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Review

Self-care behaviors in people living with type 2 diabetes

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Abstract

Introduction: Type 2 diabetes is a chronic disease that impairs the body's ability to use carbohydrates in foods for energy. Self-care is an effective strategy to improve the status and control of chronic diseases, including type 2 diabetes. The present study aimed to systematically review the current self-care behaviors in patients with type 2 diabetes. **Methods:** We carried out a systematic review in February 2021 using the PubMed, Scopus, Science Direct, and Web of Science databases. We evaluated the records in two phases of title/abstract and full-text screenings against the inclusion/exclusion criteria. Non-English studies, reviews, case reports, studies lacking full-text, and studies on non-human subjects were excluded. We then extracted the data into word tables and the extracted data was used to draft the study. **Results:** We identified 43 eligible records. In this study, a set of self-care behaviors was identified for individuals with type 2 diabetes in five main groups: diet, exercise, blood sugar monitoring, medication adherence, and other self-care behaviors. Based on the study's findings, the majority of reviewed studies (n=37, 86.0%) referred to diet and exercise as an effective self-care behavior for type 2 diabetes. Blood glucose monitoring, medication adherence, and foot care were reported in 74.4%, 58.1%, and 37.2% of other studies, respectively. **Conclusion:** Given the high prevalence of type 2 diabetes worldwide, lifestyle amendments such as diet modification and daily exercise can be effective in managing this disease. Therefore, it is recommended to focus on self-care, especially behavior change and lifestyle modification of people with type 2 diabetes, rather than investing only in the clinical treatment of this disease.

Keywords: Type 2 diabetes, Self-care, Self-management, Self-care behavior, Lifestyle.

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Introduction

Diabetes is a progressive and chronic metabolic disorder that has become a significant health problem worldwide, especially in developing countries [1]. The global prevalence of diabetes is about 6.4% and is expected to affect 366 million people by 2030 [2]. The most important reasons for the increasing number of patients can be the aging population and lifestyle changes in the paradigm shift toward inactivity and poor nutrition [1]. Approximately 20% of people over the age of 65 have type 2 diabetes, which may increase rapidly in the coming decades. Various studies reported that the prevalence of diabetes in older people had been estimated at least 14% in Iran. Type 2 diabetes is one of the significant health issues of the elderly, which imposes a high burden on older people, families, and the countries' health systems [3].

Uncontrolled diabetes often results in complications such as diabetic foot ulcers, blindness, kidney and heart diseases, and hypertension [2]. One of the most important causes of these complications that predispose to mortality in diabetic patients is the lack of self-care behaviors [3]. This disease requires long-term medical care and self-management training and support to prevent acute complications and reduce the risk of long-term complications. Diabetes care is complex, and we need to address many issues beyond blood sugar monitoring, and a wide range of interventions are needed to improve diabetes outcomes [1, 4].

Integration of daily activities, such as exercise, nutritional behaviors, blood sugar monitoring, developing health-related programs, and communication with care providers, are major contributors to diabetes self-care [5]. In patients with type 2 diabetes, more than 95% of the treatment process is performed by the patient, and care providers play only a controlling role in the treatment process [6]. Self-care in patients with type 2 diabetes can have various physiological, social, emotional, and spiritual dimensions. Considering the course of diabetes, the dimensions mentioned above show that the physiological dimension of self-care (such as diet, exercise, blood sugar monitoring) is more important [7, 8].

Self-care is an active, practical patient-directed process that is essential to preventing short- and long-term complications. Self-care behavior is a critical concept in health promotion and includes decisions and activities taken to adjust to a health problem or improve health status. Diabetes self-care refers to proper and timely insulin injection, appropriate diet, regular exercises, identifying hyperglycemia symptoms, regular medication use, foot care, and increasing quality of life [9]. Recent research shows that diabetic patients should spend 58 min/day on self-care, and over three-quarters of adults with chronic illness should play an active self-care role at all or most of the time [9, 10].

Considering the importance of type 2 diabetes as a chronic disease and the importance of self-care in advancing the therapeutic goals of this disease, specific requirements and policies focused on providing self-care services can be a remarkable achievement for health-care organizations. People with type 2 diabetes can contribute to their disease management by practicing proper self-care behaviors. Besides, adopting specific policies to provide guidance and control over the prescribed medications and diets can reduce the time and cost of in-person referrals. Also, patients' self-care involvement can create the necessary motivation to continue cooperating with patients and improve the quality of care. Therefore, the present research aimed to identify the self-care behaviors of people living with type 2 diabetes.

Methods

Data sources

We conducted this systematic review according to the PRISMA (Preferred Reporting Items for Systematic Reviews) 2020 guidelines. To prepare this study, we conducted a search in the databases of PubMed, Scopus, Science Direct, and Web of Science using the keywords of Type 2 diabetes, Self-care, Self-care behavior based on the following search strategy.

A: "Self-management" OR "Self-care" OR "Self-care behaviors" OR "Self-care

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policies" OR "Self- efficacy" OR "Life style"
B: "Diabetes" OR "Type 2 diabetes" OR "Diabetes Mellitus" OR "Noninsulin-Dependent Stable" OR "Adult-Onset Diabetes Mellitus" OR "Maturity-Onset Diabetes Mellitus"
C: [A] AND [B]

Study selection

Two independent investigators screened and selected the studies with the most relevant titles and abstracts. We then reviewed the full text of the extracted papers and selected the most relevant articles based on the eligibility criteria. The inclusion criteria included peer-reviewed research articles (full-text access) in the English language; publications between 2015 and 2021 and addressed the issue of self-care for people with T2DM.

The exclusion criteria for the present study were as follows:

- Case reports
- Abstracts, conference abstracts, or no access to the full-text document
- Non-English articles
- Reviews, systematic review, meta-analyses, or other studies that lacked original data
- Non-human studies, i.e: animal or pure lab-based studies.

Data extraction

Two independent researchers organized data, including the first author's name, date of publication, and self-care behaviors, into a table. Other authors cross-checked the selected papers to ensure the relatedness and comprehensiveness and avoid overlap or duplication of the content. The relevant full-text articles were included, and their results were discussed to make the final selection. After reading the full text of all eligible papers, the researchers made the final decision for each study.

Results

General specifications

Using the applied systematic search strategies, 1025 articles were identified and retrieved. After an initial review of retrieved articles, we removed 392 duplicates and screened the title and abstract of the remaining 633 articles. After applying the selection criteria, 590 articles were excluded, and only 43articles met inclusion criteria and were included in the final review (Figure 1).

Assessment of self-care behaviors

In this study, a set of self-care behaviors was identified for individuals with type 2 diabetes in four main groups: diet, exercise, blood sugar monitoring, and medication adherence. Table 1 represents each of these categories, along with the type and results of reviewed articles. Based on the study's findings, the majority of reviewed studies (86.0%) referred to diet and exercise as an effective self-care behavior for type 2 diabetes. Blood glucose monitoring, medication adherence, and other behaviors were reported in 74.4%, 58.1%, and 72.1% of other studies, respectively (Figure 2).

Other self-care behaviors

According to the findings, 31 out of the 43 studies reviewed, in addition to the four main self-care behaviors, also addressed other self-care behaviors. Among other self-care behaviors, foot care (37.2%) was the most frequently practiced self-care behaviors. Other identified self-care behavior for people with type 2 diabetes included were shown in Figure 3.

Discussion

Diabetes is the leading cause of new cases of blindness, kidney failure, and non-traumatic

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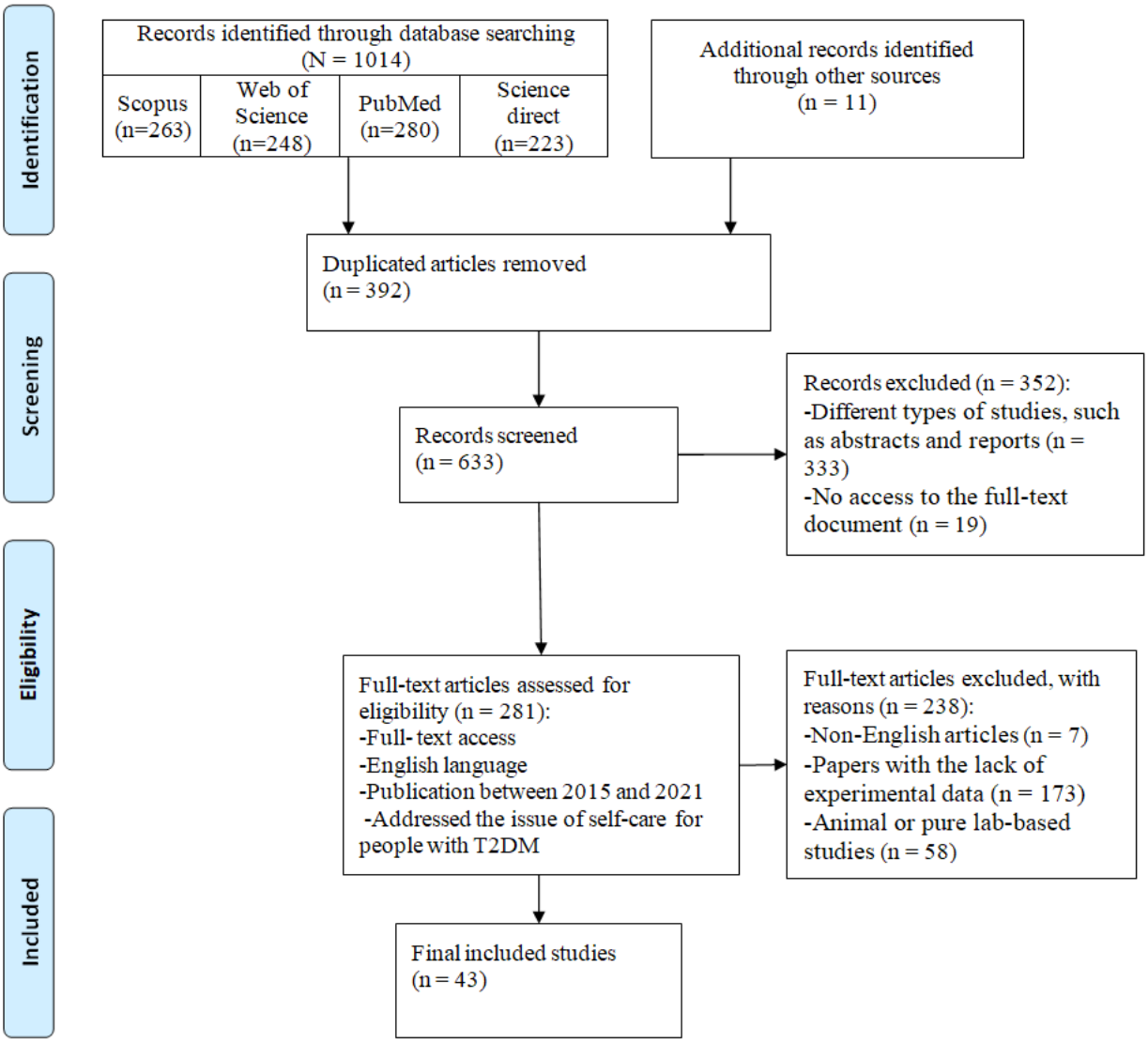

Figure 1: Flow diagram for the selection process of identified articles.

amputation. Regular blood sugar monitoring will lead to better long-term results and reduced complications. Self-care is an essential part of diabetes management and includes patient behaviors regarding diet, exercise, blood sugar monitoring, and proper and timely medication use [54]. Self-care leads to an improved quality of life, optimal metabolic control of the disease, a reduction in the disease's complications, number of hospitalizations, and medical costs [55].

In the present study we showed that lifestyle and self-care behaviors play an important role in the management of type 2 diabetes. Any ignorance of self-care behaviors will increase complications in people with diabetes [55]. Recent evidence indicates that a poor lifestyle is the leading cause of mortality in patients with type 2 diabetes [56–58]. For many patients, it is difficult to adhere to self-care behaviors in their lifestyle [59]. However, health-care providers need to convey to patients the fact that appropriate self-care behaviors are as effective as drug treatment in controlling their disease [60]. The present study's findings also revealed that diet was the most important factor mentioned in most of the studies reviewed. The complications of type 2 diabetes can be reduced by changing one's diet and losing extra weight [61, 62]. They should carefully monitor carbohydrate intake and calculate the amount of carbohydrate, fat, and protein intake per meal [63]. Based on the Look AHEAD Study findings, at 1 year, an intensive lifestyle intervention (ILI) significantly improved glycemic control and cardiovascular risk factors such as blood

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Table 1: Identified categories of self-care behaviors for type 2 diabetes.

ID	The first author (reference)	Date of publication	Self-care behaviors of T2DM					
			Diet	Exercise	Blood sugar checks	Medication adherence	Type of study	Results of study
1	Al-Qahtani A. M. [11]	2020	Yes	Yes	Yes	No	Cross-sectional	Inadequate self-care behavior was widely prevalent in study population
2	Babazadeh T. [12]	2020	Yes	Yes	Yes	Yes	Cross-sectional	Self-efficacy was found effective in improving health behaviors in patients with T2DM
3	Caruso R. [13]	2020	No	Yes	No	No	Cross-sectional multicenter study	Males and females differently perform self-care. Self-care confidence plays a different role in predicting self-care behaviors in males and females
4	Chollou K. M. [14]	2020	Yes	Yes	Yes	Yes	Cross-sectional	The health literacy (HL) dimensions predicted approximately one-fourth of self-care behaviors and the self-care behaviors and HL dimensions about eight-tenths of HbA_{1c} in this population
5	Dalal J. [15]	2020	Yes	Yes	Yes	No	Cross-sectional	After adjusting for covariates, this study demonstrated that higher patient dissatisfaction was significantly associated with poor general diet, worse blood glucose levels, and lower mental component score for quality of life
6	Gaffari-fam S. [16]	2020	Yes	Yes	Yes	Yes	Cross-sectional	In total, 65.5% of the variation in the health-related quality of life (HRQL) is explained by the health literacy, self-care behavior, and the demographic variables
7	Jones J. [17]	2020	Yes	Yes	Yes	Yes	Qualitative descriptive	Tribal communities have contemporary strengths and cultural traditions that can be activated to enhance diabetes self-management education and support
8	Lael-Monfared E. [18]	2020	No	No	No	Yes	Analytical cross-sectional	Attitude and enabling factors are effective constructs in predicting the intention to perform preventive behaviors of ocular complications in T2D patients
9	Lin C. Y. [19]	2020	Yes	Yes	Yes	No	A longitudinal design	The effects of enrollment of empowerment sessions in Patient Empowerment Program on exercise and foot care were likely to be mediated through behavioral intention

(Continues)

Table 1: Continued

ID	The first author (reference)	Date of publication	Self-care behaviors of T2DM				Type of study	Results of study
			Diet	Exercise	Blood sugar checks	Medication adherence		
10	RobatSarpooshi D. [20]	2020	Yes	Yes	Yes	Yes	Analytical cross-sectional	It is possible to reduce complications in patients, and improve their quality of life, by improving their self-care behaviors
11	Şahin S. [21]	2020	No	No	No	No	Descriptive	In the family health centers, individuals who are at risk must be initially identified and efforts should be made to prevent complications and increase illness acceptance
12	Wang M. J. [22]	2020	Yes	Yes	Yes	No	Cross-sectional	The effect of health literacy on self-efficacy was more significant in the shared decision-making than in the physician decision-making
13	Nepper M. J. [23]	2019	Yes	Yes	Yes	Yes	Quasi experimental design	The results suggested the feasibility and usefulness of the text message program for diabetes education
14	Moura N. D. [24]	2019	Yes	Yes	Yes	Yes	Quasi experimental design	Educational interventions had a positive effect on adherence to self-care and functional literacy in health
15	Bukhsh A. [25]	2019	Yes	Yes	Yes	No	Cross-sectional	Disease knowledge significantly correlated with glycated hemoglobin levels and self-care activities of Pakistani people diabetes
16	Zajdel M. [26]	2018	Yes	Yes	No	Yes	Cross-sectional	Communal coping on a daily basis may help both patients and spouses adjust psychologically to the illness as well as enhance patient self-care behaviors
17	Tharek Z. [27]	2018	Yes	Yes	Yes	Yes	Cross-sectional	Higher self-efficacy was correlated with improved self-care behavior and better glycemic control
18	Ikeda K. [28]	2018	Yes	Yes	No	No	Analytical cross-sectional	The findings of this study might lead to a better understanding of culturally sensitive behavioral intervention for the disease
19	Bukhsh A. [29]	2018	Yes	Yes	Yes	Yes	Randomized controlled trial	Glycemic control in T2DM patients requires optimum self-care activities

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20	Sittner K. J. [30]	2018	Yes	Yes	No	No	Cross-sectional	The amelioration of diabetes distress could improve self-care even in the presence of pervasive, chronic social stressors such as micro-aggressions
21	Wagner J. [31]	2017	No	No	Yes	No	Prospective	Assessment of near-to-real time behaviors and experiences combined with continual glucose monitoring can reveal dynamic biobehavioral relationships with clinical relevance
22	Onuoha P. [32]	2017	No	No	Yes	Yes	Quantitative descriptive	Level of self-care knowledge and proficiency of self-care practice with regards to blood glucose monitoring, medication compliance and foot care had no significant relationship to socio-demographic characteristics of age, ethnicity, religion, educational level
23	Babazadeh T. [33]	2017	Yes	Yes	Yes	No	Cross-sectional	Self-care behaviors were significantly associated with quality of life; among them, the greatest influence was observed in self-care nutrition behavior
24	Hemmati M. M. [34]	2017	Yes	Yes	Yes	Yes	RCT	Beneficiary effects of a family-oriented education on self-care and patient outcomes
25	Kugbey N. [35]	2017	Yes	Yes	No	Yes	Cross-sectional	Cognitive and emotional representation of diabetes and diabetes knowledge as keys determinants of patients' diabetes self-care practices
26	Lu Y. [36]	2017	Yes	Yes	Yes	Yes	Systematic review	Rigorous psychometric testing, operational definition of self-care, and sufficient explanation of scoring need to be considered for further instrument development
27	Nejaddadgar N. [37]	2017	Yes	Yes	Yes	Yes	Cross-sectional	The lowest score of self-care was related to doing blood sugar test, regular drug use and physical activity
28	Mogre V. [38]	2017	Yes	Yes	Yes	No	Cross-sectional	People with low education and women may need additional support to improve adherence to self-care behaviors
29	Istek N. [39]	2016	Yes	No	Yes	Yes	Descriptive	The patients' activities of daily living were found to affect their self-care agency
30	Simon-Tuval T. [40]	2016	Yes	Yes	Yes	Yes	Cross-sectional	Risk preference was associated with adherence to self-care behaviors

(Continues)

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Table 1: Continued

ID	The first author (reference)	Date of publication	Self-care behaviors of T2DM					
			Diet	Exercise	Blood sugar checks	Medication adherence	Type of study	Results of study
31	Mayberry L. S. [41]	2016	Yes	Yes	Yes	Yes	Health intervention	Patient participant's reported family-focused add-on for motivating self-care increased self-care
32	Miller S. T. [42]	2016	Yes	Yes	No	No	Descriptive	Receipt of diabetes education and some specialty care were below national benchmarks
33	Mayberry L. S. [43]	2016	Yes	Yes	Yes	Yes	Systematic review	Disparities in the performance of self-care behaviors may contribute to Suboptimal glycemic control among non-Hispanic Blacks
34	Lee E. H. [44]	2016	No	Yes	Yes	No	Cross-sectional	Health literacy exerted a direct effect on self-care activities, and indirect effect on self-care activities via self-efficacy
35	Williams J. S. [45]	2016	Yes	Yes	Yes	Yes	Cross-sectional	Patient-centered care was associated with diabetes self-management and quality of life
36	D'Souza M. S. [46]	2015	Yes	Yes	No	Yes	Cross-sectional	The composite score and three subscales of Diabetes Empowerment Scale were a significant and strong predictor of good glycemic control among with T2DM. Age, education, duration of DM, prior DM education program and medications were significantly associated with DES
37	Al Johani K. A. [47]	2015	Yes	Yes	Yes	No	Multicenter cross-sectional	Males and those with lower incomes were less likely to practice self-care activities

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38	Da Cruz Vargas E. [48]	2015	Yes	Yes	No	Yes	Descriptive	Sixty percent of the users were capable of seeking solutions for the barriers and of making informed decisions that were appropriate to their health and life context, trying to find solutions to cope with barriers in diabetes self-care practices
39	Dawson A. Z. [49]	2015	Yes	Yes	Yes	Yes	Cross-sectional	Perceived discrimination was associated with health behaviors and the mental component of quality of life
40	Ouyang C. M. [50]	2015	Yes	Yes	Yes	Yes	Cross-sectional	Patients who took their diabetes medications had lower hemoglobin A_{1c} levels and fewer chronic complications than those who did not
41	Laranjo L. [51]	2015	Yes	Yes	Yes	No	Qualitative	Three major themes were identified: diet, physical exercise, and glycemic control. Difficulties in changing dietary habits were grouped in four main categories: decisional, food quality, food quantity, and dietary schedule
42	Ouyang C. M. [52]	2015	Yes	No	No	No	Cross-sectional	Women were more likely than men to count carbohydrates and reduce fat in their diets. Patients who attended more nutrition education sessions were more likely to follow diabetes meal plans and the diabetes exchange system
43	Potter L. [53]	2015	Yes	Yes	Yes	No	Cross-sectional	Individuals who attributed self-reported discrimination to weight had significantly higher HbA_{1c} levels, higher levels of diabetes-related distress, and worse diabetes-related self-care behaviors (general diet, exercise, and glucose testing)

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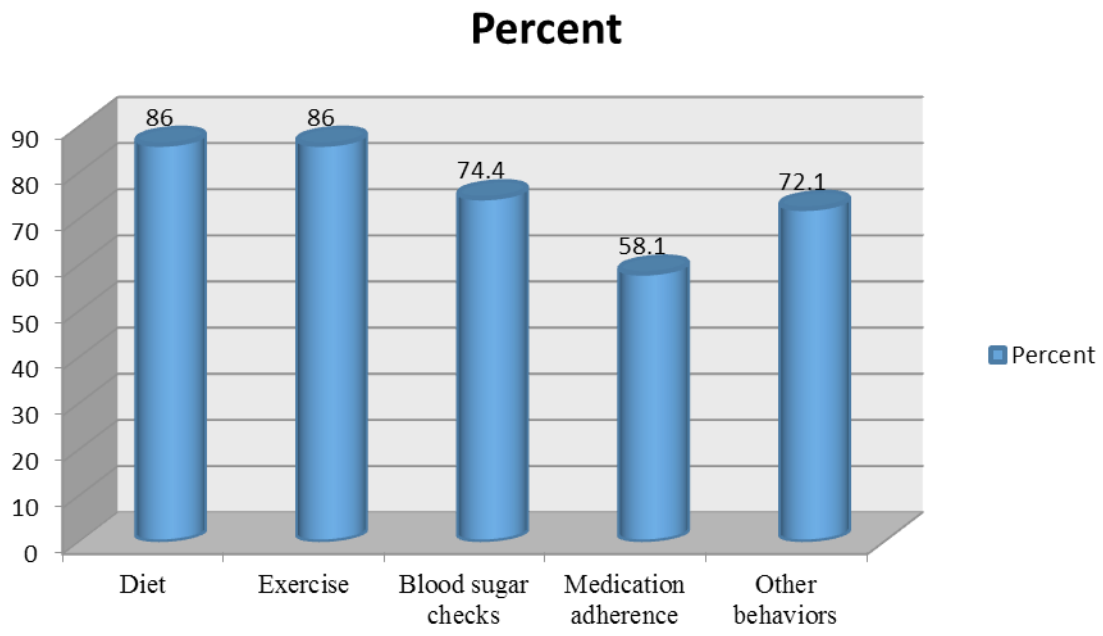

Figure 2: Percentage of articles that addressed self-care behaviors for type 2 diabetes.

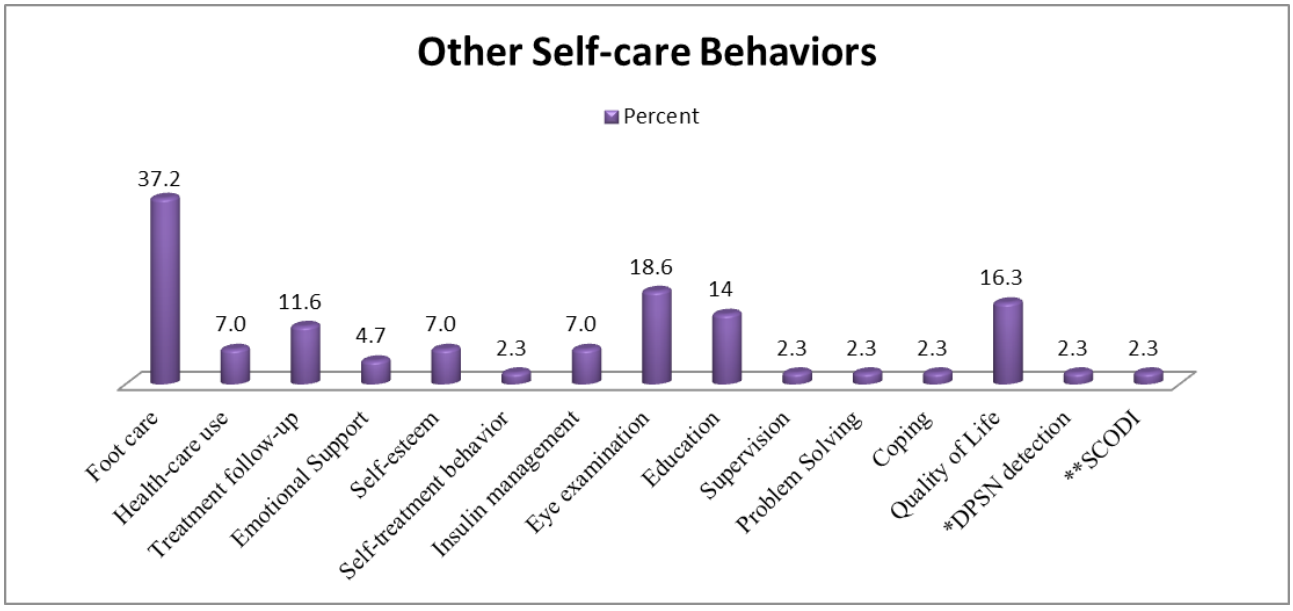

Figure 3: Percentage of articles that addressed other self-care behaviors identified for type 2 diabetes, *DPSN: diabetic peripheral sensory neuropathy, **SCODI: self-care of diabetes inventory.

pressure and lipid parameters, while at the same time reducing medication use and cost in people with T2DM[64]. However, at a median follow-up of almost 10 years, an ILI focusing on weight loss compared with diabetes support and education (DES), did not reduce the rate of cardiovascular morbidity and mortality in overweight or obese adults with T2DM. It is noteworthy that they had recruited patients with T2DM who were motivated to lose weight through lifestyle intervention and who could successfully complete a maximal-fitness test at baseline. Thus, the results cannot be generalized to all patients with type 2 diabetes [65]. According to the present study findings, exercise, blood sugar monitoring, and medication adherence were other important self-care

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behaviors for controlling type 2 diabetes. Proper exercise, such as strength training or walking, increases the body's ability to use insulin [66]. Exercise can help reduce and monitor blood sugar levels in people with type 2 diabetes. Other advantages of exercise include reducing body fat, reducing blood pressure, and protecting against heart diseases [67]. People with type 2 diabetes should perform a moderate-intensity exercise for at least 30 minutes on most days of the week [68]. Although the results of similar studies indicate that most type 2 diabetes self-care practices have limited efficacy over time, increased blood sugar monitoring is a valuable component of daily management [49, 69]. Diabetes education classes and pillboxes as medication reminders may help the diabetes care process [48, 49, 54, 60, 69–72].

In addition to the main self-care behaviors in the management of type 2 diabetes, other behaviors were also studied. Foot care was the most important behaviors among this group of other behaviors. Diabetic foot accounts for the most common cause of hospitalizations among patients with diabetes [73]. According to the findings of similar studies, 85% of lower-limb amputations in people with type 2 diabetics can be prevented with appropriate care [74, 75]. Optimal self-care behaviors of the diabetic foot include the daily examination of the feet and inspecting the insides of their shoes, daily washing and drying of the feet, non-walking with bare feet, reducing plantar pressure by wearing comfortable shoes, avoiding cutting toenails at edges, non-manipulation of warts and corns and regular visits to the doctor [74–76].

Eye examination was another self-care behavior that was emphasized in this study. Diabetes causes changes in arteries and veins and gradually damages the retina, which has tiny vessels [77]. One of the essential ocular complications of type 2 diabetes is vision loss. Therefore, eye examinations and regular visits to the ophthalmologist are preventive self-care behaviors to prevent blindness in people with type 2 diabetes [61, 77].

Diabetes mellitus can increase the risk of sensory, motor, and autonomous neuropathy [78], with distal symmetrical neuropathy being the most common form of diabetic neuropathy [79]. Sensory neuropathies may impose the burden of postural instability on diabetic patients, further resulting in falls and lower limb fractures [80, 81]. According to the findings of the present study, education has a significant role in improving lifestyle and preventing the complications of type 2 diabetes. Diabetic polyneuropathy plays an important role in diabetic foot ulceration [73]. Therefore, educating the patients on proper examinations and recognition of this condition might be a beneficial approach [21]. Finally, various studies have suggested that training people with type 2 diabetes to improve their lifestyle is one of the most crucial self-care factors in this disease [23, 37–43, 48, 49, 60, 62, 69–82].

This study comes with various limitations. As we focused more on the four primary self-care practices discussed above, the other methods received less recognition, and they might need further research to decipher the unknowns surrounding them. Furthermore, as this study's scope and aim did not include statistical analysis, further meta-analysis studies might be insightful in establishing future strategies. Future studies need to strengthen our knowledge in this area. Moreover, the authors of future studies can use the results of this study to design a checklist for self-care behaviors in patients with diabetes, which can be considered as a tool to assess the self-care behaviors of diabetic patients.

Conclusions

In this study, we demonstrated effective self-care behaviors in the management of type 2 diabetes. Given the high prevalence of type 2 diabetes worldwide, lifestyle amendment such as diet modification and daily exercise can be effective in managing this disease. Since refusal to engage with self-care increases the likelihood of complications. Consequently, diabetes complications and problems have a significant impact on the quality of life of the individual and family and also imposes high costs on the individual and the economy of society; therefore, it is recommended to focus on self-care, especially behavior and lifestyle modification of people with type 2 diabetes,

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rather than investing only on the clinical treatment of the disease.

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Conflict of interest

The authors declare no conflict of interest.

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