Investigating the factors affecting self-care behaviors in diabetic patients: A systematic review

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Abstract

Diabetes is one of the most common non-communicable diseases, which have far-reaching economic and social consequences and threaten the national production and economy of countries. However, diabetes is a disease of self-control. Therefore, self-care strategies can maintain patients' independence while reducing the burden imposed on health care resources. This study aimed to investigate the factors affecting self-care behaviors in diabetic patients. This study is a systematic review; Google Scholar, SID, Scopus, PubMed, Science Direct, and ISI databases were used; 17,500 articles were found including the keywords "self-care", "diabetes" and "affecting factors" in the search process, and all studies after 2010 were included. After reviewing the titles and abstracts, 51 studies were included. The studies' reports on self-care behaviors and their prevalence were very different depending on the tools used. The studies show the relationship between self-care behaviors in patients with diabetes and various factors, including demographic, socio-economic, and psychological factors. The most important variables included are educational status, age, gender, marital status, BMI, occupational status, duration of illness, comorbidities, income, having glucometer, perceived severity of the disease and its complications, perceived barriers, diabetes distress, diabetes knowledge, perceived susceptibility, self-efficacy, social and family support, depression, and anxiety. Due to the relationship of demographic, socio-economic, and psychological factors with self-care behaviors in patients with diabetes, it is suggested that a comprehensive program for the management of caring behaviors in diabetic patients should be designed to include all of the above.

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Introduction

Today, lifestyle changes, the spread of poor nutrition patterns, and reduced mobility in daily life have led to the spread of non-communicable diseases that have become a major cause of death and disability in developed and developing countries. Diabetes is one of the most common non-communicable diseases in the world[1] that it characterized by high blood sugar. The global prevalence of diabetes in 2019 is estimated at 463 million (20-79 years) adults. With this forecast, this number will probably increase to 700 million by 2045.[2] Diabetes is accompanied by multiple comorbidities and complications, and their resulting disabilities affect the social and professional life of people with the disease, and it has direct and indirect costs for patients, health systems, and the community,[3] especially in low- and middle-income countries where the disease was the cause of 4.2 million deaths in 2019 and caused at least $760 billion in health care costs.[4]

Worldwide, the increasing prevalence of diabetes has been associated with an increasing prevalence of modifiable risk factors.[2] However, diabetes is a self-controlled disease in which patients can meet 99% of their needs. Thus, self-care strategies can change the roles that diabetics play. So that they can maintain their independence while reducing the burden on health care resources.[5]

Self-management refers to an individual's ability to manage symptoms, treatment, physical and psychosocial consequences, and lifestyle changes necessary to live with a chronic illness.[6]

Self-care behaviors that can be practiced by patients with diabetes include physical activity such as light exercise, diet, blood sugar control, foot care, behavioral therapy such as taking medication (insulin or oral hypoglycemic agents), and prevention of complications.[7-10]

According to the World Health Organization (WHO), increasing the effectiveness of self-management support may have a much greater impact on public health than other specific therapeutic advances;[5] also regular and good self-care has a positive effect on the quality of life, because it leads to efforts to control blood sugar levels and prevents the risk of complications.[9] In fact, self-care is considered the cornerstone of diabetes care, and accurate self-care assessment is important to identify and understand areas of difficulty in diabetes management.[7]

Previous studies found correlations between some of the factors associated with the self-care behaviors of patients with type 2 diabetes. For example, a previous study showed that age, gender, education, physician-patient relationship, psychological stress, social support, overweight, obesity, high self-efficacy, home blood sugar testing, weekly exercise, diet planning, dietary restrictions, duration of diabetes, year, non-drug treatment, and good appetite were significant variables associated with adherence to self-care behaviors.[11]

Because diabetes management is complex and multifaceted, it also requires a comprehensive assessment to understand the factors that affect self-care behaviors and outcomes, given the gap between understanding and influencing factors affecting self-care behaviors. Therefore, this study aimed to investigate the factors affecting self-care behaviors among diabetic patients.

Materials and Methods

For this systematic review study, based on searches in Magiran, Google Scholar, SID, Scopus, PubMed, Science Direct, and ISI databases, 17,500 articles were found including the keywords "self-care", "diabetes" and "affecting factors". After reviewing the titles and abstracts of the articles, 51 studies were finally selected to review the full text. Among the reviewed articles, only 3 articles (6%) were published in Persian and other articles (94%) were published in English (Table 1).

The exclusion criteria were as follows: i) articles that include studies that were not diabetes specific or included other diseases; ii) were not English or Persian language; iii) articles whose full text was not available; iv) and articles published before 2010.

Regarding the research setting, fourteen were from Ethiopia, ten from Iran, four from the United States, four from Turkey, four from Malaysia, three from Ghana, three from South Korea, two from Indonesia, and one from Saudi Arabia, Spain, China, Oman, Italy, and South Africa. The sample size in the reviewed studies ranged from 23 to 1996 participants with diabetes.

Results

Self-care behaviors and prevalence of adherence

The studies' report on self-care behaviors varied depending on the tools used: for example, some studies reported only the mean and standard deviation (SD) of the diabetes self-care behaviors score, while others presented the prevalence of self-care behaviors and sometimes both were reported. Among the reports of mean and SD of self-care behaviors score, Kong and Cho[54] study from South Korea with a mean of 68.74±15.76 (out of 100) had the highest score and Bigdeli *et al.*[17] study from Iran with a score of 3.77±1.15 (out of 78) had the lowest mean score of diabetes self-care behaviors.

The reports of the prevalence of self-care behaviors were very different. A total of 39.2% respondents in the Ayele *et al*.[12] study and 43.1% in the Prakash *et al.*[57] study practiced the recommended self-care. Borhaninejad *et al.*[24] in their study showed that among the subjects 67.37% had poor self-care ability, 29.14% had the average ability, and 3.40% enjoyed a proper level of self-care ability. In the study of Kassahun *et al.*,[22] the overall prevalence of poor self-care behaviors toward diabetes mellitus was reported as follows: 49.1% and 24.9% had a low level of adherence to medications, 37.9% medium and 37.2% high. In the study of Alvarado-Martel *et al*.[37] 60.1% of patients reported that it was difficult fro them to follow the treatment recommendations for the care of their disease. The findings of these studies indicated that the majority of patients had poor self-care behaviors;[7-11] while in other studies the majority of diabetes patients followed good self-care practices,[12-15] and finally in the study by Robat Sarpooshi *et al.*,[49] patients received an average score for self-care behaviors.

Diet, medication use/taking, exercise, self-monitoring of blood glucose, and foot care

Regarding diet as an aspect of self-care, Zhou *et al.*[14] reported that 66% of participants consumed four or more meals a day, 52% had consumed sweetened food or drinks more than three times during the preceding week, 26% of the participants consumed fruits daily and 7% of the participants had not eaten any fruit during the preceding week. Another study in Iran showed that consuming fruits and vegetables and following a healthy diet was reported for an average of 4.12 times a week.[18] While most studies have shown that most patients with diabetes do not adhere to their diet care,[8,12,15,19,21] the studies by Ayele *et al.*[12] and Dedefo *et al.*[42] showed that more than half of the respondents followed the recommended dietary intake.

Studies show that patients with diabetes are not committed to exercising. For example, the mean score of physical activity in Saudi patients was inadequate and low 4.46.[59] Mutyambizi *et al.*[60] also report that only 9% of South African patients show adherence to exercise. On the other hand, the results of a study in Ghana showed that in the last 7 days, participants exercised for a mean SD of 4.78 (2.09) days and the most commonly performed diabetes self-care behavior was participation in a specific exercise session 5.19 (2.24) days per week.[61]

The results of Zhou *et al.* study in which Medication self-care adherence and Self-Monitoring of Blood Glucose (SMBG) were investigated, show that the Oral Hypoglycemic Agents (OHA) medication adherence rate was 81±14.3%, and 58% of participants realized the significance of SMBG. However, only 13% of participants practiced SMBG and 3% had tested four or more times during the preceding week.[62]

Table 1. General characteristics of the reviewed studies.

Writer	Year	Type of study	Study samples	Ref
Ayele *et al.*	2012	Facility-based cross-sectional	222 adult diabetic	12
Sharoni & Wu	2012	Cross-sectional	388 patients with type 2 diabetes	13
Zhou *et al.*	2013	Descriptive	163 patients with diabetes	14
Pandit *et al.*	2014	Secondary analysis using Baseline data from a clinical trial	666 patients with diabetes	15
Dehghani-Tafti *et al.*	2015	Cross-sectional	110 diabetic patients	16
Bigdeli *et al.*	2015	Cross-sectional	500 diabetic patients	17
Walker *et al.*	2015	Cross-sectional	615 adults with type 2 diabetes	18
Mansyur *et al.*	2015	Analysis of baseline data from a randomized controlled trial	248 hispanic men and women with uncontrolled type 2 diabetes	19
Sharoni *et al.*	2015	Cross-sectional	200 elderly diabetics	20
Karimy *et al.*	2016	Cross-sectional	210 female diabetic patients aged 30 to 60	21
Kassahun *et al.*	2016	Facility-based cross-sectional	325 adults with type 2 diabetes mellitus (T2DM) patients	22
Eyüboğlu & Schulz	2016	Cross-sectional	167 diabetic patients over the age of 18	23
Borhaninejad *et al.*	2016	Cross-sectional	384 elderly diabetic patients	24
Ausili *et al.*	2016	Secondary analysis of data from a multicentre cross-sectional study	1,192 adults with heart failure (379 patients with heart failure and diabetes mellitus)	25
Ishak *et al.*	2017	Cross-sectional	143 elderly diabetes patients	5
Masoompour *et al.*	2017	Descriptive correlational	400 patients with diabetes	26
D'Souza *et al.*	2017	Correlational and descriptive	140 omani adults with T2DM	27
Mogre *et al.*	2017	Cross-sectional	201 type 2 diabetes patients	28
Amelia *et al.*	2018	Descriptive quantitative and explanatory research	115 patients with type 2 diabetes mellitus (DM)	9
Gurmu *et al.*	2018	Cross-sectional	257 diabetes patients	29
Mohebi *et al.*	2018	Cross sectional	325 diabetics patients	30
Karimy *et al.*	2018	Cross sectional	403 diabetic patients	31
Mariye *et al.*	2018	A hospital-based cross-sectional study	284 adult DM patients	32
Bonger *et al.*	2018	A health facility-based cross-sectional study	419 type 2 diabetes patients	33
Abate *et al.*	2018	Institution-based cross-sectional study	416 patients with DM	34
Allahyari *et al.* [Persian]	2018	Descriptive-analytic study	80 patients with diabetes type 2	35
Jannoo & Khan	2019	Cross-sectional	497 subjects with T2DM	36
Alvarado-Martel *et al.*	2019	A part of a cross-sectional study	428 patients with type 1 diabetes	37
Ayele *et al.*	2019	A hospital-based cross-sectional study	320 diabetic patients	38
Aschalew *et al.*	2019	An institution-based cross-sectional study	403 diabetic patients	39
Mogre *et al.*	2019	Qualitative study	23 people living with type 2 diabetes and 14 health care provider	40
Kim & Lee	2019	Cross-sectional	198 elderly patients with diabetes	41
Dedefo *et al.*	2019	A facility-based cross-sectional study	252 adult diabetic patients	42
Tiruneh *et al.*	2019	An institutional-based cross-sectional survey	385 type 2 diabetes patients	43
Badpar *et al.*	2019	Cross-sectional	190 patients with diabetes mellitus	44
Dalal *et al.*	2020	Cross-sectional	615 adults with type 2 diabetes	8
Oluma *et al.*	2020	Cross-sectional	423 diabetic patients	2
Getie *et al.*	2020	Cross-sectional	513 adults with diabetes	45
Tuncay & Avcı	2020	Cross-sectional	210 patients with type 2 diabetes mellitus older than 18 years	46
Ihan *et al.*	2020	Cross-sectional	207 individuals with type 2 diabetes older than 18 years	47
Sari *et al.*	2020	Descriptive cross-sectional study	546 T2DM patients aged 18 to 80	48
Robat Sarpooshi *et al.*	2020	Analytical cross-sectional study	400 patients with diabetes aged 30 and over	49
Afaya *et al.*	2020	Analytical descriptive cross-sectional	330 patients with type 2 diabetes mellitus aged 25 years and above	50
Kim & Han	2020	Cross-sectional	131 outpatients and in patients with diabetic foot ulcers	51
Mutyambizi *et al.*	2020	A unique health-facilities based cross-sectional survey	396 people living with diabetes	52
Al-Qahtani	2020	Cross-sectional	355 patients with T2DM and ≥18 years	53
Kong & Cho	2020	A cross-sectional descriptive survey	118 outpatients with type 2 diabetes aged over 18 years	54
Babazadeh *et al.*	2020	Cross-sectional	200 patients with type 2 diabetes (being >30 years)	55
Cinaroglu	2021	Cross-sectional	19,129 persons aged >15 years and older (1996 diabetic patients)	56
Prakash *et al.*	2021	An institution-based cross-sectional	276 T2D patients >18 years old	57
Weledegebriel *et al.*	2021	A hospital-based cross-sectional	410 patients with diabetes mellitus more than 15 years	58

In the study by Sharoni *et al.*[63] the Medication compliance had the highest (mean=5.66; SD=2.50) and blood sugar testing (mean=1.18; SD=1.16) had the lowest scores. Dehghani-Tafti *et al.*[64] and Jannoo and Khan[65] also reported, respectively, that taking medicine regularly with an average of 6.48 times per week was the highest self-care behavior and that patients with T2DM had poor self-care behaviors in blood sugar testing.

Sari *et al.*[48] in their study of foot care behavior reported that the foot self-care behavior and knowledge about foot care were poor in diabetic patients in Indonesia. In the study of Dehghani-Tafti *et al.*[64] as well, inspect the inside of shoes with an average of 1.17 times per week was the lowest reported self-care behavior and Weledegebriel *et al.*[66] also reported that only 69 (15.8%) of participants reported self-examination of their feet. This is while the highest total means and standard deviation for the self-care behaviors among the adults with T2DM of Oman were for total foot care.[67]

Factors associated with self-care behavior

The studies show the relationship between various factors including demographic, socio-economic, and psychological factors with self-care behaviors in patients with diabetes, which is described below. Most studies have examined the role of demographic variables in self-care behaviors. The most important variables in this category include educational status, age, gender, marital status, duration of illness, and comorbidities, which have been mentioned in most studies.[17,33-39,42,50,51-56,68]

Self-care practices of dietary diversity and exercise were all concentrated amongst patients with higher socioeconomic status as indicated by the positive Concentration Indices (CIs), whilst not smoking was concentrated amongst those of lower socioeconomic status as indicated by the negative CIs (estimate inequalities in adherence to diabetes self-care Practices).[14]

The Diabetes Self-Care Scale (DSCS) mean score of patients who evaluated their general health as "well" was significantly higher than that of patients who evaluated their general health as "bad". The DSCS mean scores of patients with no health problems other than diabetes were significantly higher than that of patients with additional health problems. The DSCS mean score of the patients who reported they participated in exercise regularly was significantly higher than those who did not exercise regularly. A very weak negative relationship was found between the DSCS and hemoglobin A1c (HbA1c) values.[46]

The mean scores of DSCS patients with an inadequate health literacy level were significantly lower than that of patients at other levels of health literacy. It was determined that education level, exercise status, and health literacy scores were significantly related to diabetes self-care. These variables explained 24.5% of the total variance. It was determined that having a higher education level, exercising, and having high health literacy mean scores were significantly associated with diabetes self-care.[47]

The variance of self-care behavior (20.6%) and 31.3% of the variance of self-efficacy were explained by the age, duration of diabetes, medication, HbA1c, and prevention of living activities. There is no significant difference in the level of self-care behaviors and demographic and clinical characteristics. Diet was significantly correlated with gender, fasting blood glucose, HbA1, ability to fit diabetes in life in a positive manner, and patient-physician communication. The exercise was significantly correlated with the duration of diabetes, diabetes education program, and fasting blood glucose. Age, duration of diabetes, prevention of activities of daily living, education, medication, and HbA1c highly influenced self-care behaviors and self-efficacy among adults with T2DM.[27]

Dietary diversity was associated with being female, being retired, and higher wealth index.[51] Medication adherence was found to be associated with older age groups, being non-African, widowed, and wealth quintile 2 versus wealth quintile 1. Physical activity was found to be associated with tertiary education, being a student, household size >5, and those within a higher wealth index. Self-monitoring of blood glucose was associated with being age category of 61+ years, being non-African, and being married. Not smoking was associated with being female, being non-African, and being retired.[52]

The level of diabetes management was significantly associated with gender, marital status, the experience of diabetic education, the experience of hospitalization due to diabetes mellitus or its complications, and comorbidity. The diabetes management scores for males were significantly higher than those for females, and participants with a spouse performed better in diabetes management than the others. Furthermore, participants with experience of diabetic education and hospitalization due to diabetes mellitus or its complications had significantly higher scores of diabetes management than those who did not. The diabetes management scores of participants with more than two diseases were higher than those of the others.[68]

The stepwise multiple regression analysis revealed that diabetes management was significantly related to perceived family support, the experience of diabetic education, perceived stress, a problem-focused coping strategies, experience of hospitalization, and comorbidity. Furthermore, diabetic foot care was significantly associated with the experience of diabetic education, perceived family support, and serum level of Erythrocyte Sedimentation Rate (ESR) and HbA1c.[68]

Participants' age, educational level, and practice of self-care behaviors influenced the adherence to anti-diabetes medication. Participants aged 70 years and above were 79% less likely to be non-adherent to medication as compared to those below 50 years. Participants with senior high school education were 3.7 times more likely to be non-adherent to medication than those with tertiary education. Participants with tertiary education had an increase in the level of practice of self-management by 1.14. A unit increase in knowledge score also increased the level of practice of self-management by 3.02.[49]

It was revealed that several years in school were significantly associated with patients' frequency of adhering to the diet. Female gender and non-ownership of glucometer had a decrease in SMBG frequency compared to male gender and ownership of glucometer. Females had the frequency of SMBG decreased by -0.287 compared to males while those who did not own glucometer had their frequency of SMBG decreased by 1.85.[49]

Patients who assume oral hypoglycemic agents had higher self-care and lower HbA1c than those who assume insulin. Results indicated that females had a higher self-care score than males, participants aged 60 years or older had a higher self-care score than those aged below 60 years old, unemployed participants had a higher self-care score than those who were employed, and those who did not smoke had a higher self-care score than those who smoked. Furthermore, participants with an HbA1c of 6.5% or higher had a higher self-care score than those with an HbA1c of less than 6.5%. Participants with fasting blood glucose levels less than 130 had a higher self-care score than those with fasting blood glucose levels of 130 or higher. Factors affecting self-care were the following four: self-efficacy, HbA1c, occupation status, and smoking status. Higher engagement in self-care was associated with higher self-efficacy, lower HbA1c, unemployment, and nonsmoking status. The regression model of self-care among the type 2 dia-

betes patients was statistically significant, and the explanatory power of the adjusted R2 was 69%.[54,69]

The result showed that respondents who attended secondary education had higher self-care activities than those who were illiterate and had received only primary education. Other relations did not result in any significant difference. The results of our regression analysis showed that there was a negative significant linear relationship between self-care activities and HbA1c, patients with other chronic diseases, and primary level of education. Those variables explained 28% of the variance in self-care activities. Other variables, such as demographic variables (age, gender, and ethnicity), and clinical data such as Fasting Blood Sugar (FBS), Body Mass Index (BMI), type of treatment, length of diabetes, complication of diabetes, and health education, did not show significant results.[19]

Higher social support was associated with high levels of HbA1c, FBS level, the duration of diabetes, and a decrease in BMI. It was observed that the patients with low education, Hb1Ac, and FBS level, with other chronic diseases and who have had diabetes for some time had low self-care activities. There was a significant negative relationship between an increase in social support and a decrease in self-care activity.[20]

T2DM patients who practiced good self-care were less likely to have low knowledge. Poor self-care behaviors were statistically different by the level of education, family history of DM, adherence to medications, having a glucometer at home, and history of alcohol consumption. Respondents with lower educational levels were likely to have poor self-care behavior than those with higher secondary education. Having a previous family history of DM was found to be protective against poor self-care behaviors. Compared to respondents with a low level of adherence to medications, those with medium level were 60% less, likely having poor self-care behaviors. Interestingly, respondents with glucometers at home were 2.5 times more likely to have poor self-care behaviors than those who did not have glucometers at home. Compared to respondents who did not drink alcohol, those who had a history of alcohol consumption were highly likely to have poor self-care behaviors. Among respondents with a low level of adherence to medications, 55.8% had a low level of knowledge of diabetes, 63.6% had poor self-care behaviors and 16.9% had poor glycemic control levels. Similarly, among those who had a medium level of adherence to medications, 17.9% had a medium level of knowledge on diabetes, 41.9% had poor self-care behaviors and 21.4% had poor glycemic control. Among respondents who had a high level of adherence to medications, 35.7% had a high level of diabetes knowledge, 53.9% had good self-care behaviors and 54.8% had a good glycemic control level.[21]

A high level of adherence to medications was the reference group. Farmers compared to daily workers were highly likely to have a low level of adherence to medications. Respondents with a medium level of knowledge of diabetes were 80% less likely to have a low level of adherence to medications. The relative probability of having a low level of adherence to medications among respondents who had good glycaemic control levels was higher than those who had poor glycaemic control levels. The relative probability of having a medium level of adherence to medications among respondents who had BMI between 18 and 25 kg/m^2 was significantly higher than those who had 30 kg/m^2 and above. Good glycaemic control level was significantly associated with a medium level of adherence to medications.[22]

Regimen-related distress was associated with a lesser likelihood of meeting recommended physical activity guidelines. The presence of diabetes distress, both moderate and high, were significant, independent predictors of the lesser likelihood of high medication adherence and high diabetes distress was a significant predictor for higher HbA1C levels. Bivariate associations were performed between depression and anxiety with every behavioral and clinical outcome. Patients who were more depressed and/or anxious were less likely to be highly adherent. In addition, patients who were more depressed were less likely to meet recommended physical activity guidelines. Multivariate analyses were conducted to examine the explanatory effect of either depression or anxiety in previous models that included diabetes distress (medication adherence, glycemic control, diastolic blood pressure). When depression and anxiety were included with diabetes distress, only anxiety was a significant predictor for medication adherence and when this variables added to the model for HbA1C no variable was a significant predictor of the outcome.[15]

In final, older age, low income, being married, and poor knowledge about diabetes variables were associated with poor self-care practice.

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