Self-care practices and correlates among patients with type 2 diabetes in Eastern Ethiopia: A hospital-based cross-sectional study

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Abstract

Objective: This study investigated the level and correlates of self-care practices among patients with type 2 diabetes on follow-up in two public hospitals in Harar, Eastern Ethiopia.

Methods: We conducted a hospital-based cross-sectional study on adult patients with type 2 diabetes, surveying diabetes self-care practices using a 15-item Summary of Diabetes Self-Care Activities. Responses ranged from 0 to 7 days, and a composite score was computed representing the mean days of diabetes self-care practices. A generalized Poisson regression model with robust variance was used. The association between the diabetes self-care practices and correlates was examined using the incidence rate ratio with a 95% confidence level. The statistical significance was set at a p value of ≤0.05.

Results: This study included 879 patients with type 2 diabetes. The overall mean (standard deviation) diabetes self-care practices were 3.7 ± 1.1 days out of the recommended 7 days, indicating low self-care practices. After controlling for other variables, tertiary educational level (incidence rate ratio = 1.06; 95% confidence interval: 1.01, 1.12), adequate diabetes knowledge (incidence rate ratio = 1.04; 95% confidence interval: 1.00, 1.08), moderate (incidence rate ratio = 1.07; 95% confidence interval: 1.02, 1.11) and high perceived self-efficacy (incidence rate ratio = 1.14; 95% confidence interval: 1.09, 1.13) (incidence rate ratio = 1.07; 95% confidence interval: 1.02, 1.11), high to marginal food security (incidence rate ratio = 1.13; 95% confidence interval: 1.03, 1.24), and receiving dietary advice (incidence rate ratio = 1.11; 95% confidence interval: 0.06, 1.15) were positively correlated with diabetes self-care practices. A history of hospitalization, on the other hand, was found to be inversely correlated with diabetes self-care practices (incidence rate ratio = 0.94; 95% confidence interval: 0.88, 0.99).

Conclusion: The study indicated that adherence of patients with type 2 diabetes to the recommended self-care practices was considerably low. Therefore, tailored diabetes self-management education to enhance self-efficacy and diabetes self-care practices must be in place. This can be achieved through the system or individual-based integrated intervention efforts.

Keywords

Type 2 diabetes, self-care practices, diabetes knowledge, self-efficacy, Harar, Eastern Ethiopia

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Introduction

Diabetes affects every segment of the population across the globe, including Ethiopia.[1,2] The risk factors like obesity contribute to causing or exacerbating insulin resistance, resulting in hyperglycemia.[1] The rise of blood glucose levels intensifies the progression of diabetes.[3] Therefore, strict self-care practices and medical follow-up are effective preventive strategies.[4]

According to Orem, self-care refers to performing activities that individuals initiate and act on their behalf to maintain life, health, and well-being.[5] Self-care has a vital role in

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health promotion, disease prevention, delay complications,[6] and enabling the patients to deal with the complex nature of diabetes with or without the assistance of a health care provider.[7] This includes opting for a healthy diet, regular physical activity, self-monitoring of blood glucose (SMBG), taking medication as prescribed, foot care, smoking cessation,[8] and ideal body weight control.[9]

Diabetes dietary management includes consuming a diet high in fiber foods and low in carbohydrates, trans-fats, saturated fats, refined grains, and sugary beverages, all to maintain overall health, improve glycemic control, reduce the need for antidiabetics, and reduce cardiovascular risks.[10–13] Healthy eating habits, regular exercise, and moderate weight loss, all work together to improve cardiorespiratory and cardiometabolic functions.[14–16] Though most patients with T2D achieve glycemic targets with monotherapy or combination therapy, pharmacological treatment and lifestyle changes are necessary to achieve metabolic control.[17] SMBG also allows the patients to evaluate response to treatment, self-care practices, glycemic goal attainment, and adjustment of insulin dosage.[3,18,19] Moreover, for the early detection and prevention of foot ulcers, proper footwear, daily inspection, and washing of feet are essential.[20] Diabetic foot disease results from neuropathy, deformity, and ischemia, all of which increase susceptibility to infection.[21]

Even though self-care is the cornerstone of diabetes management,[22] most diabetes patients do not consistently adhere to the recommended level of self-care practices.[23] The studies conducted in Ethiopia showed that more than three in five patients had inadequate diabetes self-care practices.[24,25] The level of dietary practice, physical activity, diabetic foot care, and SMBG were all found to be low.[23] Studies indicated that the diabetes patients' self-care practices were influenced by their age, educational status, diabetes duration and complications, and lack of personal glucometer.[26–30]

In addition, psychosocial issues that adversely affect the behavioral modification of diabetes patients have been described in the literature. However, in the Ethiopian setting, the correlation of self-efficacy, social support, diabetes knowledge, food insecurity, dietary advice, and hospital admission history with self-care practices are inconclusive and inadequately studied.[31–36] The adverse diabetic outcomes, such as uncontrolled blood glucose, multiple diabetes complications,[25] and metabolic syndrome, were also high, driven by social factors.[37] Therefore, this study aimed to investigate the level of diabetes self-care practices and correlates among patients with T2D on follow-up at public hospitals in Harar, Eastern Ethiopia. Since the nurses are one of the forefront primary health care providers who counsel and educate the patients in the health care delivery settings,[38] understanding factors that impede or facilitate the patients' self-care practices benefits the nurses and other health care providers to assist the patients in making regular adjustments in their daily lives.[39]

Methods and materials

Study design and setting

A hospital-based cross-sectional study was undertaken at public health hospitals in Harar from 1 December 2020 to 30 March 2021. Harar is located 526 km east of Addis Ababa, the capital city of Ethiopia. There are two public hospitals, Hiwot Fana Specialized Comprehensive Hospital and Jugal General Hospital. Both hospitals provide services for the entire community of eastern Ethiopia. The hospitals have several departments delivering services: medical, surgical, pediatrics, obstetrics and gynecology wards, intensive care units (ICUs), outpatient departments (OPDs), radiology, pathology, laboratory, and pharmacy departments. They also serve as teaching centers for health and medical science students. In the OPD of hospitals, more than 1985 people with T2D are receiving follow-up care.

Population

The study comprised patients with T2D who were undergoing diabetes follow-up at Hiwot Fana Specialized Comprehensive Hospital and Jugal General Hospital. The patients with T2D aged 18 years and older who visited the diabetes follow-up clinic at least three times for pharmacological therapy and blood glucose monitoring were randomly selected. However, those patients with T2D with severe illness, cognitive impairment, and hearing impairment were excluded because they could not provide adequate information and valid consent.

Sample size and sampling strategy

The sample size was determined using Epi-Info version 7.1 software by considering the following assumptions: 80% power, 1.5 odds ratio, 95% confidence interval (CI), one-to-one ratio, and 58.5% (lack of social support).[40] Accordingly, the total calculated sample size was 891 patients with T2D. The sample size was allocated proportionally based on the caseload of each hospital (n = 598 patients with T2D from Jugal General hospital and n = 293 T2D from Hiwot Fana Specialized Comprehensive Hospital). Finally, the patients were recruited for participation by a systematic random sampling technique; the first person was nominated at random using the lottery method, and then the rest were selected every two patients. If the selected patient declined to participate, the next patient was considered.

Data collection and measurements

The questionnaires were developed after reviewing previously published literature. The data were collected through a well-structured and pre-tested questionnaire administered to respondents by trained nurses. These survey instruments

consisted of sociodemographic information, clinical characteristics, diabetes self-care practices, diabetes knowledge, diabetes self-care knowledge, social support, food security, and self-efficacy. A wealth index score was computed from 23 household assets, including farmland and animals, using principal component analysis (PCA). Self-care practices are the performance of activities an individual initiates to maintain life and a sense of well-being.[41] These practices were measured using a Summary of Diabetes Self-Care Activities (SDSCA) encompassing diet, exercise, medication, blood glucose monitoring, foot care, and cigarette smoking.[42] Several previous studies used SDSCA to measure self-care practices.[25,27] We applied 15 items of the SDSCA, responses ranging from 0 to 7 days, and responses of items 4 and 10A were reverse coded.[30] Since currently published literature does not assign a cut-off for the SDSCA, a composite score was computed to represent the mean days of general self-care practices. The SDSCA has Cronbach's alpha of 0.79, indicating an acceptable level of reliability.[43]

The Revised Brief Diabetes Knowledge Test (DKT2) was developed and validated at the Michigan Diabetes Research and Training Center. This instrument consists of 23 items that have been widely used to measure disease knowledge.[44] The responses to the first two items were modified to align with the cultural context of the study area after consultation with a nutrition expert. The correct answer was coded as one, while an incorrect response was coded as zero, and the response option ranged from 0 to 23. The coefficient alpha demonstrated 0.81 for the overall DKT2, indicating a good level of reliability.[43] DKT2 results were categorized as adequate or inadequate based on the mean value; any score above the mean (11.8 ± 4.4) was classified as sufficient diabetes knowledge, whereas scores below the mean were considered insufficient.

A validated 30-item Diabetes Self-Care Knowledge questionnaire (DSCK-30), which consisted of structured close-ended questions with possible responses of "yes" or "no" was also used.[45] Those who scored above the mean (21.8 ± 4.1) were categorized as having adequate diabetes self-care knowledge, while those with scores below the mean were considered to have inadequate diabetes self-care knowledge. The coefficient alpha was 0.80, indicating a good level of reliability. The patient's confidence level to undertake a variety of diabetic self-care practices was assessed using an eight-item Diabetes Empowerment Scale (DES-SF) with responses ranging from "strongly disagree" to "strongly agree" and a summated composite score ranging from 1 to 40.[46,47] The DES-SF reliability was 0.92, showing good internal consistency. DES-SF was categorized into three quantiles as low, moderate, and high perceived self-efficacy.

Data quality control

A structured questionnaire prepared in English and translated into local languages was used for the data collection. Then, it was retranslated back to the English language by another expert to ensure the consistency of the instruments. Before the actual fieldwork, data collectors and supervisors were trained on interviewing techniques, data quality, and extracting data from the records. The research instrument was also pre-tested for practicability and applicability in 50 (5.6%) patients with T2D who attended diabetes care at Dilchora Hospital in Dire Dawa Administration. Moreover, throughout the actual data collection, the supervisors and principal investigator double-checked the data for completeness daily.

Statistical analysis

Before data entry, data were checked for consistency and completeness. Data were cleaned, coded, and entered to Epidata software version 3.1 and then exported to Stata version 14.0 for analysis. Descriptive statistics such as frequency, percentage, cross-tabulation, and summary measures were computed. The summary results were presented in tables and graphs. The overall diabetes self-care practices were computed, generating a mean number of days of diabetes self-care practice, which ranged from 0.9 to 6.5 days. Next, the mean values were rounded to the nearest whole number or count data, resulting in 1 to 7 days of diabetes self-care practices. The generalized Poisson (GP) regression model with robust variance was fitted. Though the Poisson model assumes equi-dispersion of the mean and variance, the variance was smaller than the mean in our data which indicated under-dispersion. Therefore, GP is recommended for both over-dispersed and under-dispersed count data.[48,49] The correlation between the diabetes self-care practices and independent variables was examined using the incidence rate ratio (IRR) with a corresponding 95% confidence level (CI). All variables with a p value ⩽0.20 at a 95% CI in the bivariate analysis were candidates for the multivariable analysis. The multivariable analysis was performed to adjust the effects of potential confounders. Statistical significance was declared at a p value ⩽0.05. The multi-collinearity test was carried out to identify the linear correlation among independent variables. The variance inflation factor and correlation coefficient did not demonstrate the existence of collinearity and multi-collinearity. Hosmer and Lemeshow's goodness of fit tests showed model fitness (p=0.592).

Results

Sociodemographic characteristics

In this study, 879 patients with T2D were included, giving a response rate of 99%. More than half of them, 493 (56.1%), were males. Out of all, 447 (50.9%) were over 55 years old, while the mean age was 52.7 ± 13.3 years. Three hundred fifty-two participants (40.1%) had no formal schooling. More than four-in-five, 714 (81.23%), were married, and 684 (77.8%) were urban dwellers. Almost two-thirds, 577 (65.6%), had health insurance (Table 1).

Table 1. Sociodemographic characteristics and SDSCA score of patients with T2D in Eastern Ethiopia, 2020/2021 (n = 879).

Variables	N (%)	Overall SDSCA score, mean (SD)	Dimensions of SDSCA, mean (SD)				
			Overall diet	Physical activity	Medication taking	Glucose testing	Foot care
Sex							
Male	386 (43.9)	3.78 (1.1)	3.15 (1.8)	3.69 (2.2)	6.45 (1.9)	0.64 (1.6)	5.00 (1.9)
Female	493 (56.1)	3.66 (1.1)	3.22 (1.2)	3.05 (2.5)	6.38 (1.9)	0.68 (1.6)	4.99 (1.7)
Age (years)							
18–34	83 (9.4)	3.67 (1.2)	3.19 (1.2)	3.38 (2.4)	6.43 (1.8)	0.58 (1.6)	4.95 (2.1)
35–44	128 (14.6)	3.67 (1.1)	3.22 (1.2)	3.46 (2.4)	6.57 (1.6)	0.49 (1.3)	4.92 (1.8)
45–54	221 (25.1)	3.78 (1.1)	3.26 (1.2)	3.57 (2.4)	6.42 (1.8)	0.63 (1.6)	5.11 (1.7)
55+	447 (50.9)	3.65 (1.1)	3.15 (1.2)	3.16 (2.4)	6.35 (1.9)	0.74 (1.6)	4.97 (1.8)
Educational level							
No formal education	352 (40.0)	3.56 (1.1)	3.06 (1.1)	3.20 (2.4)	6.26 (2.1)	0.34 (1.2)	4.92 (1.8)
Primary (grades 1–8)	216 (24.6)	3.69 (0.9)	3.22 (1.1)	3.07 (2.6)	6.44 (1.8)	0.53 (1.2)	5.14 (1.7)
Secondary (grades 9–12)	171 (19.5)	3.59 (1.2)	3.09 (1.3)	3.37 (2.4)	6.46 (1.7)	0.64 (1.4)	4.78 (1.8)
Tertiary (12+)	140 (15.9)	4.14 (1.2)	3.59 (1.2)	3.05 (2.1)	6.67 (1.3)	1.58 (2.4)	5.23 (1.8)
Marital status							
Never married	72 (8.2)	3.29 (1.4)	2.93 (1.2)	2.87 (2.5)	5.29 (2.9)	0.51 (1.1)	4.55 (2.1)
Married	714 (81.2)	3.77 (1.1)	3.25 (1.2)	3.49 (2.4)	6.51 (1.7)	0.67 (1.6)	5.10 (1.7)
Divorced and separated	28 (3.2)	3.72 (1.0)	3.26 (1.3)	3.50 (2.5)	6.32 (1.8)	0.80 (1.4)	4.92 (1.8)
Widowed	65 (7.4)	3.20 (1.2)	2.84 (1.3)	3.03 (1.9)	6.60 (1.6)	0.66 (1.6)	4.37 (2.1)
Occupation							
Paid employee	209 (23.7)	3.85 (1.2)	3.33 (1.2)	3.74 (2.4)	6.56 (1.6)	0.86 (1.8)	5.06 (1.8)
Merchant	74 (8.4)	3.86 (1.1)	3.08 (1.2)	4.07 (2.2)	6.53 (1.7)	1.09 (2.1)	5.13 (1.8)
Farmer and daily laborer	203 (23.1)	3.66 (1.1)	3.16 (1.9)	3.76 (2.2)	6.51 (1.7)	0.28 (1.1)	5.25 (1.9)
Housewife	295 (33.6)	3.57 (1.1)	3.25 (1.2)	2.61 (2.4)	6.19 (2.1)	0.53 (1.3)	4.96 (1.7)
Others[a]	98 (11.2)	3.56 (1.3)	3.89 (1.1)	3.09 (2.3)	6.56 (1.6)	0.84 (1.8)	4.72 (1.9)
Residence							
Urban	684 (77.8)	3.71 (1.11)	3.24 (1.8)	3.20 (2.5)	6.39 (1.9)	0.75 (1.7)	5.02 (1.7)
Rural	195 (22.2)	3.63 (1.04)	3.01 (1.2)	3.79 (2.2)	6.47 (1.7)	0.34 (1.1)	4.93 (1.9)
Wealth index							
Low	296 (33.7)	3.51 (1.4)	2.92 (1.1)	3.80 (2.5)	6.10 (2.2)	0.41 (1.3)	4.71 (1.9)
Medium	345 (39.4)	3.78 (1.1)	3.32 (1.2)	3.19 (2.3)	6.47 (1.7)	0.71 (1.6)	5.16 (1.8)
High	237 (26.9)	3.79 (1.0)	2.98 (2.4)	2.98 (2.4)	6.72 (1.2)	0.90 (1.7)	5.13 (1.5)
Health insurance							
No	577 (65.7)	3.69 (1.1)	3.05 (1.1)	3.81 (2.4)	6.36 (1.9)	0.71 (1.6)	4.95 (1.8)
Yes	302 (34.3)	3.68 (1.1)	3.44 (1.2)	2.41 (2.2)	6.50 (1.7)	0.57 (1.4)	5.09 (1.7)

SDSCA: Summary of Diabetes Self-Care Activities; T2D: type 2 diabetes; SD: standard deviation.
[a]Students, non-employee, retired.

Advises on diabetes self-care dimensions

Six hundred seventy participants (76.2%) received dietary advice from health care providers. The majority (89.7%) received advice on appropriate physical exercise. Seven hundred one participants (79.8%) received advice on SMBG levels, while 61.5% of the current smokers were advised on smoking cessation (Figure 1).

Dietary advice and types of diets

In total, 72.1% of the patients with T2D who were advised to consume at least five servings of fruits and vegetables per day had relatively good diabetes self-care practices (≥3.7 days).

Similarly, 71.5% of them were advised to eat food high in dietary fiber, 70.9% received advice to follow a complex carbohydrate diet, 70.8% were advised to reduce sugar intake, 69.5% were advised to follow low caloric diets, and 67.9% were advised to follow a low-fat diet eating plan; all these patients practiced self-care for three and more days per week (Table 2).

Diabetes self-care practices with the corresponding number of days

Three hundred thirty-six (38.23%) patients with T2D practiced self-care for 4 days, while a quarter of them, 219 (24.91%), applied self-care for 5 days out of a week.
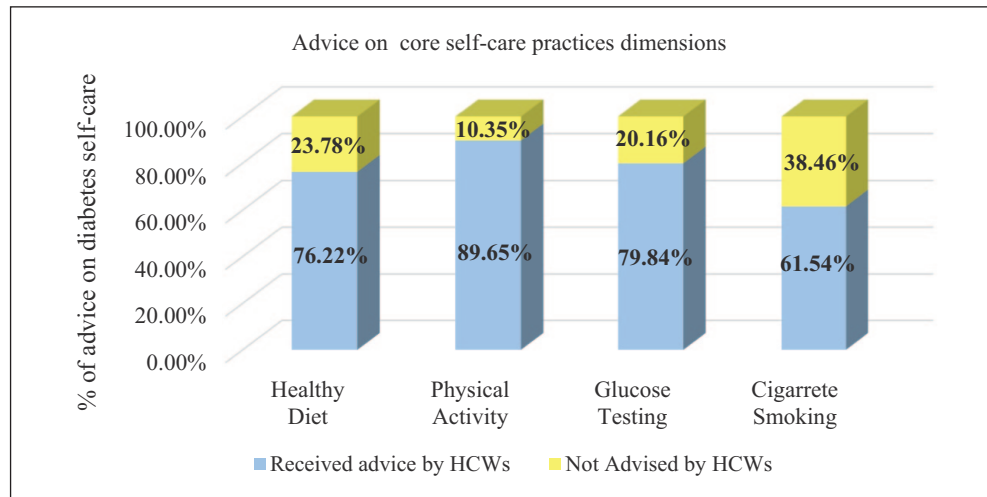
Figure 1. The proportion of patients with T2D who received advice on the core dimensions of diabetes self-care practices, 2020/2021 (n = 879).

However, those patients who practiced recommended self-care for six or more days were very few (2.62%) (Figure 2).

Overall and specific dimensions of diabetes self-care practices

The overall mean score (SD) of diabetes self-care practices was 3.7 ± 1.1 days out of seven. A total of 512 (53%) T2D patients scored above the mean on SDSCA items, relatively indicating a good level of self-care practice. Patients taking medication as prescribed yielded the highest mean score (6.4 days per week), whereas blood glucose monitoring had the lowest mean score (less than 1 day per week) of all dimensions (Table 3).

Correlates of diabetes self-care practices

In the bivariate GP regression analysis, the following showed correlation with the number of days of self-care practices: tertiary educational level, inadequate diabetes knowledge, adequate self-care knowledge, moderate to high perceived self-efficacy, high to marginal food security, receiving dietary advice from healthcare providers, attending diabetes mellitus (DM) education, and having a history of hospital admission. Furthermore, after controlling other variables, tertiary educational level, inadequate diabetes knowledge, adequate self-care knowledge, moderate to high perceived self-efficacy, high to marginal food security, receiving dietary advice from health care providers, and a history of hospital admission were correlated with the number of days of diabetes self-care practices (Table 4).

Since the other variables held constant in the model, the days of self-care practices in participants who attended a tertiary education were 6% greater than in those with no formal education (IRR = 1.06; 95% CI: 1.01, 1.12). Participants with

inadequate diabetes knowledge had 4% fewer days of self-care practices (IRR = 0.96; 95% CI: 0.93, 0.99) than those with adequate diabetes knowledge. Participants with adequate diabetes self-care knowledge had a 17% higher number of days of practicing self-care than those with inadequate knowledge of diabetes self-care (IRR = 1.17; 95% CI: 1.12, 1.22). In addition, the participants with moderate and high perceived self-efficacy exhibited a 7% (IRR = 1.07; 95% CI: 1.02, 1.11) and 14% (IRR = 1.14; 95% CI: 1.09, 1.19) increased days of self-care practices, respectively.

In comparison with the low food secure participants, those who were higher to marginally food secure had 13% more days of self-care practice (IRR = 1.13; 95% CI: 1.03, 1.24). In addition, participants who received dietary advice from their healthcare provider had 11% more self-care practice days than those who did not (IRR = 1.11; 95% CI: 1.06, 1.15). On the other hand, those participants with a history of hospital admission had 0.94 times fewer (IRR = 0.94, 95% CI: 0.88, 0.99) days than those who had never been admitted.

Discussion

The overall mean (SD) of diabetes self-care practices was 3.7 ± 1.1 days out of a week, with 53% of the patients scoring above the mean number of days. Of the five diabetes self-care dimensions, medication adherence yielded the highest mean score (6.4 days per week), whereas blood glucose monitoring was the least practiced self-care dimension (0.65 days per week). In addition, levels of education, diabetes knowledge, self-care knowledge, perceived self-efficacy, food security, receiving dietary advice from health care providers, and a history of hospital admission were found to affect the days of diabetes self-care practices.

The mean days of diabetes self-care practices were 3.7 ± 1.1 days, showing that self-care was practiced for less

Table 2. The average number of days of diabetes self-care practice among those patients with T2D who received dietary advice in Eastern Ethiopia, 2020/2021 (n = 879).

| Types of diets	Dietary advice		Mean days of DSCA	
	Yes (n/%)	No(n/%)	⩾3.7 days	<3.7 days
Eating at least five servings of fruits per day	581 (66.1)	298 (33.9)	419 (72.1)	162 (27.9)
Eating food high in dietary fibers	583 (66.3)	296 (33.7)	417 (71.5)	166 (28.5)
Complex carbohydrate diets	593 (67.5)	286 (32.5)	421 (70.9)	172 (29.1)
Eating very few sweets	596 (67.8)	283 (32.2)	422 (70.8)	174 (29.2)
Reducing the number of calories	610 (69.4)	269 (30.6)	424 (69.5)	186 (30.5)
Following a low-fat eating plan	630 (71.7)	249 (28.3)	428 (67.9)	202 (32.1)

T2D: type 2 diabetes.
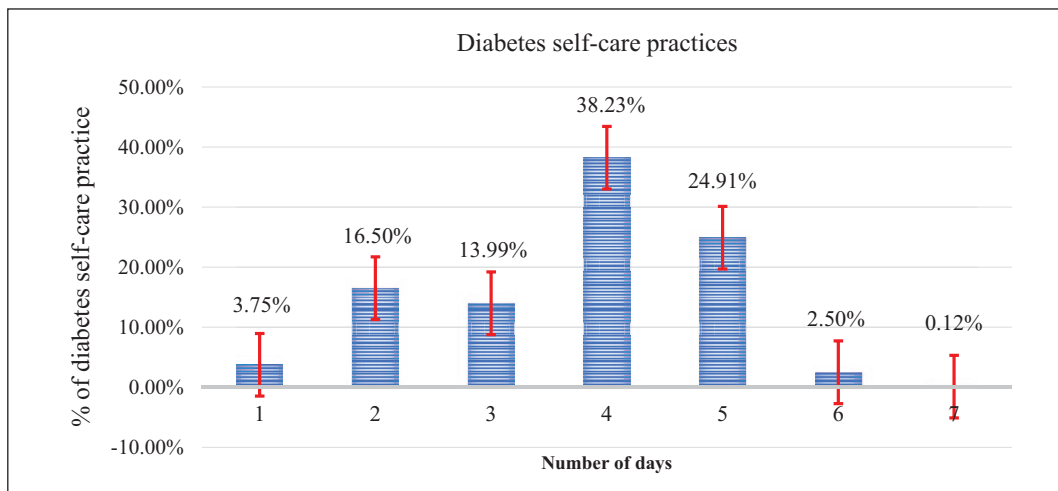
Figure 2. Distribution of the numbers of days of self-care practices performed by patients with T2D in Eastern Ethiopia, 2020/2021 (n = 879).

than the recommended number of days. Moreover, the patients were largely reliant on prescribed medication to manage their illnesses and they tended to overlook the significance of other aspects of self-care due to lack of resources, lack of awareness, lack of health care providers' support, or unorganized diabetes care services.[50] As a result, these patients were more likely to experience uncontrolled glycemia and diabetes-related complications.[51]

This finding was comparable with a previous finding in Ethiopia (3.2 days per week),[52] and other two studies conducted in Saudi Arabia (3.72 days per week[53] and 3.13 days per week).[54] This convergence might be attributed to higher comorbidity, poor diabetes knowledge, lack of regular diabetes education, and lower educational levels across the studies. Although previous studies reported the extent of diabetes self-care practice either as good or poor based on the mean value generated from raw score[55,56] or a mean value of either greater than or less than three,[26] similar self-care practice levels were found. Moreover, several studies reported the mean days of practice of each self-care domain.[53,57]

In this study, medication adherence yielded the highest mean score (6.4 days per week) among all dimensions. This

result was higher than those studies previously undertaken in Ethiopia, Saudi Arabia, Malesia, and Greece.[53,55,57–59] This could be because patients perceive taking prescribed medicine to be a simpler method of glycemic control than the alternatives. Although SMBG guides medication dosage adjustments and lifestyle changes, it was found to be the least practiced self-care aspect, with only 0.7 days per week.[60] Studies in Morocco[61] and Norway[62] found that SMBG was also done fewer than once a week, which was consistent with this finding. On the other hand, SMBG was lower than two prior Saudi Arabian studies.[53,57] This low SMBG practice may be attributed to a lack of a personal glucometer, testing strips, and knowledge of diabetes' adverse health impacts.

This study revealed that attending tertiary education level was correlated with the days of diabetic self-care practices. This finding was consistent with the studies conducted in Debre Berhan Referral Hospital, Northeast; Addis Ababa, Nekemte, Harar and Dire Dawa Administration, Ethiopia.[52,55,63,64] Participants with higher educational levels better comprehend health information and health professional instructions and are more likely to engage in self-care

Table 3. The mean scores of specific diabetes self-care practices with corresponding SD, SE, and CI among patients with T2D in Eastern Ethiopia, 2020/2021 (n = 879).

Variables	Mean day	95% CI	SD	SE	Mean day%
Medication taking	6.4	6.3, 6.5	1.8	0.06	91.43
Foot care	4.9	4.9, 5.1	1.9	0.06	70.00
Physical activity/exercise	3.3	3.2, 3.5	2.4	0.08	47.14
General diet	3.3	3.2, 3.5	2.2	0.08	47.14
Specific diet	1.5	1.4, 1.6	1.5	0.04	21.43
Overall diet	3.2	3.1, 3.3	1.2	0.03	45.71
Blood glucose testing	0.7	0.6, 0.8	1.6	0.05	10.00
Overall diabetes self-care	3.7	3.6, 3.8	1.1	0.04	52.85

CI: confidence interval; SD: standard deviation; SE: standard error; T2D: type 2 diabetes.

practices. In addition, they have increased access to health-care and health information from various sources, likely influencing them to practice self-care.

Having inadequate diabetes knowledge decreased the days of self-care practices. This matched with the findings from Ethiopia and Saudi Arabia.[27,55,65] The consistency of these results could be explained by the lack of formal diabetes education which influences the knowledge and attitude toward diabetic self-care practices and the sociodemographic factors.[66]

This study identified that high and moderate levels of perceived self-efficacy were correlated with the days of diabetes self-care practices. Evidence suggests that the diabetes patients' levels of confidence and self-efficacy are essential factors in their disease management.[67] These results corresponded to studies done in Korea and Iran, where patients with T2D with higher self-efficacy had a better engagement in self-care practice and glycemic control.[68,69] Likewise, the recent studies reported that diabetes education enhanced self-efficacy, positively influencing self-care adherence.[70,71] In addition, Bandura showed a link between learned knowledge, social modeling, and verbal encouragement to enhance self-efficacy.[72] Therefore, diabetes education, advice, and social support may improve patients' self-efficacy, which has a positive impact on self-care adherence.[70,71]

Receiving dietary advice revealed improved the days of self-care practices. This finding mirrored that of a study conducted in Bahir Dar, Ethiopia, which found that patients who got dietary advice had a better understanding of diabetes diet, which was associated with better self-care practices.[73] Dietary knowledge encourages them to consume a healthy diet that lowers glycemic levels.[74–76] Moreover, dietary advice offers an opportunity to appreciate the link between food and diabetes care. Receiving this support from health care experts improves patients' comprehension and encourages them to exercise self-care.

Food security showed a correlation with the number of days of self-care practice. In this study, 23% of patients with T2D experienced low and extremely low levels of food security, adversely affecting medication adherence and self-care behaviors,[36] resulting in an increased risk of depression, diabetes distress, and poor glycemic control.[77–79] The food

insecurity level in this study was higher than that recently reported from the US national survey.[80] Another study in the United States indicated that food-insecure diabetes patients showed poor adherence and delayed filling of prescribed medications, respectively.[81] The patients who are food insecure have less access to healthy foods to be able to follow the recommended diabetic diet.

History of hospitalization was found to be inversely correlated with the days of self-care practices. This result was in line with a study conducted in Eastern Ethiopia that found patients with T2D who practiced poor self-care had a higher hospital admission rate.[82] On the other hand, better self-care practices lead to optimal glucose control and a lower risk of hospitalization due to diabetes complications.[83,84] This resemblance can be explained by the fact that the research populations have similar socioeconomic features and are in the same study context. Besides, most patients had at least one comorbid illness, which increased the likelihood of hospitalization.

Strengths and limitations of the study

This study used large samples of T2D and generated helpful evidence. The study also employed a standard validated tool (SDSCA) to assess the levels of diabetes self-care practices, which helped to ensure that our results were comparable due to measurement consistency. However, the study was facility-based, and the findings need to be interpreted considering the limitations. The self-report data likely introduce social desirability bias. The cross-sectional nature of the data also does not demonstrate a causal relationship; instead, it shows the association between diabetes self-care and its correlates.

Conclusion

The study indicated that adherence to the recommended self-care practices among patients with T2D was considerably low. Self-monitoring blood glucose was the most neglected component of diabetes self-care practice. Having adequate knowledge of diabetes and self-care practices, high and moderate self-efficacy, and receiving dietary advice were

Table 4. Correlates of self-care practices among patients with T2D in Eastern Ethiopia, 2020/2021 (n = 879).

Variables	n (%)	Unadjusted	Adjusted	p value
		IRR (95% CI)	IRR (95% CI)	
Sex				
Male	386 (43.9)	1	1	
Female	493 (56.1)	0.97 (0.93, 1.01)	0.99 (0.96, 1.02)	0.495
Age (years)				
18–34	83 (9.4)	1	1	
35–44	128 (14.6)	0.98 (0.91, 1.07)	1.02 (0.96, 1.10)	0.413
45–54	221 (25.1)	1.01 (0.94, 1.09)	1.03 (0.97, 1.09)	0.288
55+	447 (50.9)	0.98 (0.92, 1.05)	1.03 (0.97, 1.09)	0.265
Educational level				
No formal education	352 (40.0)	1	1	
Primary (grades 1–8)	216 (24.6)	1.02 (0.97, 1.07)	0.98 (0.94, 1.02)	0.315
Secondary (grades 9–12)	171 (19.5)	1.01 (0.96, 1.06)	0.96 (0.91, 1.00)	0.086
Tertiary (12+)	140 (15.9)	1.15 (1.09, 1.22)	1.06 (1.01, 1.12)	0.023*
Wealth index				
Lower	296 (33.7)	1	1	
Medium	345 (39.4)	1.08 (1.03, 1.12)	1.01 (0.97, 1.06)	0.458
Higher	237 (26.9)	1.04 (0.99, 1.09)	1.02 (0.98, 1.07)	0.291
Diabetes knowledge				
Adequate	443 (50.4)	1	1	
Inadequate	436 (49.6)	0.86 (0.84, 0.89)	0.96 (0.93, 0.99)	0.024*
Self-care knowledge				
Inadequate	386 (43.9)	1	1	
Adequate	493 (56.1)	1.27 (1.23, 1.31)	1.17 (1.12, 1.22)	<0.001*
Perceived self-efficacy				
Low	296 (33.7)	1	1	
Moderate	305 (34.7)	1.16 (1.11, 1.21)	1.07 (1.02, 1.12)	0.005*
High	278 (31.6)	1.31 (1.25, 1.37)	1.14 (1.09, 1.19)	<0.001*
Food security				
High to marginal	674 (76.7)	1.11 (0.99, 1.23)	1.13 (1.03, 1.24)	0.008*
Low	173 (19.7)	1.02 (0.91, 1.14)	1.03 (0.93, 1.13)	0.613
Very low	32 (3.6)	1	1	
DM education attended				
No	616 (70.1)	1	1	
Yes	263 (29.9)	1.07 (1.03, 1.11)	1.02 (0.98, 1.05)	0.406
Dietary advice by HCPs				
No	209 (23.8)	1	1	
Yes	670 (76.2)	1.20 (1.15, 1.26)	1.11 (1.06, 1.15)	<0.001*
Admission history				
No	812 (92.4)	1	1	
Yes	67 (7.6)	0.87 (0.81, 0.94)	0.94 (0.88, 0.99)	0.037*

T2D: type 2 diabetes; IRR: incidence rate ratio; CI: confidence interval; DM: diabetes mellitus; HCPs: health care providers.
*Statistical significance.

positively correlated with the days of self-care practice. On the other hand, having a history of hospital admission decreased the days of self-care practice. It is well recognized that diabetes self-care practices are the backbone of diabetes management. Therefore, tailored strategies to increase the patients' access to quality diabetic information, such as structured diabetes self-management education, are essential to enhance the knowledge of diabetes, self-efficacy, and self-care practices. Moreover, further qualitative studies are recommended to explore the barriers to diabetes self-care practices from the perspective of patients and families.

Author contributions

All authors made a significant contribution to the conception, study design, execution, acquisition of data, analysis, and interpretation of the data; took part in drafting and critically reviewing the article; gave final approval of the version to be published and agree to be accountable for all dimensions of the work.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

The study was reviewed and approved by the Institutional Health Research and Ethical Review Committee (IHRERC) of the College of Health and Medical Sciences, Haramaya University, with the reference number (IHRERC/2017/2020). In addition, an official letter of cooperation was obtained from the college to get permission from the hospital administrators and diabetes units.

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Informed consent

The objective of the study was explained to each study participant. All volunteer participants signed written informed consent. Privacy was assured by interviewing in a separate room. Personal identifiers were not used. All information was kept confidential. The COVID-19 prevention protocols were strictly kept during data collection.

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