Diabetes Self-Management and its Related Factors among Type 2 Diabetes Patients in Primary Health Care Settings of Kerman, Southeast Iran

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ABSTRACT

Aims: Diabetes self-management (DSM) plays a crucial role in diabetes control. The present study was conducted to evaluate DSM and its related factors among type 2 diabetes mellitus (T2DM) patients.

Methods: A cross-sectional study was carried out among T2DM patients from January to March 2017 in urban healthcare centers of Kerman city, southeast Iran. A total of 600 T2DM patients were enrolled in the study using a multistage sampling method. Valid and reliable diabetes self-management questionnaire (DSMQ) was employed for data collection.

Results: The mean (±SD) score of DSM was 6.92 (±1.17) out of 10 with interquartile range 6.25-7.70. DSM mean score was higher in patients with higher educational level and household income significantly. Employed subjects (mean=7.18) had a higher DSM mean score than unemployed ones (mean=6.84). Moreover, DSM was better in patients who receive insulin and those with diabetes-related complications. DSM had a direct correlation with the number of visits by specialist physicians ($r = 0.257$, $P < 0.001$) and treatment duration ($r = 0.103$, $P = 0.013$). University education (Beta = 0.243, $P < 0.001$) was the strongest predictor of DMS, followed by high school education (Beta = 0.226, $P < 0.001$) and number of annual visits in primary healthcare centers (Beta = 0.205, $P < 0.001$).

Conclusion: Self-Management behaviors were suboptimal among the diabetes patients. Diabetes self-management as one of the important components of a diabetes control program should be considered in the first level of health care delivery system in Iran

Keywords: Diabetes mellitus, Self-management, Self care, Iran

1. INTRODUCTION

Prevalence of diabetes mellitus has risen worldwide in recent decades particularly in developing countries [1]. There were 451 million adults over 18 years with diabetes worldwide in 2017, and this number will reach to 693 million by 2045 globally [2]. In 2017, diabetes caused more than 5 million deaths and USD 850 billion in costs [2]. Various disabling complications including nephropathy, neuropathy, retinopathy, cardiovascular accidents, stroke, and foot ulcers occur commonly among diabetes patients [3]. The complications lead to considerable premature deaths, disabilities, and healthcare expenditure [3]. Based on the 2017 International Federation of Diabetes Atlas for Diabetes, there were more than 5 million adults over 18 years with diabetes in Iran, which reflects the 8.9% prevalence of the disease [2]. Studies have demonstrated that there were high frequencies of diabetes-related complications and inappropriate diabetes management in Iranian people with diabetes [4,5].

Closed collaboration between patients and healthcare providers is crucial in achieving appropriate diabetes control [6]. Diabetes patients should accept responsibility for self-management practice as the cornerstone for controlling their disease [6, 7]. Without the patients' involvement in the process of the disease treatment, it is not possible to achieve therapeutic goals such as improving the quality of life and optimal control of blood glucose [7]. So, self-management is an essential and effective component to the disease control in diabetes patients. Diabetes self-management (DSM) refers to

perform complex care activities including self-monitoring of blood glucose, medication adherence, physical activity, and foot care [8, 9]. Appropriate compliance with DSM behaviors can lead to reduced onset or advancement of diabetes-related complications and improved blood glucose control and health outcomes [10, 11]. A statistically significant negative correlation has been reported between diabetes self-management behaviors with HbA1c level [12]. Studies have shown that good DSM leads to improving metabolic control and quality of life in diabetes patients [13, 14].
Several studies in China, Ethiopia, and Indonesia have revealed low compliance with DSM behaviors among diabetes patients [8, 15, 16]. Also, a study in Iran showed that a mean diabetes self-care score of 4.08±0.65 (out of 10), reflecting its suboptimal condition [5]. Various personal, social, and environmental factors are associated with DSM in diabetes patients [17, 18]. Identifying the affecting factors helps to achieve better control of diabetes and improving DSM [4, 18]. This study was conducted to assess DSM and related factors among type 2 diabetes patients attending in urban healthcare centers as the first level of healthcare provider system in Iran.

2. MATERIAL AND METHODS

This cross-sectional study was conducted among type 2 diabetes mellitus (T2DM) patients from January to March 2017. Study population consisted subjects with T2DM attending in urban healthcare centers of Kerman city. Kerman city is located in the southeast of Iran with about 1 million populations. Twelve of 43 urban health centers were selected via random sampling method. A total of 50 patients from each of the selected centers were enrolled in the study through a convenience sampling method. T2DM patients with at least one year of disease duration and at least one-year usage of anti-diabetic medications were enrolled in the study.

Diabetes self-management questionnaire (DSMQ) was used for assessing self-care behaviors. This questionnaire consisted of 16 items in four subscales including ‘Glucose Management’ (GM), ‘Dietary Control’ (DC), ‘Physical Activity’ (PA), and ‘Health-Care Use’ (HCU). The last item asked the overall rating of self-care (19). The answers of the items were recorded in four-item Likert scales including “does not apply to me”, “applies to me to some degree”, “applies to me to a considerable degree”, and “applies to me very much”. The answers were scored as 0, 1, 2, and 3, respectively and for negative items scoring was conducted reversely. Sum of the score for total items of self-management and each subscale was considered as the raw score. Then, the raw scores were divided by the maximum scores and multiplied to 10. Therefore, standard scores of self-management and the subscales ranged between 0 and 10. Studies confirmed the validity and reliability of the questionnaire [20, 21]. Also, we conducted a pilot study on 30 diabetes patient that showed test re-test reliability and Cronbach alpha for the questionnaire as 0.82 and 0.87, respectively.

Demographic data such as patients’ age, sex, marital status, educational level, occupation, and income as well as disease-related characteristics including disease duration, type of medication, diabetes-related complications, and the number of follow-up visits for controlling diabetes by general or specialist physicians during the previous year were gathered.

The questionnaires were completed by face-to-face interview with the eligible patients. Before starting data collection, the interviewer explained the study objectives to the participants and assured them of the confidentiality of the data. Also, after obtaining the written consent, the patients enrolled in the study. The patients who did not accept to enroll in the study received diabetes care services as same as those enrolled in the study. Furthermore, the study proposal was approved by the ethics committee of Kerman University of Medical Sciences (Ethical Code: IR.KMU.AH.REC.1396.1301).

Data were imported to SPSS version 22. Descriptive results were presented by mean, standard deviation and percentage. Independent T-test, one way analysis of variance and Pearson coefficient correlation were employed to data analysis. Also, multivariate linear regression was used to determine predictor variables of diabetes self-management. Level of statistical significance was set at 0.05.

3. RESULTS

Of 600 completed questionnaires, 11 cases were excluded due to uncompleted data. So, data of 589 participants were entered in data analysis (response rate of 98.1%). More than two third (67.9%, n = 400) of the participants were female and 62% had high school education or higher. Over 73% (n = 423) of them were married and 22.2% (n = 131) were employed. The mean (±SD) age of the subjects was 56.40 (11.9) year, with 72.3% (n = 426) of them aged 64 years or younger. Near 30% (n = 172) of the patients took insulin alone or in combination with other antidiabetic agents in their treatment regimen. More than half (51.1%) of the studied patient had at least one of the diabetes-related complications (Table 1). The median disease duration was 7 years (mean = 8.63, SD = 7.8) and the median of medication treatment duration was 6 years (mean = 7.84, SD = 5.6). The mean (±SD) of annual medical visits of the patients in primary healthcare centers was 4.26 (3.52) with interquartile 2-6. The mean of medical visits by a specialist and subspecialist was 2.44 (SD = 1.93). The frequencies of at least one visit by a specialist and subspecialist were 73.3% and 45.2% in the previous year, respectively.

The mean (SD) score of DSM was 6.92 (1.17) out of 10 with interquartile range 6.25-7.70. DC subscale with mean score of 7.48 (1.35) had the highest mean score, followed by HCU (mean = 7.23, SD = 1.60) and PA (mean = 7.05, SD = 2.33) subscales. GM subscale (mean = 6.25, SD = 1.88) had the lowest mean scores of the subscales.

The results of the current study revealed that the mean scores of DSM had significant differences in term of educational level (P < 0.001). Post hoc analysis showed DSM scores of the three subgroups of educational level had significant differences (p < 0.05), in which the patients with university education (7.45) had the highest mean score followed by patients with high school education level (7.00) and primary education level or less (6.67). The patient with monthly household income over $250 US had greater mean score than those with income less than $250 US significantly (6.99 vs. 6.66, P = 0.003). DSM means score of unemployed patients (6.84) was significantly lower compared to employed people (7.18) (P < 001). The mean score of DSM of the patients took insulin in their treatment regimen (7.38) was higher than those received oral antidiabetic drugs (6.73) (P < 0.001). Also, diabetes patients with diabetes-related complications (7.03) had a higher mean score of DMS compared to those without complications (6.80) (P = 0.017). There were no differences in DSM mean score in term of sex and marital status (Table 1)

Table1. Characteristics of the studied sample and comparing mean scores of DSM in terms of demographic and diseases related variables

Independent Variable	**Categories**	**N (%)**	**DSM score**	**P-value**
			Mean (SD)	
sex	Male	400 (67.9)	6.96 (1.30)	.574
	Female	189 (32.1)	6.90 (1.11)	
Marital Status	With spouse	423 (73.4)	6.94 (1.19)	.534
	Without spouse	157 (26.6)	6.87(1.14)	
Education Level	Illiterate and primary school	224(38.0)	6.67(1.18)	<.001
	High school	301 (51.1)	7.00(1.12)	
	university	64 (10.9)	7.45(1.16)	

Job Category	Employed Unemployed	131 (22.2) 458 (77.8)	7.18(1.23) 6.84(1.15)	.004
Monthly Income	less $250 (US) over $250 (US))	161 (27.3) 428(72.7)	6.66(1.11) 6.99(1.19)	.003
Type of Medication	Insulin Oral ant- diabetic drugs	172 (29.2) 417 (70.8)	7.38(1.10) 6.73(1.15)	<.001
Diabetes Complication	Yes No	302 (51.3) 287 (48.7)	7.03(1.19) 6.80(1.14)	.017

As presented in Table 2, the correlation coefficient between PA and HCU subscales was not statistically significant but correlation coefficients between other the subscales were significant. The strongest correlations were between GM and HCU subscales (r = 0.385, P < 0.001), followed by that between GM and DC subscales (r = 0.368, P < 0.001) and between DC and HCU subscales (0.218, P < 0.001). There was a positive correlation between DSM with the number of annual visits by a specialist (r = 0.257, P < 0.001) and treatment duration (r = 0.103, P = 0.013), but DSM had a negative correlation with patients' age (r = -0.083, P = 0.044). There was no association between DSM with disease duration and the number of annual visits in primary healthcare centers (Table 2).

Table2. Correlation between subscales of DMS and age, disease duration, treatment duration, number of annual visits in primary healthcare centers number of annual visits by a specialist.

Variables	**DSM r(P)**	**HCU r(P)**	**PA r(P)**	**DC r(P)**	**GM r(P)**
Glucose management	.823(<.001)	.385(<.001)	.142(.002)	.368(<.001)	1
Dietary control	.629(<.001)	.218(<.001)	.126(.001)	1	
Physical activity	.508(<.001)	.037(.367)	1		
Health care use	.557(<.001)	1			
Age	-.083(.044)	.037(.372)	-.360(<.001)	.163(<.001)	-.013(.750)
Disease duration	.077(.063)	.205(<.001)	-.268(<.001)	.125(.002)	.160(<.001)
Treatment duration	.103(.013)	.224(<.001)	-.258(<.001)	.145(<.001)	.177(<.001)
Number of annual visits in primary healthcare centers	.067(.104)	.173(<.001)	.061(.143)	.034(.410)	.052(.208)
Number of annual	.257(<.001)	.349 (<.001)	-.012(.779)	.080(.053)	.246(<.001)

visits by specialist					

Multivariate linear regression model to determine of predictors of DSM is shown in Table 3. Education level, receiving insulin in the treatment regimen, the number of annual visits by specialists, treatment duration, and the number of annual visits in primary healthcare centers were predictors of DSM, which predicted 17.2% (R2 = 0.172, P < 0.001) of DSM variance. University education (Beta = 0.243, P < 0.001) was the strongest predictor of DMS, followed by high school education (Beta = 0.226, P < 0.001), number of annual visits in primary healthcare centers (Beta = 0.205, P < 0.001), receiving insulin in treatment regimen (Beta = 0.182, P < 0.001), the number of annual visits by specialists (Beta = 0.182, P < 0.001), and treatment duration (Beta = 0.092, P = 0.032).

Table3. Multiple linear regression analysis, predicting variables of DSM

Dependent variables	**Predictors**	**B**	**SE**	**Beta**	**P**	**95.0% Confidence Interval for B**
Diabetes self-Management (Adjusted R2 = .172, P<.001)	Constant	5.695	.144		<.001	5.412-5.972
	Being insulin in treatment regimen	.474	.111	.182	<.001	.256-.691
	Number of annual visits by specialists	.112	.026	.182	<.001	.061-.163
	University education High school Primary school and illiterate (references)	 1.151 .534	 .205 .123	 .243 .226	 <.001 <.001	 .747-1.554 .330-.739
	Number of annual visits in primary healthcare centers	.067	.104	.205	<.001	.040-.095
	Duration of treatment	.019	.009	.092	.032	.002-.037

4. DISCUSSION

The result of this study revealed that the mean score of DSM was 6.92. Based on DSM score quartiles, diabetes self-management was at a moderate level in diabetes patients. A study in Thailand using the DSMQ scale showed that the mean score of DSM was 7.11 that have been evaluated as a moderate level [22]. A study in Indonesia revealed that 63.8% of patients had a poor level of DSM and another study in Oman reported that the most of diabetes patients had a low level of compliance with DSM behaviors [7, 10]. Bigdeli et al. in a study in Iran reported a moderate level of DSM [23]. An explanation for suboptimal DSM can be that DSM behaviors include challenging, embedded, and deep changes in patients' lives, so the majority of diabetes cases were not able to develop and especially maintain these healthy behaviors lifelong [24]. Furthermore, it has been evidenced that different social, cultural, financial, personal, and medical factors can have a considerable effect on diabetes self-management behaviors [7, 10, 15, 16]. So, because of the multifactorial reasoning of DSM and complexity of the relationship between DSM and various factors, having good DSM behaviors and improving them are challenging issues for healthcare providers and patients. Good compliance with DSM behaviors leads to better control of the disease, preventing or delaying diabetes-related complications, and promoting patients' quality of life [7, 12, 14].

The result of this study showed that DC subscale with mean score 7.48 had the highest mean score, followed by HCU, PA, and GM subscales. A study in Thailand showed that mean scores of DC, HCU, PA, and GM subscales were as 7.34, 7.97, 7.13, and 6.80, respectively [22]. Another study in Oman showed that only 1% of diabetes patients were regular on self-monitoring blood glucose; 9.5% exercise regularly; and 18% maintain healthy diet practices [7]. DSM behaviors are multidimensional issues such that to develop and continue each of them the patients require to have adequate knowledge about diabetes, its complications, and importance of adherence to various aspects of self-management behaviors [8, 10, 24]. Moreover, diabetes patients should have a positive attitude and capability to perform these behaviors [6]. Various social, cultural, personal, environmental factors can affect different self-care behaviors in different manners [17, 18]. The difference in the level of compliance with DSM behaviors can be explained considering the change in these factors from one country to another [15, 16].

The results of this study showed that the mean DSM score was higher in patients with high school and university education compared to those with primary school education level. Also, higher education level was the strongest predictor of DMS in this study. The results of several studies, in line with our findings, have revealed that patients with a higher level of education exhibit better self-management behavior [8, 11, 25]. According to a study in China, low education and old age were as predictors of poor self-care in diabetes patients [25]. The patients with higher education are more capable of receiving and handling knowledge while the low-educated patients are more likely to have misconceptions of DSM behaviors [11, 25, 26]. However, in contrast with this result, some studies did not show any association between DSM behaviors and education level [10, 12, 27].

Employed patients had higher DSM score rather than the unemployed ones in the current study. It has been documented that workplace conditions have considerable effects on diabetes management [28, 29]. Interferences between occupational tasks and self-care activities have negative effects on self-management behaviors in employed diabetes patients [28]. An explanation to higher DSM means score in the employed patient in this study can be due to a higher educational level in this group compared to unemployed patient.

Several studies consistent with the current study have reported that individuals with higher household income are more likely to have good self-management [15, 18, 30]. Sirari et al have reported that self-care behaviors were better in diabetes patients with higher socioeconomic status [30]. Inconsistent with this study, a study in Iran reported that there was not a significant relationship between self-care and household income [23]. Diabetes patients need to afford drugs, equipment, and healthy food, and take regular medical health care services for proper control of their disease. Therefore, the financial factor can influence diabetes self-care behaviors [31].

According to the results of the current study, patients who took insulin in medication regimen and those suffering diabetes-related complications had higher DSM mean scores. Several studies, consistent with our study, have reported that insulin recipients had better DSM condition compared to those taking oral hypoglycemic medications for diabetes treatment [8, 23]. An explanation for this result may be that the patient using insulin had more serious and complicated diseases than those using oral antidiabetic drugs. Also, insulin users and complicated patients are more likely to receive advice about treatment regimen and self-management behaviors [27].

In our study, treatment duration of the disease had a significant correlation with DSM but there was no association between disease duration and DSM. Unlike our finding, several studies have demonstrated that diseases duration is a

major factor affecting DSM [23, 27, 32]. Patients with longer duration of treatment were likely to receive more education about self-care, improve attitude toward self-management, and increase their self-care ability that causes better adherence to self-care behaviors [8,23]. Also, when treatment is prolonged, adaptation with lifestyles changes and healthy behaviors are improved [24].

The current study revealed that the number of annual medical visits by general physicians and specialists (internist or endocrinologist) is a predictor of DSM score. A study in Iran has shown that medical visit by physicians is an effective factor on the healthy behavior of diabetes self-care, such that there was a negative correlation between the time interval of visiting and the performance of self-care behavior [33]. Bigdeli et al. reported a positive significant correlation between self-care behaviors and the number of annual visits to the doctor [23]. Physicians and other health care providers during providing healthcare services to diabetes patients can improve self-care of diabetes patients with increasing patients' knowledge and self-efficacy as well as modifying their beliefs [8]. Studies have demonstrated that the patients that take clear information and favorable education about their disease during medical appointments are more likely to understand importance and necessity of disease self-care and comply with diabetes self-care behaviors [23, 33, 34].

Limitations

This study assessed self-management amongst Iranian diabetes patients using DSMQ in the first level of healthcare delivery system, where the majority of patient with diabetes took their health and medical care. Therefore, the results could be generalized to the majority of diabetes patients. However, there were two limitations of this study. Firstly, the study was cross-sectional, so the cause-effect relationship was not confirmable. Also, needed data were collected in a self-reported manner and thus there was the possibility of desirability bias.

5. CONCLUSION

According to the results of this study, self-management behaviors (particularly glucose management and physical activities) were suboptimal among diabetes patients. The factors including education level, job, household income, type of medication, treatment duration, and the number of annual visits by physicians had an association with DSM. Also, it was found that university and high school education, receiving insulin in the treatment regimen, the number of annual visits by specialists or general physician, and duration of treatment were predictors of DSM. Diabetes self-care as one of the important components of a diabetes control program should be considered in the first level of health care delivery system in Iran. A multidisciplinary approach including ongoing patients' educations about diabetes self-management, training to increase family and social support, identifying lifestyle modification in high-risk patients, and using motivational modality can improve compliance with DSM behaviors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

ETHICAL APPROVAL

THE STUDY PROPOSAL WAS APPROVED BY THE ETHICS COMMITTEE OF KERMAN UNIVERSITY OF MEDICAL SCIENCES (ETHICAL CODE: IR.KMU.AH.REC.1396.1301).

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