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Self-Care Practices for Blood Glucose Control among Patients with Type 1 Diabetes Attending Diabetes Clinic in Rwanda

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ABSTRACT

Background: Diabetes is a growing global public health issue in all age group. Common complications in type 1 diabetes underscore the importance of effective self-care.

Objective: This study aimed to assess self-care practices level for blood glucose control among patients with type 1 diabetes in Rwanda.

Method: A cross-sectional study was conducted from January to February 2026, involving 263 patients with type 1 diabetes attending for follow-up at RDA Diabetes clinic. Data were collected using a questionnaire evaluating key self-care domains such as medication adherence, home glucose monitoring, diet, physical activity, and foot care. Glucose control was defined as glucosylated hemoglobin (HbA1c) ≤8%. A descriptive analysis was used to determine self-care practices and blood glucose control levels while associations between both were analyzed using Chi-square test and multivariate logistic regression.

The overall, 61.2% of participants reported good self-care practices, with medication adherence highest (88.4%), followed by home glucose monitoring (63.4%), diet (56.8%), physical activity (48.2%) and foot care (47.6%); only 4.7% reported smoking or alcohol use. Despite this, only 37.3% achieved controlled blood glucose. Good medication adherence (AOR=3.1, 95% CI:1.58-6.14) and home glucose monitoring (AOR=2.4, 95% CI:1.33-4.37) were significantly associated with controlled HbA1c, while dietary practice showed a modest association (AOR=1.9, 95% CI:1.04-3.42); physical activity and foot care were not significant predictors.

Conclusion: Although over half reported good self-care practices, most did not achieve adequate glucose control, highlighting the need to strengthen self-care practices especially medication adherence and home glucose monitoring.

Keywords: Diabetes Mellitus, Type 1 Diabetes, Self-care Practice, Blood Glucose Control, Glucosilated Hemoglobin.

INTRODUCTION

Diabetes mellitus is a prevalent chronic metabolic disorder that is manifested by hyperglycemia [1]. If the blood glucose is not properly controlled, it would cause complications such damage to the heart, blood vessels, eyes, kidneys, and nerves [2]. Globally, diabetes mellitus is a growing public health issue

affecting all age group. More than half a billion people are estimated to be affected by diabetes. Low-income countries are among the highly affected regions of the world, with a concomitant high burden of undiagnosed cases [1]. Type 1 diabetes is usually developed in childhood and characterized by the body's inability to produce insulin as result of auto immunological destruction of pancreatic beta cells [3]. Type 1 diabetes continues to be a significant concern, with many new cases diagnosed each year. Globally, over million children and teenagers live with type 1 diabetes, 54% of whom are under 15 years old. Approximately 19700 new cases of type 1 diabetes were identified annually in Africa among children and adolescents, while over half of cases remained undiagnosed [1].

Global health workforce shortages limit access to essential care, leaving around half million people without adequate care and with a projected shortage of 18 million health professionals by 2030; in response, the WHO recommend strengthening self-care interventions to empower individuals to make informed decisions about their health care [4]. Self-care practices remains a vital component in the effective management of chronic diseases like diabetes, and irreplaceable to keep the illness under control [5]. While research results showed that maintaining glucose control reduce complications; the patients with diabetes continues to increase the risks of complications, including in Rwanda [2].

For the purpose of this study, self-care assessed diet, medication adherence, physical activities, home blood glucose monitoring, foot care, and avoidance of risky behaviors; according to the summary of diabetes self-care activities measure revised from 7 previous study [6]. Findings from different African countries showed that self-care practice levels among diabetes patients remained variant, ranging from 25% to 90%. Previous studies conducted in Sub-Sahara Africa reported variations in blood glucose control levels with a range of 10-60%, according a systematic analysis of 73 studies on type 2 diabetes using data from five databases [7]. The study result from Rwandan referral hospital, include 75% aged above 40 years, reported 73.6% of participants were regularly engaged in diabetes self-care practices while 60.7% of participants reported facing significant barriers [8]. This wide variation in self-care practice and blood glucose control levels was expected due to different studied population which has variant socio economic and cultural.

Therefore, generating local evidence that corresponds to those contextual differences is crucial. Moreover, many studies used capillary test to measure blood glucose control, which can influenced by short-term factors such as recent meals, prolonged fasting, or physical activity, and are therefore less reliable indicators of long-term glucose control compared to HbA1c.Most studies also assessed the level of diabetes self-care practices among patients combining both type 1 and type 2 diabetes, aged 18 years or older and did not include adolescents and children. This resulted in gaps in considering patients with type 1 diabetes. In addition, only a limited number of studies have assessed the relationship with diabetes self-care practice and blood glucose control. This study aimed to assess the level of diabetic self-care practices, blood glucose level and the association of both among patients with type 1 diabetes attending for follow at Rwanda Diabetic Association Diabetes clinic.

METHOD

Study setting and study design

The study was conducted at Rwanda Diabetic Association Diabetes clinic, a NGO located in Gasabo district, Kigali city, Rwanda. Created in 1997, member of international Diabetes Federation (IDF) in 2003, with mission of diabetes prevention, care, and support for patients and their families. The clinic serve a large number from different hospitals of country, particu larly those under 30 years and

vulnerable adults who receive social support. According administrative report, the clinic has 596 registered patients with types 1 diabetes on follow-up by the end of 2025. A quantitative cross-sectional study was conducted at RDA Diabetes clinic from January 7 to February 5, 2026.

Study population

The study population for this study were all patients with type 1 diabetes on follow-up at RDA Diabetic clinic who visited during the data collection period.

Inclusion and exclusion criteria

Inclusion criteria

All patients with type 1 diabetes who were on follow up less than 3 months at RDA Diabetes clinic to avoid elevated glucose report from before the initiation of anti diabetic treatment, due to HbA1c test was used to measure average glucose over the past 3 months.

Exclusion criteria

They were excluded those who were on follow up less than three months and all patients seriously ill, suffer from serious mental disorder unable to provide needed information, and those who aged less than 18 years who does not have accompanist to make an agreement consent and provide information.

Sample size and sampling procedure

The sample size was determined by the following finite population correction formula $n=\frac{n_0}{1+\frac{n_0-1}{N}}$, where $n_0=\frac{Z^2 \cdot p(1-p)}{d^2}$[8]; Using the following assumption: Z-score for confidence level (1.96 for 95%), confidence interval (95% CI), 5% margin of error (d); and total population size (N): 596. After accounting for a 10% non-response rate, a sample size of 263 was obtained.

A systematic random sampling technique was employed to select study participant using a sampling interval of K=2 (596/263). When a patient didn't fulfill the inclusion criteria, the next patient who fulfilled the criteria was considered in the study. Patient's medical record numbers were listed accordingly to avoid patient re-selection if repeated visits occurred during the study period.

Data collection procedure and quality control

Data were collected using an interview with questionnaire in kobo toolbox by 2 data collectors made by registered nurses trained on interview technics, assessing patient characteristics and self-care practices using the summary of diabetes self-care activities (SDSCA), which includes a healthy diet, physical exercise, blood sugar testing, foot care, and risk behaviors of smoking and alcohol use. Data collection was done after informed verbal consent obtained by responding "Yes" to the preliminary mandatory question of questionnaire in kobo toolbox "Do you accept to participate in this research?" Both the English and Kinyarwanda questionnaire versions were created to ensure that patients who struggle with English may understand the message more clearly. A pre-test of the data collection tool was conducted on 10% of the sample size at RDA Diabetes clinic and internal consistency of the questionnaire was calculated with a Cronbach's alpha, the result was 0.85, exceeding the acceptable threshold of 0.70, indicating that the tool was reliable [9]. Those who were under fifteen were assisted by their respective accompanist. While HbA1c tests results were recorded on extraction form and entered in kobo tool box.

Data processing and analysis

Data were entered, cleaned, and analyzed using R, with categorical variables coded numerically and continuous variables checked for accuracy and completeness. Descriptive statistics summarized frequencies and percentages. Blood glucose control was determined using HbA1c levels, with values ≤8% classified as good control and >8% as poor control. Self-care practices were assessed using a questionnaire covering key areas such as diet, physical activity, glucose monitoring, foot care, medication adherence, and substance use, and then combined into a composite score categorized as good or poor. Associations between self-care practices and glucose control were examined using Chi-square tests, adjusted odds ratios (AOR) with 95% confidence intervel (CI), and multivariate logistic regression to adjust for confounding factors, and those with a p-value<0.05 were considered statistically significant.

Operational definitions:

Type 1 diabetes: a chronic autoimmune disease with little or no insulin production, requiring continuous insulin therapy and follow-up care for confirmed increasing glucose, having fasting blood sugar levels higher than 1.26g/l [10].

Self-care practice: refers to the patients' engagement in recommended care to keep their condition under management. For the purpose of this study, self-care assessed diet, medication adherence, physical activities, home blood glucose monitoring, foot care, and avoidance of risky behaviors (smoking and alcohol consummation). And self-care was classified based on similar characteristics in good or poor using clustering taxonomy [11].

Good self-care practice: defined as patient's achievement the required scores across all assessed domains: diet (3), physical activity (2), home glucose testing (3), foot care (3), absence of smoking and alcohol use (0), and medical adherence (≤2) (Gaćina et al., 2024).

Poor self-care practice: defined as patient's failure to meet minimum score in one or more assessed domains: diet (0-2), physical activity (0-1), home glucose testing (0-2), foot care (0-2), smoking and alcohol use (1-4), and medical adherence (3) [6].

Diet: refers to diabetes-related nutrition engagement, including knowledge of recommended nutrition and regular consumption of fruits and vegetables on their servings of previous seven days, consistent with the guidelines that promote a balanced diet to support blood glucose, lipid, and blood pressure control for reducing complications [12].

Home glucose testing: refers to monitoring glucose levels using a personal glucometer device, tested since the last clinic visit, and testing regularly during the previous seven days with guidance from healthcare providers on proper use and interpretation of results, as recommended in national guidelines of NCDs (MoH Rwanda, 2024).

Medical adherence: refers to patients who follow their prescribed regimen without forgetting medicine, missing insulin, and avoiding unprescribed drugs to maintain stable glucose [12].

Physical activity: involves regular aerobic or structured exercise, supporting weight management and insulin sensitivity, adults are recommended 50 minutes and adolescents 60 minutes per day at least three times weekly with glucose monitoring and diet or medication adjustments to prevent hypoglycemia [13].

Foot care: involves awareness of diabetic foot wounds, preventive measures like hygiene, proper footwear to reduce diabetic foot complications, alongside daily assessments to detect risks of ulcers and amputation [14].

RESEARCH FINDINGS

Characteristics of respondents

Characteristics of respondents show that a total of 263 participants were included in the analysis. More than half of the respondents were female (55.1%), while males accounted for 44.9% of the study population. Regarding age distribution, participants aged 25-44 years constituted the largest proportion (29.7%), followed by those aged 20-24 years (27.8%). Children and adolescents aged 0-14 years and 15-19 years each represented 21.3% of participants. In terms of educational attainment, the majority of respondents had primary education (55.1%), followed by secondary education (39.2%). Only a small proportion had attained university education or higher (4.9%), while less than one percent (0.8%) had no formal education. With respect to the duration of diabetes, approximately half of the participants (50.2%) had lived with the condition for 1-5 years. Those with a duration of 6-10 years accounted for 28.1%, while 19.0% had been living with diabetes for more than 10 years. A minority (2.7%) had been diagnosed within the previous year.

Level of self-care practice in people with type 1 diabetes attending at RDA Diabetes clinic, 2026.

Self-care practice was assessed across multiple domains, including diet, physical activity, glucose monitoring, foot care, and medication adherence. Based on the composite self-care score, participants were classified as having either good or poor self-care practice. The majority of 263 respondents, 61.2% of them were classified as having good self-care practice, while 38.8% were categorized as having poor self-care practice. This indicates that, based on the composite self-care score, most participants met the minimum criteria for adequate self-care across the assessed domains.

Blood glucose control level in those with type 1 diabetes at RDA Diabetes clinic

The results of this study show that only 37.3% of participants achieved controlled glucose status (HbA1c $\leq$ 8.0%), whereas the vast majority (62.7%) had uncontrolled blood glucose levels (HbA1c > 8.0%).

The table (2), illustrates the proportion of participants who achieved good self-care practice across individual diabetes self-care domains, revealing variation between domains. Medication adherence demonstrated the highest level of adequacy, with 88.2% (n = 142) of participants meeting the recommended practice criteria. This was followed by glucose monitoring, where 63.4% (n = 102) reported adequate practice. Moderate levels of adequacy were observed for dietary practices (56.5%, n = 91), physical activity (48.4%, n = 78), and foot care (48.4%, n = 78).

Overall, while medication adherence and glucose monitoring were relatively well practiced, engagement in lifestyle-related self-care behaviors particularly foot care and physical activities remained sub optimal among a substantial proportion of participants.

Table 1. Characteristics of Types 1 Diabetes Patients attending RDA Diabetes Clinic (n=263), 2026.

Variable	Category	Frequency (N = 263)	Percent (%)
Sex	Female	145	55.1
	Malea	118	44.9
Age group (years)	0-14	56	21.4
	15-19	56	21.4
	20-24	73	27.5
	25-44	78	29.7

Education level	No formal education	2	0.8
	Primary	145	55.1
	Secondary	103	39.2
	Tertiary	13	4.9
Duration with diabetes	<1 year	7	2.7
	1-5 years	132	50.2
	6-10 years	74	28.1
	>10 years	50	19

Table 2. Proportion of Types 1 Diabetes Patients Attending RDA Diabetes Clinic Achieving Individual Good Self-care aspects, 2026.

Self-care practice	Frequency (n)	Percentage (%)
Medication adherence	142	88.2
Glucose monitoring	102	63.4
Foot care	77	47.8
Diet	91	56.5
Physical activity	78	48.4
Overall self-care practices	**161**	**61.2**

Table 3. The Association between Self-care Practice and Glucose Control Level among Types 1 Diabetes Patients Attending RDA Diabetes Clinic, 2026.

Self-care practice level	Uncontrolled HbA1c (n, %)	Controlled HbA1c (n, %)	Chi-square	P-value
Poor	72 (70.6)	30 (29.4)	4.12	**0.032**
Good	93 (57.8)	68 (42.2)		
Total	**165 (62.7)**	**98 (37.3)**		

Table (3) shows that blood glucose control differed by self-care practice level. Among participants with poor self-care practices, only 29.4% achieved controlled HbA1c, while the majority (70.6%) remained uncontrolled. In contrast, participants with good self-care practices had a higher proportion of controlled HbA1c (42.2%), although more than half (57.8%) were still uncontrolled. The Chi-square test indicated a statistically significant association between self-care practice level and glucose control ($\chi^2 = 4.12$, $p = 0.032$).

Table 4. Adjusted Association of Good Self-care Practices with Glucose Control Level among Types 1 Diabetes Patients attending RDA Diabetes Clinic, 2026.

Self-care practice	Category	OR	95% CI	P-value
Medication adherence	Poor medication adherence (Ref.)	1	—	—
	Good medication adherence	3.12	1.58 – 6.14	**0.001**
Glucose home monitoring	Inadequate home monitoring (Ref.)	1	—	—
	Regular monitoring	2.41	1.33 – 4.37	**0.004**

Foot care	Poor foot care (Ref.)	1	—	—
	Good foot care	1.53	0.87 – 2.71	0.138
Diet	Poor diet practice (Ref.)	1	—	—
	Good diet practice	1.89	1.04 – 3.42	**0.036**
Physical activity	Inadequate physical activity (Ref.)	1	—	—
	Adequate physical activity	1.46	0.82 – 2.60	0.195

Table (4), describes the two variables adjusted, self care practice variables and blood glucose control variable. Patients who reported good medication adherence were over than three times more likely to achieve glycemic controlled (HbA1c) compared to those with poor adherence (AOR = 3.12, 95% CI: 1.58-6.14, p = 0.001). Similarly, those with regular home glucose monitoring was significantly associated with 2.4 times higher odds to improved glucose control (AOR = 2.41, 95%, CI: 1.33-4.37, p = 0.004). Good dietary practice showed a statistically significant association with glucose control (AOR = 1.89, 95%, CI: 1.04-3.42, p = 0.036). However, even good foot care practice (OR=1.53, 95% CI: 0.87-2.71, p=0.138) and adequate physical activity (OR=1.46, 95% CI: 0.82-2.60, p=0.195) increased the odds of glucose control, these associations were not statistically significant. In other words, overall self-care practice, medication adherence, home glucose monitoring, and dietary practices were key factors associated with improved glucose outcomes.

Discussions

The study found that 61.2% of participants had good self-care practice. This is slightly similar to 59.4% reported in Ethiopia; but lower than the 73.6% observed at a Rwandan teaching hospital [15] [16]. The differences may be attributed to variations in the study populations, as some studies assessed adults patients with type 2 diabetes, whereas this study focused on type 1 diabetes involving more teenagers and adolescents .

About the assessed self-care activities, medication adherence was the highest-rated component at 88.4%, followed by home blood glucose testing (63.36%) and dietary practice (56.77%)**,** with physical activity (48.17%) and foot care scoring the lowest at 47.61%. Risky behaviors were minimal, as smoking and alcohol use totaled of 4.76%. Despite more participants had good self-care practice, the study found only 37.3% of participants achieved glucose control. This is comparable to 34.4% reported in Ethiopia and aligns with a systematic review of 73 studies in sub-Saharan Africa showing a 30% adequate glucose control rate with range of 10-60% [17] [18]. However, it is slightly lower than the 39.14% reported in systematic review of 41 studies in low and middle income countries; and higher than the 26% reported in a cross sectional study of 1,267 adults with type 2 diabetes in Cameroon and Guinea [19] [20]. Differences could be due to variations in operational definitions of glucose control (e.g., HbA1c <7% or <8%, FBG 70-130 mg/dl, fasting or random blood glucose) and population characteristics such as age, duration of diabetes, comorbidities, and diabetes type. In Rwanda, similar findings about blood glucose control (37%) were reported in Rwamagana district, while a slightly higher rate (40.2%) was observed in the same district following a 3-month educational intervention [21] [22] suggesting that methodological differences and interventions may influence outcomes. The findings of this study are consistent with evidence from Jordan, where better adherence to diabetes self-care practices was also associated with improved blood glucose control. Similarly, in this study, 42.2% of participants with good self-care achieved controlled HbA1c compared to 29.4% among those with poor self-care ($\chi^2 = 4.12$, p = 0.032),

confirming that self-care plays an important role in glycemic management. However, the strength of the association in this study appears more moderate compared to the Jordan study, where the relationship was reported to be stronger. This difference may be explained by contextual factors such as variations in healthcare access, patient education, avail insulin, and health system support [23].

Conclusion

The study found that although many patients had uncontrolled glucose, overall self-care was fairly good; medication adherence, home glucose monitoring, and dietary practices were key factors associated with improved glucose outcome, and better self-care was strongly linked to controlled glucose.

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