized clinic for endocrinology and diabetes affiliated with Qazvin University of Medical Sciences in 2019-2020, were recruited through a convenience sampling method. For data collection, the brief Illness Perception Questionnaire and the Treatment Self-Regulation Questionnaire were used. Collected data were analyzed by SPSS v21 using a multivariable regression model.*

Results. *Mean and standard deviation scores of self-regulation and illness perception were 69.11 ± 17.61 and 36.21 ± 7.05, respectively. Results of the multivariate regression model revealed the significant correlations of self-regulation with illness perception, age, cardiovascular complications, diabetic retinopathy, and diabetic foot ulcers.*

Conclusions. *In this study, participants presented a moderate level of self-regulation. The results also revealed that illness perception could be a predictor of improving patients' self-regulation. Therefore, providing infrastructure programs such as continuous education and appropriate care programs for diabetic patients to improve their illness perception can effectively improve their self-regulation behaviors.*

Introduction

Diabetes is one of the most common chronic diseases in the world [1, 2]. According to the International Diabetes Federation announcement in 2019, the total number of people living with diabetes is projected to rise to 700 million by 2045 [3]. In Iran, the number of people suffering from diabetes mellitus is projected to rise to 9.2 million by the year 2030 [4]. The condition can lead to many problems, such as cardiovascular, renal and brain dysfunction, and imposes a large economic burden on patients as well as their societies [5]. Diabetes is the seventh leading cause of death in the United States and has been one of the ten most common causes of death in Iran [6]. In 2010, the mortality rate was estimated at 10.6 deaths per 100,000 population in Iran that was higher than Greece (7.9 per 100,000 people) and lower than Italy (32.2 per 100,000 people) [7]. The mortality rate among diabetic patients is mostly related to an unhealthy diet and a sedentary lifestyle [8]. Self-regulation assists as a guide for diabetic patients to attain their goals and continue self-care behaviors [9].

Self-regulation is defined as one's common values or motivations to execute certain behaviors in order to improve health when suffering from diseases [10]. It is classified as controlled and independent motivations. Controlled motivation is comprised of external regulation, and internal motivations are controlled by internal feelings, leading to certain beliefs in a person to execute a behavior [11]. Basic structures of self-regulation learning abilities include the following processes: goal-setting, planning to achieve them, monitoring them, comparing them with standards, and changing behaviors to improve performance [12]. Self-regulation leads to adaptive behaviors which are effective in dealing with disease [13], improving one's physical health, quality of life, and self-care behaviors [14], and reducing disease complications and its psychological burden [15]. Impaired self-regulation negatively impacts health outcomes [10], self-efficacy [13], disease complications, self-management, blood sugar control and quality of life [15, 16]. Diabetic patients are responsible for executing certain behaviors, such as having a healthy lifestyle, controlling blood sugar, and taking medications on time, in order to improve their own health [17, 18], and self-regulation strategies strengthen their efforts to meet such ends [19]. However, poor treatment self-regulation leads to poor adherence to medication as well as poor

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blood sugar control, and long-term hyperglycemia increases the risk of microvascular and macrovascular complications [20].

Recent studies conducted in different settings showed that the prevalence of adherence to diabetes medication varied between 36 and 93%. Motivation plays a predictive role in diabetes self-management through consuming more vegetables/fruits and fewer fats, eating healthier foods, changing diet, doing regular exercise, regularly taking medication, and self-monitoring blood sugar levels resulting in better diabetes control. Cultural, religious, personal and social factors can also affect patients' beliefs and motivation in this regard. Taking several oral drugs and insulin, being concerned about their side effects, lack of confidence in their efficacy and lack of knowledge about them can all negatively impact individuals' adherence to medication [21, 22]. Illness perception and knowledge about diabetes significantly predict self-care behaviors in diabetic patients [23]. Hence, identifying such predictors is of great importance in these patients.

When dealing with a disease, patients usually create an image of the disease and its treatment process in their mind, which is defined as "illness perception" [24]. Factors such as poor blood sugar control, duration of treatment, presence or absence of complications lead to emotional reactions, and impaired self-management can affect individuals' illness perception [25]. In other words, patients living with diabetes consider their disease as a threat, and this belief leads to poor illness perception, and eventually depression [26]. The way people perceive an illness (illness perceptions) plays a role in how they adapt to their illness [27]. Therefore, assessing illness perception in such patients should be considered as a part of the healthcare services [28].

Regardless of the physiological factors, illness perception significantly affects the consequences of the disease [27]. Paying attention to the physical and mental problems of patients living with diabetes and assessing the consequences of their disease, including illness perception, are highly important. As a member of the treatment team, nurses play a key role in this regard by promoting self-regulation and assessing illness perception [10]. Due to the fact that the role of illness perception, as an effective factor in self-regulation, is not clearly evident, the current study aimed to determine the predictive role of illness perception in treatment self-regulation in patients with type 2 diabetes.

Methods

The current study is a descriptive cross-sectional study. The study population included patients with type 2 diabetes, who were referred to the only specialized clinic for endocrinology and diabetes in Qazvin, Iran, from 2019 to 2020. This clinic is located in Velayat teaching hospital affiliated with Qazvin University of Medical Sciences.

Considering $\alpha = 0.05$ (a 95% confidence interval), $\beta = 0.05$ (95% power), results of a previous study (r = -0.33) [23], and the possibility of a 30% not responding, the final sample size was calculated to be 200.

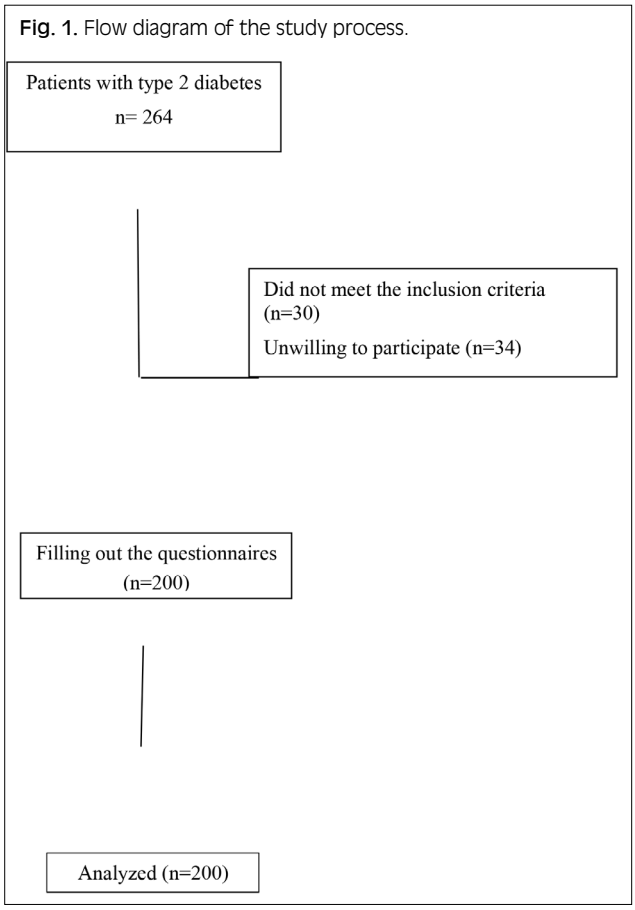

Fig. 1. Flow diagram of the study process.

A convenience sampling method was applied for sampling. Patients met the inclusion criteria if they were diagnosed with type 2 diabetes by a specialist, were able to read and write, and consented to participate in the study. Those patients who were diagnosed with type 1 or gestational diabetes and suffered from acute mental problems were excluded from the study. For data collection, each patient completed the demographic characteristics and disease information forms, the brief Illness Perception Questionnaire (Brief IPQ), and the Treatment Self-Regulation Questionnaire (TSRQ). Figure 1, shows the flow diagram of the study.

The demographic characteristics and clinical characteristics associated with diabetes mellitus forms included age, gender, educational level, marital status, employment status, medications prescribed, and duration of the disease.

The brief IPQ is a 9-item questionnaire designed to assess one's emotional and cognitive perception of his/her illness. The 9 items, respectively, assess consequences, timeline, personal control, treatment control, identity, concern, illness comprehensibility, emotional impact, and cause of the disease. Items 1-8 are scored on a 10-point Likert scale, ranging from 1-10. Item 9, which is an open-ended question,

involves patients identifying the three most important perceived causes of their disease. In the final analysis, it is recommended that each of the subscales be analyzed separately. In items 3, 4, and 7, a higher score indicates a more negative perception, and in the other items, a lower score indicates a more positive perception. The Cronbach's alpha for this questionnaire is 0.80, and the test-retest reliability coefficients for a 6-week interval were reported between 0.42 and 0.75. To assess the concurrent validity of the questionnaire, the revised IPQ was applied to a sample of patients with asthma, diabetes, and renal problems, indicating a correlation of the subscales from 0.32 to 0.63. The discriminant validity of the brief IPQ was calculated and confirmed by comparing the scores of patients with diabetes, asthma, chest pain, and colds [29].

The TSRQ is a 19-item questionnaire developed by Ryan and Cannell to assess self-regulation in patients with diabetes [30-31]. It utilizes a general approach to autonomously assessing self-regulation using the following subscales: autonomous regulatory style, controlled regulatory style, and motivation. The autonomous regulatory style represents the most self-determined form of motivation and has consistently been associated with maintained behavior change and positive healthcare outcomes [32, 33]. Based on the 19-item version, there are a variety of reasons why diabetic patients take their medications, check their blood sugar levels, follow a diet, or do regular exercises. The questionnaire is comprised of 2 subscales, autonomous self-regulation, and controlled self-regulation, which are assessed with 2 headings: 1. I take or would take my medications or control my glucose because … (8 items), and 2. I follow or would follow the recommended diet and exercise or would regularly because … (11 items). Items 2, 3, 7, 10, 13, 16, 18, and 19 assess the first subscale, and items 1, 4, 5, 6, 8, 9, 11, 12, 14, 15, and 17 assess the second subscale. Responding to each item is based on a 7-point Likert scale, ranging from 1-7. A relative autonomous index is also calculated [34, 35].

Data Analysis

Collected data were analyzed by IBM SPSS Statistics for Windows, version 21.0, using descriptive statistics (mean, standard deviation and frequency distribution), and a multiple linear regression model. Kolmogorov–Smirnov test was used to assess the normality of data, and Levene's test was used to assess the equality of variance for the groups. A p-value of < 0.05 was considered significant.

Tab. I. Patients' demographic characteristic.

Variables		Freq.	%
Gender	female	103	51.5
	male	97	48.5
Marital status	single	17	8.5
	married	165	82.5
	widowed	15	7.5
	divorced	3	1.5
Educational level	illiterate	60	30.0
	under diploma	94	47.0
	diploma and higher	46	23.0
Employment status	unemployed	102	51.0
	employed	54	27.0
	retired	44	22.0
Diabetes duration (year)	< 1	19	9.5
	1-5	59	29.5
	6-10	59	29.5
	> 10	63	31.5
Type of treatment	tablet	113	56.5
	insulin	44	22.0
	tablet + insulin	31	15.5
	no medication	12	6.0
Insulin (unit)	0	122	61.0
	1-10	27	13.5
	11-20	38	19.0
	21-30	13	6.5
Tablet	0	63	31.5
	1-2	42	21.0
	3 and more	95	47.5
Underlying disease	yes	115	57.5
	no	85	42.5
MI	yes	6	3.0
	no	194	97.0
ACS	yes	41	20.5
	no	159	79.5
CKD	yes	3	1.5
	no	197	98.5
Diabetic complications	yes	116	58.0
	no	84	42.0
Diabetic nephropathy	yes	18	9.0
	no	182	91.0
Diabetic retinopathy	yes	61	69.5
	no	139	30.5
Cardiovascular complications	yes	50	25.0
	no	150	75.0
Diabetic neuropathy	yes	75	37.5
	no	125	62.5
Diabetic foot ulcers	yes	23	11.5
	no	177	88.5

N: Number; %: Percent; MI: Myocardial Infraction, ACS: Acute Coronary Syndrome; CKD: Chronic Kidney Disease.

Results

In this study, 200 patients were enrolled. Of them, 103 patients (51.5%) were female and 97 patients (48.5%) were male. Their mean age was 59 years. Table I shows patients' demographic characteristics in more detail.

Patients' mean and standard deviation scores of self-regulation and illness perception were 69.11 ± 17.61 and 36.21 ± 7.05, respectively.

The multivariate regression model showed that diabetic patients' self-regulation decreases as their age increases.

Tab. II. Predictors for self-regulation among diabetic patients.

Variables		M (SD)	Adjusted β	p-value	95% CI
Marital status	Married	70.79 (17.78)	-		-
	Single	88.76 (21.35)	-0.019	0.806	-11.70-9.11
	Divorced	85.33 (7.77)	0.039	0.536	-12.94-24.79
	Widowed	59.33 (12.40)	-0.033	0.621	-11.59-6.94
Educational level	Illiterate	66.78 (16.72)	-		-
	Under diploma	70.64 (17.77)	-0.113	0.159	-10.10-1.67
	Diploma and higher	80.20 (20.33)	-0.134	0.179	-14.51-2.68
Type treatment	Tablet	66.14 (14.89)	-0.032	0.857	-14.42-12.00
	Insulin	73.48 (22.04)	-0.144	0.248	-17.52-4.55
	Tablet+ insulin	68.39 (17.38)	0.046	0.751	-12.26-16.96
	No medicine	83.00 (15.99)	-		-
Diabetes duration (year)	< 1	76.58 (16.23)	0.037	0.474	-7.43-12.13
	1-5	72.86 (18.25)	0.056	0.503	-4.46-9.05
	6-10	67.73 (16.46)	0.017	0.820	-5.42-6.84
	> 10	64.65 (17.38)1	-		-
Underlying disease	Yes	65.11 (15.71)	0.074	0.302	-0.71- -0.037
	No	74.53 (18.68)	-		-
Diabetic retinopathy	Yes	62.10 (15.24)	-0.152	0.04	-12.27- -0.49
	No	72.19 (17.76)	-		-
Cardiovascular complications	Yes	58.44 (10.93)	-0.170	0.022	-13.59- -1.07
	No	72.67 (18.01)	-		-
Diabetic neuropathy	Yes	63.67 (15.51)	-0.018	0.801	-6.15-4.76
	No	72.38 (18.05)	-		-
Diabetic foot ulcers	Yes	79.61 (15.74)	0.255	0.000	7.03-22.75
	No	67.75 (17.43)	-		-
Tablet	0	74.51 (20.70)	-		-
	1-2	71.19 (15.61)	-0.148	0.218	-17.61-4.04
	3 and more	64.62 (15.05)	-0.271	0.056	-20.42-0.25
Variables	**M (SD)**	**Range**	**Adjusted β**	**p-value**	**95% CI**
Age	59.91 (14.09)	15-84	-0.329	0.001	-0.70- -0.17
Perceived illness	43.89 (7.05)	5-70	-0.141	0.030	-0.71- -0.04

M: Mean; SD: Standard deviation; CI: Confidence Interval.

The results also showed that as illness perception increases, patients' self-regulation improves ($p = 0.03$). Compared to other patients, self-regulation was significantly lower in patients with diabetic retinopathy ($p = 0.048$) or cardiovascular complication ($p = 0.022$). Also, compared to other patients, self-regulation was significantly lower in patients with diabetic foot ulcers ($p < 0.0001$) (Tab. II).

Discussion

The current study aimed to determine the role of illness perception in treatment self-regulation among patients with type 2 diabetes.

In this study, participants presented a moderate level of self-regulation. This finding is supported by Shahbazi et al. (2018) and Salehi et al. (2014) studies, in which self-regulation was reported to be at a moderate level among diabetic patients [36, 37]. However, Mahdilouy et al. (2019) and Lin et al. (2016) concluded that self-regulation is low in diabetic patients [38, 39]. Fuladvandi et al. (2017) also reported that self-regulation is low in patients with high blood pressure [40]. Based on these results, it seems that the current educational programs are not enough to improve and promote self-care behaviors among patients with diabetes. Hence, the treatment team, especially nurses, should consider other measures to better and more effectively educate this group of patients in order to improve their awareness about the potential and hazardous complications of improper diabetes control.

Based on the results of the current study, diabetic patients with greater illness perception used more self-regulation. This is consistent with national [41] and international [42, 43] studies which reported similar results. For instance, Kugbey et al. (2017) reported that illness perception and diabetes knowledge significantly predict overall diabetes self-care practices [23]. Abubakari et al. (2018) also found that illness perceptions are important determinants of self-management among diabetic patients [42]. Furthermore, illness perception was correlated with

medication adherence in patients with type II diabetes [41]. A possible explanation for this finding might be that illness perception is the patient's organized cognitive beliefs about his/her disease. These beliefs in turn affect coping strategies and health-related behaviors that he/she uses to manage the disease.

The results of the current study also showed a significant decrease in self-regulation among diabetic patients with cardiovascular complications, diabetic retinopathy, and diabetic foot ulcers. In line with this finding, Gholamaliei et al. (2016) reported that patients with type 2 diabetes who develop diabetes complications and have elevated HbA1C levels show lower levels of self-regulation [43]. Gabr et al. (2015) also concluded that self-care and self-regulation are low in epilepsy patients suffering from complications [44]. Poor treatment self-regulation leads to poor medication adherence as well as poor blood sugar control, and long-term hyperglycemia increases the risk of microvascular and macrovascular complications [45].

Based on the results of the current study, self-regulation significantly decreased with advancing age. Fuladvandi et al. (2017) concluded that patients' self-regulation decreases as their age increases [40]. However, on the contrary, Mahdilouy et al. (2019) showed that self-regulation has no statistically significant relationship with age [38]. Also, Gholamaliei et al. (2016) reported that older patients have higher levels of self-regulation and better medication adherence [43]. It seems that age-related conditions, such as hearing loss, vision problems, and cognitive/physical disorders, cause older adults to become dependent and reduce their self-efficacy in adopting self-regulation behaviors.

Conclusions

In this study, diabetic patients presented a moderate level of self-regulation. Predictive factors of self-regulation including illness perception, age, cardiovascular complications, diabetic retinopathy, and diabetic foot ulcers should be taken into consideration by healthcare providers. Therefore, providing infrastructure programs such as continuous education and appropriate care programs for diabetic patients to improve their illness perception can effectively improve their self-regulation behaviors.

Ethical consideration

The current study was approved by the ethics committee of Qazvin University of Medical Sciences (IR.QUMS.REC.1398.313). Patients were reassured about the confidentiality of data, and necessary explanations on how to complete the questionnaire were provided to them. Prior to data collection, informed consent was also obtained from them.

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Conflict of interest statement

The author declares no conflict of interest.

Authors' contributions

Conceptualization: FA, HB, RK, SAM.
Methodology: FA, HB, RK, SAM.
Investigation, Writing – original draft, and Writing – review & editing: All authors.
Data collection: HB and RK.
Data analysis: SAM.
Supervision: FA and SAM.

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