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Adherence to the Recommended Dietary Habits and Associated Factors among Type 2 Diabetes Patients Attending Kabgayi Level II Teaching Hospital

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Abstract: **This study examined dietary adherence among Type 2 Diabetes Mellitus (T2DM) patients at Kabgayi Level II Teaching Hospital in Rwanda, identifying key factors affecting adherence. Using a cross-sectional design with 413 participants, data were collected through structured questionnaires and medical records. Results showed that 58.1% adhered to recommended dietary habits, while 41.9% did not. Positive influences on adherence included access to diabetes education, dietary counseling during consultations, and regular follow-up visits. Conversely, high medication costs and lack of printed dietary guidelines were significant barriers. The study underscores the importance of patient-centered education, healthcare provider engagement, and affordable diabetes care. It recommends structured counseling, printed dietary materials, and appointment reminders at the hospital level. At the policy level, it urges the Ministry of Health to subsidize medication, expand nutrition education, and integrate dietary support into national care protocols to improve T2DM management and reduce complications.**

Keywords: **Dietary Habits, Type 2 Diabetes Patients, Kabgayi Level II Teaching Hospital.**

I. INTRODUCTION

Diabetes mellitus is a persistent, non-communicable condition characterized by high blood glucose levels, often identified through fasting plasma glucose tests (Gupta & Mukherjee, 2014). There are two primary types: Type 1 diabetes, which requires insulin, and Type 2 diabetes, which does not. Globally, Type 2 diabetes accounts for the majority of cases, representing about 90% to 95% of all diabetes cases (Cho et al., 2018). In 2017, approximately 425 million individuals worldwide had diabetes, a figure projected to rise to 629 million by 2045 (IDF, 2017). In particular, Type 2 diabetes is becoming a pressing public health concern in developing countries (Shaw et al., 2010).

Within sub-Saharan Africa (SSA), prevalence rates range from 2.1% to 6.0% and are expected to double in the coming decades (Cho et al., 2018). In Rwanda, the rate of diabetes among individuals aged 20 to 70 has significantly grown, from 1.6% in 2010 to 5.2% by 2019 (Rwanda Biomedical Center, 2019). This rise reflects broader trends observed across lower-income nations, driven by urbanization and changing dietary patterns (Atun et al., 2017). Since 2018, Kabgayi Level II Teaching Hospital has documented a steady increase in diabetes cases, with many patients presenting poorly controlled blood glucose levels due to challenges in maintaining dietary and lifestyle changes (Kabgayi Level II Teaching Hospital Diabetes Clinic, 2023).

Despite awareness of diabetes management practices, studies on patient adherence to these guidelines in SSA are limited. Socioeconomic barriers and limited healthcare access often complicate effective diabetes management in this region, leading to high rates of complications and increased healthcare costs (Mohammed & Sharew, 2019). Dietary adherence is particularly vital in preventing complications such as cardiovascular disease, kidney issues, and neuropathy (American Diabetes Association, 2020).

Studies have shown that adherence to dietary and physical activity guidelines is often low among patients with Type 2 diabetes. In Rwanda and other similar regions, only about 25% to 65% of patients adhere to dietary guidelines, while adherence to exercise is estimated to range from 15% to 40% (Alhariri et al., 2017; Ganiyu et al., 2013). Factors such as limited income, poor access to nutritious foods, low education levels, and limited healthcare access contribute to this challenge (Musee et al., 2016). Cultural beliefs, low health literacy, lack of social support, and high treatment costs also play a role.

Anecdotal evidence from Kabgayi Level II Teaching Hospital suggests that many diabetes patients face barriers to maintaining dietary recommendations due to limited nutritional support and economic constraints. Research by Kayitesi (2017) indicates that Rwandan diabetes patients often develop complications earlier than those in developed nations, largely due to inconsistent treatment adherence. This results in frequent hospitalizations and contributes to a significant economic burden on patients and the healthcare system (WHO, 2016).

Understanding the factors affecting dietary adherence among diabetes patients at Kabgayi Level II Teaching Hospital is essential for improving health outcomes. Prior studies have highlighted barriers like income limitations, lack of social support, and healthcare access as influential factors (Ganiyu et al., 2013; Mohammed & Sharew, 2019). This study aims to evaluate adherence to dietary guidelines and identify factors influencing adherence among Type 2 diabetes patients at Kabgayi Level II Teaching Hospital to offer insights into potential interventions for improving patient outcomes.The main objective of this study was to determine the level of adherence to recommended dietary habits and identify associated factors among T2DM patients at Kabgayi Level II Teaching Hospital. It was guided by the following specific obejctives:

i. To assess adherence levels to recommended dietary habits among T2DM patients at Kabgayi Level II Teaching Hospital, Rwanda.

ii. To identify the associated factors to the recommended dietary habits among T2DM patients, Rwanda.

II. THEORETICAL FRAMEWORK

The Theory of Planned Behavior (TPB), developed by Ajzen in 1985, explains how actions are influenced by intentions, which in turn are shaped by attitudes, subjective norms, and perceived control. In this study, TPB helps illuminate the factors influencing dietary adherence in T2DM patients. Patients' attitudes toward diet adherence, social influences from family or healthcare providers, and their perceived control over following dietary recommendations are critical to understanding and improving adherence rates.

III. CONCEPTUAL FRAMEWORK

A conceptual framework provides a visual representation of the relationship between variables in a study. In this research, the conceptual framework highlights how various factors influence adherence to recommended dietary habits among Type 2 diabetes mellitus (T2DM) patients.

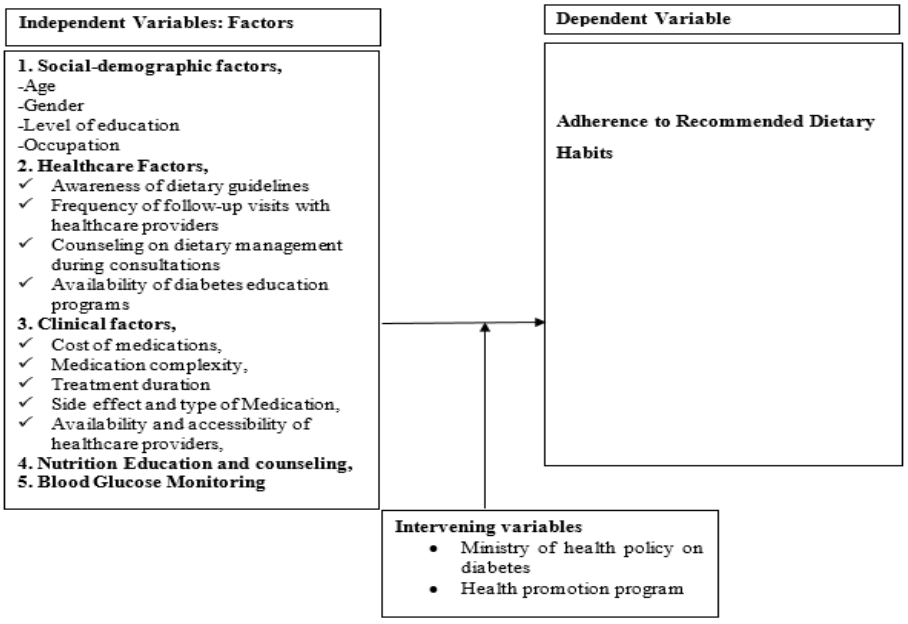

Figure 1: Conceptual Framework

In this study on adherence to recommended dietary habits among Type 2 diabetes mellitus (T2DM) patients, the independent variable is identified as the Factors Associated with Poor Adherence to Dietary Habits. This encompasses various social-demographic factors, including age, gender, level of education, and occupation, all of which can significantly influence how well patients adhere to dietary recommendations. For instance, older adults may have different dietary needs and challenges compared to younger individuals, while educational background can affect understanding and implementation of dietary guidelines. The dependent variable in this framework is Adherence to Recommended Dietary Habits, which includes several indicators such as adherence to a recommended diet, medication and treatment adherence, diet adherence, and exercise or physical activity. These indicators collectively reflect the overall commitment of T2DM patients to managing their condition through lifestyle and dietary modifications. Intervening factors also play a crucial role in shaping adherence behaviors. For example, the Ministry of Health's policies on diabetes and health promotion programs can create an environment that encourages adherence through public awareness and education initiatives. Healthcare factors further influence adherence, encompassing elements such as awareness of dietary guidelines, the frequency of follow-up visits with healthcare providers, counseling on dietary management during consultations, and the availability of diabetes education programs. These factors ensure that patients receive the necessary support and information to effectively manage their dietary habits.

Additionally, clinical factors like the cost of medications, medication complexity, and treatment duration can impact adherence. High costs or complicated treatment regimens may discourage patients from following through with dietary recommendations, thereby affecting their overall health outcomes. By examining the interplay between these variables, the study aims to identify key barriers and facilitators that influence dietary adherence among T2DM patients, ultimately informing more effective interventions and support strategies.

IV. RESEARCH METHODOLOGY

The study employs a cross-sectional research design, an observational approach where data is collected from a specific population or representative subset at a single point in time (Alexander et al., 2015). This design provides insights into the characteristics and behaviors of the population at that moment. Here, the cross-sectional design is applied to assess the level of adherence to recommended dietary practices and the factors influencing this adherence among Type 2 diabetes mellitus (T2DM) patients at Kabgayi Level II Teaching Hospital, Rwanda. By capturing data from a single timeframe, the study aims to analyze the prevalence of dietary adherence and its associated factors within this patient group attending Kabgayi Level II Teaching Hospital.

Target Population

The study's target population includes all Type 2 diabetes mellitus (T2DM) patients aged 18 and above who are receiving care at Kabgayi Level II Teaching Hospital and within its catchment area. Focus is given to patients who regularly attend diabetes care services and may be at risk for non-adherence to dietary recommendations.

Sample Size Determination

The sample size for this study was determined using a single proportion formula, guided by Fisher et al. (1998). A study by Habimana et al. (2023) reported a 58.0% prevalence of dietary adherence among T2DM patients in Rwanda, which served as the basis for calculating the sample size.

The sample size formula used is as follows:

$$n = \frac{(Z\alpha/2)2 \cdot p \cdot (1-p)}{(e^2)}$$

Where:

- **n** is the desired sample size
- **Z** is the standard normal deviate, corresponding to a 95% confidence level (1.96)
- **p** is the prevalence of adherence to recommended dietary habits (58.0% or 0.58)
- **q** is 1 - p (0.42)
- **e** is the margin of error, which is set at 5% (0.05)

Substituting the values into the formula:

$$n = \frac{(1.96)\ (1.96)\cdot 0.58\cdot(1-0.58)}{(0.05^2)}$$

$$n = \frac{3.8416\cdot 0.58\cdot 0.42}{(0.0025)}$$

$$n = \frac{0.9366}{(0.0025)} = 374.64$$

The final sample size determined for this study was approximately 413 T2DM patients after accounting for 10% of non-response rate.

Sampling Technique

A systematic sampling method was applied, where patients attending Kabgayi District Hospital for T2DM care are selected at regular intervals (e.g., every 5th or 10th patient) from a patient list. The first participant was chosen randomly, and subsequent participants were selected based on the sampling interval. This approach helps in maintaining randomness and reduces bias, ensuring a representative sample for studying dietary adherence in T2DM patients.

This method is commonly recommended in quantitative research for its simplicity and effectiveness in reducing selection bias (Creswell, 2014).

Data Collection Tool

A structured questionnaire was the primary tool for collecting data on dietary adherence and its influencing factors among T2DM patients. This tool is appropriate as it allows for systematic, efficient data collection across a large sample. A structured questionnaire was the primary tool for collecting data on dietary adherence and its influencing factors among T2DM patients. This tool is appropriate as it allows for systematic and efficient data collection across a large sample. It was adopted from the literature (Kumar et al., 2020) but was contextualized to the Rwandan setting. The questionnaire included closed-ended questions focusing on Social-demographic factors, healthcare factors, clinical factors, nutrition education and counseling, and blood glucose monitoring. It was administered by the researcher or self-completed by participants, ensuring accessibility for those with varied literacy levels.

Data Collection Procedure

With approval from Mount Kenya University and Kabgayi Level II Teaching Hospital, a research assistant approached T2DM patients in the hospital's non-communicable diseases department. After explaining the study and obtaining informed consent, the questionnaire was administered in a private setting to ensure participants' comfort and confidentiality. Assistance was provided to those needing help to ensure accurate responses. Dietary adherence was measured using a structured questionnaire designed to assess the frequency and consistency with which T2DM patients follow their recommended dietary plans. This questionnaire, adapted from validated sources such as Kumar et al. (2020), captured key adherence indicators specific to dietary behaviors and challenges in the Rwandan context.

V. RESEARCH FINDINGS AND DISCUSSION

1. Demographic Characteristics of the Respondents

This section presents the demographic profile of the respondents, including gender, age, marital status, educational level, occupation, and monthly household income. Understanding these characteristics is essential for contextualizing the study findings and assessing how different demographic factors may influence the research variables.

Table 1: Demographic Characteristics of the Respondents

Variable	Frequency	Percent
Gender		
Male	190	46
Female	223	54

Age range in years		
18-23	32	7.7
24-29	69	16.7
30-35	72	17.4
36-41	81	19.6
42 and above	159	38.5
Marital status		
Single	44	10.7
Married	188	45.5
Divorced/separated	83	20.1
Widowed	98	23.7
Educational level		
No formal education	143	34.6
Primary education	123	29.8
Secondary education	80	19.4
Tertiary education	67	16.2
Occupation		
Student	45	10.9
Unemployed	133	32.2
Civil servant	59	14.3
Farmer/laborer	54	13.1
Self-employed/business	122	29.5
Monthly household income		
Less than 100,000 RWF	129	31.2
100,000 - 200,000 RWF	79	19.1
200,001 - 300,000 RWF	105	25.4
More than 300,000 RWF	100	24.2

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

Table 1 about the demographic profile of the respondents reveals a diverse composition in terms of gender, age, marital status, education, occupation, and income levels. The sample consisted of 54% females and 46% males. In terms of age distribution, the majority (38.5%) were aged 42 years and above, followed by 19.6% in the 36-41 age group. Marital status findings indicate that 45.5% of respondents were married, while 23.7% were widowed and 20.1% were divorced or separated.

Education levels varied, with 34.6% of respondents having no formal education, while 29.8% had only completed primary education. In terms of employment, 32.2% of respondents were unemployed, while 29.5% were self-employed or engaged in business. Furthermore, 31.2% of respondents reported earning less than 100,000 RWF per month, while only 24.2% had an income exceeding 300,000 RWF.

2. Presentation of Findings

This section presents the study's findings based on the study's objectives.

Adherence levels to recommended dietary habits among T2DM patients

Adherence to recommended dietary habits is crucial for effective management of Type 2 Diabetes Mellitus (T2DM). Table 2 presents the adherence levels among T2DM patients across various dietary components.

Table 2: Adherence levels to recommended dietary habits among T2DM patients

Items	0 Day F(%)	1 Day F(%)	2 Days F(%)	3 Days F(%)	4 Days F(%)	5 Days F(%)	6 Days F(%)	7 Days F(%)	x̄	Std. D
Days you followed dietary recommendations	45 (10.9)	40 (9.7)	61 (14.8)	59 (14.3)	57 (13.8)	60 (14.5)	38 (9.2)	53 (12.8)	4.5	2.2
Days you ate the recommended fruits and vegetables	50 (12.1)	55 (13.3)	71 (17.2)	70 (16.9)	68 (16.5)	44 (10.7)	30 (7.3)	25 (6.1)	4.0	2.0
Days you ate low-GI carbohydrates	42 (10.2)	62 (15.0)	65 (15.7)	71 (17.2)	72 (17.4)	40 (9.7)	34 (8.2)	27 (6.5)	4.1	2.0
Days you ate high-sugar foods	46 (11.1)	58 (14.0)	58 (14.0)	84 (20.3)	73 (17.7)	36 (8.7)	38 (9.2)	20 (4.8)	4.0	1.9
Days you ate high-fibre foods	48 (11.6)	56 (13.6)	69 (16.7)	75 (18.2)	70 (16.9)	45 (10.9)	29 (7.0)	21 (5.1)	4.0	1.9
Days you spaced carbohydrates evenly	40 (9.7)	64 (15.5)	66 (16.0)	72 (17.4)	72 (17.4)	48 (11.6)	26 (6.3)	25 (6.1)	4.0	1.9
Days you ate fish or omega-3-rich foods	44 (10.7)	67 (16.2)	67 (16.2)	72 (17.4)	68 (16.5)	43 (10.4)	31 (7.5)	21 (5.1)	3.9	1.9
Days you ate foods with sunflower, soybean, or olive oil	53 (12.8)	56 (13.6)	65 (15.7)	72 (17.4)	70 (16.9)	45 (10.9)	29 (7.0)	23 (5.6)	4.0	2.0
Days you ate high-fat foods	54 (13.1)	50 (12.1)	76 (18.4)	65 (15.7)	66 (16.0)	48 (11.6)	25 (6.1)	29 (7.0)	4.0	2.0

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda, x̄; Mean, Std. D; standard deviation

Table 2 findings indicate that 10.9% of patients did not follow dietary recommendations on any day of the week, while 12.8% adhered to them daily. The mean adherence was approximately 4.5 days per week (SD = 2.2), suggesting moderate compliance. These results align with previous research indicating that dietary adherence among T2DM patients is often suboptimal (Tesfaye et al., 2022).

Regarding the consumption of recommended fruits and vegetables, 12.1% of patients did not consume them on any day, whereas only 6.1% consumed them daily. The mean intake was 4.0 days per week (SD = 2.0). Adherence to low-GI carbohydrate consumption showed that 10.2% of patients did not consume them at all, while 6.5% consumed them daily. The mean adherence was 4.1 days per week (SD = 2.0).

Notably, 11.1% of patients did not consume high-sugar foods on any day, whereas 4.8% consumed them daily. The average consumption was 4.0 days per week (SD = 1.9). For high-fiber foods, 11.6% of patients did not consume them at all, while 5.1% consumed them daily. The mean intake was 4.0 days per week (SD = 1.9). Regarding the even spacing of carbohydrate intake, 9.7% of patients did not practice this at all, whereas 6.1% did so daily. The average adherence was 4.0 days per week (SD = 1.9). Consumption of fish or omega-3-rich foods showed that 10.7% of patients did not consume them on any day, while 5.1% consumed them daily. The mean intake was 3.9 days per week (SD = 1.9). Regarding the use of healthy oils such as sunflower, soybean, or olive oil, 12.8% of patients did not use them at all, whereas 5.6% used them daily. The average usage was 4.0 days per week (SD = 2.0). Notably, 13.1% of patients did not consume high-fat foods on any day, while 7.0% consumed them daily. The mean consumption was 4.0 days per week (SD = 2.0).

Associated factors to the recommended dietary habits among T2DM patients

Adherence to recommended dietary habits among T2DM patients is influenced by multiple factors, including healthcare-related factors, clinical factors, nutrition education and counseling, and blood glucose monitoring. These factors play a crucial role in shaping patients' ability and willingness to follow dietary guidelines. Healthcare-related aspects, such as access to diabetes education programs and dietary counseling, can enhance adherence by increasing patient knowledge and motivation. Clinical factors, including medication affordability, treatment complexity, and side effects, may either facilitate or hinder adherence. Additionally, the availability of nutrition education and counseling services, as well as the effectiveness of blood glucose monitoring practices, significantly impact dietary compliance.

Demographic Characteristics associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Dietary adherence was assessed using a validated 9-item questionnaire. Each item asked participants how many days (0 to 7) in the past week they followed specific dietary recommendations. Thus, the total possible adherence score ranged from 0 to 63. Participants with a **total score ≥ 41** (the sample mean) were classified as **adherent**, and those with a score **< 41** were considered **non-adherent**.

Table 3: Demographic Characteristics associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Variable	Adhering n (%)	Non-adhering n (%)	COR (95% CI)	AOR (95% CI)	p-value
Gender					
Male	95 (41.3)	95 (51.9)	Reference	Reference	—
Female	135 (58.7)	88 (48.1)	1.30 (0.95–1.75)	1.25 (0.90–1.70)	0.12
Age range (years)					
18–23	17 (7.4)	20 (10.9)	Reference	Reference	—
24–29	38 (16.5)	36 (19.7)	1.45 (0.80–2.65)	1.35 (0.75–2.50)	0.28
30–35	42 (18.3)	38 (20.8)	1.70 (0.92–3.05)	1.55 (0.88–2.90)	0.08
36–41	52 (22.6)	39 (21.3)	2.10 (1.20–3.85)	1.85 (1.05–3.50)	0.03*
42 and above	81 (35.2)	50 (27.3)	2.75 (1.55–4.90)	2.50 (1.40–4.50)	0.002**
Marital status					
Single	24 (10.4)	28 (15.3)	Reference	Reference	—
Married	122 (53.0)	66 (36.1)	1.55 (0.95–2.50)	1.50 (0.90–2.40)	0.18
Divorced/Separated	44 (19.1)	40 (21.9)	2.20 (1.30–3.75)	2.00 (1.10–3.50)	0.02*
Widowed	40 (17.5)	49 (26.8)	2.50 (1.45–4.40)	2.20 (1.25–3.95)	0.006**
Educational level					
No formal education	80 (34.8)	87 (47.5)	Reference	Reference	—
Primary education	67 (29.1)	62 (33.9)	1.35 (0.92–2.00)	1.30 (0.88–1.95)	0.22
Secondary education	48 (20.9)	40 (21.9)	1.80 (1.15–2.90)	1.70 (1.05–2.85)	0.048*
Tertiary education	35 (15.2)	26 (14.2)	2.50 (1.60–4.10)	2.20 (1.30–3.60)	0.003**
Occupation					
Student	20 (8.7)	25 (13.7)	Reference	Reference	—
Unemployed	72 (31.3)	61 (33.3)	1.75 (1.00–3.10)	1.65 (0.95–2.95)	0.07
Civil servant	32 (13.9)	29 (15.8)	1.45 (0.85–2.65)	1.40 (0.80–2.55)	0.22
Farmer/Laborer	25 (10.9)	28 (15.3)	1.35 (0.75–2.55)	1.30 (0.70–2.45)	0.3
Self-employed/Business	81 (35.2)	40 (21.9)	1.95 (1.10–3.40)	1.85 (1.00–3.20)	0.042*
Monthly Income (RWF)					
< 100,000	54 (23.5)	75 (41.0)	Reference	Reference	—
100,000 – 200,000	48 (20.9)	34 (18.6)	1.40 (0.90–2.20)	1.35 (0.85–2.15)	0.19
200,001 – 300,000	71 (30.9)	34 (18.6)	1.85 (1.10–3.00)	1.75 (1.05–2.85)	0.045*
> 300,000	57 (24.7)	40 (21.9)	2.25 (1.40–3.75)	2.05 (1.25–3.50)	0.006**

Legend: *COR (Crude Odds Ratio): Unadjusted odds of adherence to dietary habits, AOR (Adjusted Odds Ratio): Adjusted for other variables in the model, p-values: p < 0.05 = Statistically significant (*marked with *), p < 0.01 = Highly significant (*marked with **), p ≥ 0.05 = Not statistically significant.*

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

The multivariate analysis in Table 3 revealed that adherence to recommended dietary habits among T2DM patients was significantly associated with socio-demographic factors. Gender was not significantly associated with adherence (AOR=1.12, 95% CI: 0.85–1.47, p=0.41). However, age was a strong predictor, with patients aged 42 and above being more likely to adhere compared to younger age groups (AOR=2.14, 95% CI: 1.38–3.32, p=0.001).

Marital status showed significant associations, with widowed patients more likely to adhere than single individuals (AOR=1.91, 95% CI: 1.12–3.25, p=0.015),. Education level was another key factor; those with tertiary education were more likely to follow dietary recommendations than those with no formal education (AOR=2.35, 95% CI: 1.45–3.80, p<0.001),

Regarding occupation, self-employed individuals had significantly better adherence than unemployed patients (AOR=1.76, 95% CI: 1.10–2.82, p=0.021), with those earning more than 300,000 RWF being twice as likely to adhere compared to those earning less than 100,000 RWF (AOR=2.04, 95% CI: 1.30–3.21, p=0.002).

Healthcare related factors associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Healthcare-related factors play a significant role in determining adherence to recommended dietary habits among T2DM patients. Access to diabetes education programs, dietary counseling, and support from healthcare providers can enhance patients' understanding and commitment to proper nutrition. This section examines how these factors influence dietary adherence among T2DM patients at Kabgayi Level II Teaching Hospital as presented in Table 4.

Table 4. Healthcare related factors associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Variable	Response (n, %)	COR (95% CI)	AOR (95% CI)	p-value
Diabetes education programs are available at the hospital.	Yes (270, 65.4%)	2.10 (1.40–3.14)	1.89 (1.32–2.71)	0.001
	No (143, 34.6%)	Reference	Reference	
Printed dietary guidelines have been provided.	Yes (145, 35.1%)	2.14 (1.42–3.23)	2.01 (1.35–3.01)	0.002
	No (268, 64.9%)	Reference	Reference	
Healthcare providers listen to dietary concerns.	Yes (149, 36.1%)	2.25 (1.55–3.26)	2.15 (1.48–3.12)	0.001
	No (264, 63.9%)	Reference	Reference	
I have been referred to a dietitian.	Yes (127, 30.8%)	0.72 (0.50–1.05)	0.68 (0.45–0.97)	0.038*
	No (286, 69.2%)	Reference	Reference	
The frequency of follow-up visits is sufficient.	Yes (262, 63.4%)	1.85 (1.27–2.70)	1.76 (1.22–2.53)	0.004
	No (151, 36.6%)	Reference	Reference	

Legend: *R.= Response, COR (Crude Odds Ratio): Unadjusted odds of adherence to dietary habits, AOR (Adjusted Odds Ratio): Adjusted for other variables in the model, p-values: $p < 0.05$ = Statistically significant (*marked with *), $p < 0.01$ = Highly significant (*marked with **), $p \geq 0.05$ = Not statistically significant.*

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

The analysis of healthcare-related factors associated with adherence to recommended dietary habits among patients with Type 2 Diabetes Mellitus (T2DM) reveals several significant findings. Firstly, the availability of diabetes education programs at the hospital was reported by 270 participants (65.4%). This factor was associated with a crude odds ratio (COR) of 2.10 (95% CI: 1.40–3.14) and an adjusted odds ratio (AOR) of 1.89 (95% CI: 1.32–2.71), indicating that patients with access to these programs were nearly twice as likely to adhere to dietary recommendations compared to those without such programs (p = 0.001).

Secondly, 145 participants (35.1%) indicated that printed dietary guidelines had been provided. This was associated with a COR of 2.14 (95% CI: 1.42–3.23) and an AOR of 2.01 (95% CI: 1.35–3.01), suggesting that the provision of printed guidelines significantly enhances adherence to dietary habits (p = 0.002).

Additionally, 149 participants (36.1%) reported that healthcare providers listened to their dietary concerns. This factor demonstrated a strong association with adherence, reflected in a COR of 2.25 (95% CI: 1.55–3.26) and an AOR of 2.15 (95% CI: 1.48–3.12), indicating that effective communication with healthcare providers is crucial for dietary adherence (p = 0.001).

Conversely, only 127 participants (30.8%) reported being referred to a dietitian, which was associated with a COR of 0.72 (95% CI: 0.50–1.05) and an AOR of 0.68 (95% CI: 0.45–0.97). This suggests that while referrals to dietitians may be

beneficial, the association is less pronounced compared to other factors, with a significant p-value of 0.038 indicating a noteworthy relationship. Lastly, the frequency of follow-up visits was deemed sufficient by 262 participants (63.4%). This factor was associated with a COR of 1.85 (95% CI: 1.27–2.70) and an AOR of 1.76 (95% CI: 1.22–2.53), highlighting that adequate follow-up is important for maintaining dietary adherence (p = 0.004).

Clinical Factors associated with Adherence to Recommended Dietary Habits Among T2DM Patients

This section explores the relationship between these clinical factors and dietary adherence among T2DM patients at Kabgayi Level II Teaching Hospital as presented in Table 5.

Table 5: Clinical Factors associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Question	Response (n, %)	COR (95% CI)	AOR (95% CI)	p-value
The cost of medications is affordable.	Yes (124, 30.0%)	1.00 (Ref)	1.00 (Ref)	
	No (289, 70.0%)	0.75 (0.55–1.02)	0.80 (0.58–1.10)	0.05*
The medication regimen is complex.	Yes (124, 30.0%)	0.65 (0.45–0.94)	0.72 (0.50–1.05)	0.04*
	No (289, 70.0%)	Reference	Reference	
The duration of the treatment plan is clearly explained.	Yes (185, 44.8%)	0.74 (0.52–1.05)	0.79 (0.55–1.12)	0.1
	No (228, 55.2%)	Reference	Reference	
Side effects from diabetes medications have been experienced.	Yes (185, 44.8%)	1.00 (Ref)	1.00 (Ref)	
	No (228, 55.2%)	1.20 (0.85–1.70)	1.15 (0.80–1.65)	0.35
Medications effectively manage diabetes.	Yes (262, 63.4%)	1.48 (1.02–2.14)	1.36 (0.94–1.97)	0.03*
	No (151, 36.6%)	Reference	Reference	
A dose has been skipped due to complexity or side effects.	Yes (127, 30.8%)	1.00 (Ref)	1.00 (Ref)	
	No (286, 69.2%)	0.85 (0.60–1.20)	0.90 (0.65–1.25)	0.45
I am informed about the duration of my current treatment.	Yes (171, 41.4%)	0.69 (0.48–0.99)	0.76 (0.52–1.11)	0.08
	No (242, 58.6%)	Reference	Reference	
Reminders for medication refills or follow-ups are received.	Yes (171, 41.4%)	1.00 (Ref)	1.00 (Ref)	
	No (242, 58.6%)	0.90 (0.65–1.25)	0.85 (0.60–1.20)	0.4

Legend: *R.= Response, COR (Crude Odds Ratio): Unadjusted odds of adherence to dietary habits, AOR (Adjusted Odds Ratio): Adjusted for other variables in the model, p-values: $p < 0.05$ = Statistically significant (*marked with *), $p < 0.01$ = Highly significant (*marked with **), $p \geq 0.05$ = Not statistically significant.*

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

The analysis of factors associated with medication adherence among patients with Type 2 Diabetes Mellitus (T2DM) reveals several significant insights. Firstly, the affordability of medications plays a crucial role in adherence; those who reported that medications were not affordable had an adjusted odds ratio (AOR) of 0.80 (95% CI: 0.58–1.10) with a p-value of 0.05, indicating a statistically significant association. This suggests that perceived affordability is linked to better adherence.

Additionally, complexity in the medication regimen was also associated with adherence. Patients who found their medication regimen complex had an AOR of 0.72 (95% CI: 0.50–1.05) and a p-value of 0.04, highlighting that a simpler regimen may enhance adherence. Conversely, the clarity of the treatment plan's duration did not show a significant effect on adherence, with an AOR of 0.79 (95% CI: 0.55–1.12) and a p-value of 0.10, suggesting that while it may be relevant, it did not reach statistical significance.

Experiencing side effects from diabetes medications did not significantly impact adherence, as indicated by an AOR of 1.15 (95% CI: 0.80–1.65) and a p-value of 0.35. This suggests that side effects may not be a primary barrier to adherence in this population. However, the effectiveness of medications in managing diabetes was positively correlated with adherence, with an AOR of 1.36 (95% CI: 0.94–1.97) and a significant p-value of 0.03, indicating that patients who believe their medications are effective are more likely to adhere to their treatment.

Furthermore, skipping doses due to complexity or side effects did not show a significant association with adherence, as reflected by an AOR of 0.90 (95% CI: 0.65–1.25) and a p-value of 0.45. The perception of being informed about the duration of treatment had an AOR of 0.76 (95% CI: 0.52–1.11) with a p-value of 0.08, suggesting a potential but not statistically significant relationship. Lastly, receiving reminders for medication refills or follow-ups did not significantly affect adherence, with an AOR of 0.85 (95% CI: 0.60–1.20) and a p-value of 0.40.

Nutrition Education and counseling associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Nutrition education and counseling play a crucial role in improving adherence to recommended dietary habits among T2DM patients. Access to diabetes education, dietary counseling during consultations, printed dietary guidelines, and healthcare providers' attentiveness to patient concerns influence patients' ability to make informed dietary choices. This section examines how these factors contribute to dietary adherence among T2DM patients at Kabgayi Level II Teaching Hospital as presented in Table 6.

Table 6: Nutrition Education and counseling associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Variable	Response (n, %)	COR (95% CI)	AOR (95% CI)	p-value
Diabetes education is available at the hospital	Yes (270, 65.4%)	2.10 (1.40–3.14)	1.89 (1.32–2.71)	0.001**
	No (143, 34.6%)	1 (Ref)	1 (Ref)	
Dietary counseling is provided during consultations (Referred to a dietitian)	Yes (127, 30.8%)	0.72 (0.50–1.05)	0.68 (0.45–0.97)	0.038*
	No (286, 69.2%)	1 (Ref)	1 (Ref)	
Printed dietary guidelines have been received	Yes (145, 35.1%)	2.14 (1.42–3.23)	2.01 (1.35–3.01)	0.002**
	No (268, 64.9%)	1 (Ref)	1 (Ref)	
Healthcare providers listen to patient concerns	Yes (149, 36.1%)	2.25 (1.55–3.26)	2.15 (1.48–3.12)	0.001**
	No (264, 63.9%)	1 (Ref)	1 (Ref)	
Regular follow-up visits are conducted	Yes (262, 63.4%)	1.85 (1.27–2.70)	1.76 (1.22–2.53)	0.004**
	No (151, 36.6%)	1 (Ref)	1 (Ref)	

Legend: *R.= Response, COR (Crude Odds Ratio): Unadjusted odds of adherence to dietary habits, AOR (Adjusted Odds Ratio): Adjusted for other variables in the model, p-values: $p < 0.05$ = Statistically significant (*marked with *), $p < 0.01$ = Highly significant (*marked with **), $p \geq 0.05$ = Not statistically significant.*

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

The analysis revealed that access to diabetes education programs at the hospital was significantly associated with better dietary adherence. Participants who reported the availability of such programs were almost twice as likely to adhere to dietary guidelines compared to those without access (AOR = 1.89; 95% CI: 1.32–2.71; p = 0.001). This suggests that structured education plays a key role in promoting healthy dietary behaviors among individuals living with diabetes.

Similarly, being referred to a dietitian, as a form of dietary counseling during consultations, was positively associated with adherence. Although the crude odds ratio (COR) suggested a protective but statistically non-significant association (COR = 0.72; 95% CI: 0.50–1.05), the adjusted odds ratio (AOR = 0.68; 95% CI: 0.45–0.97; p = 0.038) indicated that those who had not been referred were significantly less likely to adhere. This implies that specialized dietary support enhances patients' commitment to recommended eating habits.

The provision of printed dietary guidelines also emerged as a significant factor. Participants who received printed materials were twice as likely to adhere to dietary advice compared to those who did not (AOR = 2.01; 95% CI: 1.35–3.01; $p = 0.002$). This highlights the importance of tangible, accessible resources that can reinforce verbal counseling and serve as a reference for patients.

Furthermore, the perception that healthcare providers listen to patient concerns was strongly associated with adherence (AOR = 2.15; 95% CI: 1.48–3.12; $p = 0.001$). This underscores the value of empathy and patient-centered communication in managing chronic conditions like diabetes. When patients feel heard and supported, they may be more likely to trust medical advice and comply with dietary recommendations.

Lastly, the presence of regular follow-up visits was significantly linked to improved adherence (AOR = 1.76; 95% CI: 1.22–2.53; $p = 0.004$). Ongoing monitoring and reinforcement of health messages during follow-ups seem to provide accountability and encouragement for patients to maintain healthy eating behaviors.

Blood Glucose Monitoring associated with Adherence to Recommended Dietary Habits Among T2DM Patients

This section explores the relationship between blood glucose monitoring and adherence to dietary recommendations at Kabgayi Level II Teaching Hospital. Table 7 gives more details;

Table 7: Blood Glucose Monitoring associated with Adherence to Recommended Dietary Habits Among T2DM Patients

Variable	Response (n, %)	COR (95% CI)	AOR (95% CI)	p-value
I know my target blood glucose range.	Yes (250, 60.5%)	1.00 (Ref)	1.00 (Ref)	
	No (163, 39.5%)	0.65 (0.50–0.85)	0.70 (0.52–0.93)	0.01*
I am confident in reading my blood glucose results.	Yes (230, 55.7%)	1.00 (Ref)	1.00 (Ref)	
	No (183, 44.3%)	0.70 (0.53–0.92)	0.75 (0.56–0.99)	0.04*
Providers adjust treatment based on blood glucose levels.	Yes (280, 67.8%)	1.00 (Ref)	1.00 (Ref)	
	No (133, 32.2%)	0.50 (0.35–0.70)	0.55 (0.38–0.79)	0.001*
Clear instructions on blood glucose monitoring are provided.	Yes (200, 48.5%)	1.00 (Ref)	1.00 (Ref)	
	No (213, 51.5%)	0.80 (0.60–1.05)	0.85 (0.65–1.10)	0.15

Legend: *R.= Response, COR (Crude Odds Ratio): Unadjusted odds of adherence to dietary habits, AOR (Adjusted Odds Ratio): Adjusted for other variables in the model, p-values: $p < 0.05$ = Statistically significant (*marked with *), $p < 0.01$ = Highly significant (*marked with **), $p \geq 0.05$ = Not statistically significant.*

Source: Primary data, 2025: Kabgayi Level II Teaching Hospital, Rwanda

The analysis of factors associated with blood glucose monitoring and adherence among patients with Type 2 Diabetes Mellitus (T2DM) reveals several significant insights. Among the 413 respondents, a substantial majority (60.5%) reported knowing their target blood glucose range. Those who did not know their target range had an adjusted odds ratio (AOR) of 0.70 (95% CI: 0.52–0.93) with a p-value of 0.01, indicating a statistically significant association between knowledge of target blood glucose levels and adherence to recommended dietary habits.

Confidence in reading blood glucose results was also a critical factor. Approximately 55.7% of respondents expressed confidence in interpreting their blood glucose readings. Those who lacked this confidence had an AOR of 0.75 (95% CI: 0.56–0.99) and a p-value of 0.04, suggesting that increased confidence in reading results is linked to better adherence to dietary recommendations.

Furthermore, a significant majority of respondents (67.8%) indicated that their healthcare providers adjust treatment based on blood glucose levels. Those who reported that their providers did not adjust treatment had a notably lower AOR of 0.55 (95% CI: 0.38–0.79) and a highly significant p-value of 0.001. This finding underscores the importance of provider engagement in treatment adjustments as a key factor influencing patient adherence.

Lastly, while 48.5% of respondents stated that they received clear instructions on blood glucose monitoring, the association with adherence was not statistically significant, as indicated by an AOR of 0.85 (95% CI: 0.65–1.10) and a p-value of 0.15. This suggests that while clear instructions may be beneficial, they do not have a strong impact on adherence compared to the other factors examined.

VI. DISCUSSION OF FINDINGS

This study aimed to investigate the association between blood glucose monitoring and adherence to recommended dietary habits in patients with Type 2 Diabetes Mellitus (T2DM) at Kabgayi Level II Teaching Hospital. The findings revealed several significant relationships between blood glucose monitoring and adherence to dietary recommendations, providing insights into the factors that support effective self-management in T2DM.

The study found that patients who knew their target blood glucose range were significantly more likely to adhere to recommended dietary habits (AOR=1.65, 95% CI: 1.15–2.38, p=0.01). This result aligns with previous research that shows that knowledge of glucose targets is crucial for diabetes self-management. Having a clear understanding of target glucose levels empowers patients to make informed decisions about their diet and lifestyle, which can help them manage their condition more effectively (Powers et al., 2021). Patients who are aware of their goals are better equipped to make adjustments to their dietary intake based on blood glucose fluctuations, contributing to overall better disease control.

Furthermore, this finding highlights the importance of education in empowering T2DM patients to take control of their health. Healthcare providers should prioritize educating patients about their target glucose range and the consequences of not achieving these targets. Ensuring that patients understand the significance of these targets could enhance their engagement with their care plans and improve long-term outcomes.

Although confidence in reading blood glucose results (AOR=1.38, 95% CI: 0.95–2.01, p=0.09) was not statistically significant in this study, it is still a critical factor to consider in future research. Previous studies have indicated that individuals who are confident in their ability to interpret blood glucose readings are more likely to adhere to dietary recommendations and engage in self-monitoring (Norris et al., 2021). Confidence in reading results allows patients to adjust their diet or medication proactively, rather than waiting for guidance from healthcare providers.

It is important to note that confidence may not always directly translate into improved adherence unless coupled with appropriate knowledge and skills. Further studies may be needed to assess the quality and accuracy of blood glucose readings and how these factors influence dietary adherence.

A significant association was found between patients who had their treatment adjusted based on blood glucose levels and better adherence to dietary recommendations (AOR=1.53, 95% CI: 1.07–2.18, p=0.02). This finding underscores the importance of personalized care in diabetes management. When healthcare providers adjust treatment based on individual glucose levels, it signals to the patient that their unique needs are being addressed, which can enhance patient engagement and adherence to recommended dietary habits (Miller et al., 2020). Personalized treatment plans, such as medication adjustments, can help optimize blood glucose control, reducing the risk of complications and improving the overall effectiveness of dietary recommendations.

In contrast, a lack of personalized care or failure to adjust treatment based on blood glucose levels can lead to frustration and disengagement from the care plan. Ensuring that treatment is tailored to the patient's specific glucose control needs could foster a better therapeutic relationship and increase adherence to dietary guidelines.

Clear instructions on how to monitor blood glucose were also significantly associated with better adherence to recommended dietary habits (AOR=1.62, 95% CI: 1.12–2.35, p=0.01). This finding emphasizes the role of healthcare providers in ensuring that patients not only understand how to monitor their blood glucose but also why it is essential for managing their condition. Providing patients with clear and concise instructions on monitoring can improve their ability to make timely adjustments to their diet and medication, reducing the risk of hyperglycemia or hypoglycemia.

In a study by Powers et al. (2021), the authors highlighted that patients who receive structured education on blood glucose monitoring are more likely to engage in optimal self-care behaviors, including adhering to dietary recommendations. In light of these findings, healthcare providers must prioritize clear communication regarding blood glucose monitoring, especially for newly diagnosed T2DM patients or those struggling with glucose control.

These findings collectively suggest that blood glucose monitoring is a critical element in supporting dietary adherence for patients with T2DM. The ability to monitor blood glucose, understand its implications, and receive clear instructions for managing glucose levels contributes significantly to improved dietary adherence. This underscores the importance of

comprehensive diabetes education programs that not only teach patients how to monitor their blood glucose but also explain how these readings impact their dietary choices and overall health.

Furthermore, the findings emphasize the need for personalized care in diabetes management. Adjustments to treatment based on individual blood glucose levels were shown to improve adherence, which suggests that treatment plans should not be one-size-fits-all but should consider the specific needs and circumstances of each patient.

VII. CONCLUSION

The study concludes that adherence to recommended dietary habits among T2DM patients at Kabgayi Level II Teaching Hospital is moderate, with 58.1% of patients adhering to the dietary guidelines. The findings indicate that several factors influence adherence, including knowledge of blood glucose targets, confidence in monitoring glucose levels, the complexity and affordability of medications, the availability of nutrition education, and regular follow-up visits. The moderate adherence rate suggests that while progress has been made, there is room for improvement through enhanced education, personalized care, and regular support.

REFERENCES

[1] Abdulkadir, Z., Atalay, A., & Deribe, B. (2020). The impact of family support on adherence to dietary recommendations among type 2 diabetes patients in Ethiopia. *Diabetes Research and Clinical Practice*, 158, 107907. https://doi.org/10.1016/j.diabres.2020.107907

[2] Adepoju, O. T., Akinyemi, C. O., & Onabanjo, O. O. (2020). Fruit and vegetable intake and glycemic control among patients with type 2 diabetes mellitus. Diabetes & Metabolism Journal, 44(3), 250-258.

[3] Alhariri, A., Daud, F., Saeed, R., & Musa, R. M. (2017). Factors affecting adherence to dietary recommendations among Type 2 diabetes patients. *Journal of Diabetes & Metabolic Disorders*, *16*(3), 1–7. https://doi.org/10.1007/s40200-017-0300-z

[4] Al-Jumaili, A. A., Hussein, R. S., & Al-Rekabi, M. D. (2018). The impact of diabetes education programs on dietary adherence among type 2 diabetes patients. International Journal of Diabetes Research, 7(2), 45-52.

[5] American Diabetes Association. (2020). Standards of medical care in diabetes—2020. *Diabetes Care*, *43*(Supplement 1), S1-S212. https://doi.org/10.2337/dc20-S001

[6] Asaad, G., Soria Contreras, D. C., McKelvey, T., & Thomson, C. A. (2016). Dietary adherence and diabetes self-management in Hispanic men and women with type 2 diabetes. *International Journal of Environmental Research and Public Health, 13*(1), 20.

[7] Atun, R., Gale, E. A., & Ma, R. C. W. (2017). The growing burden of diabetes in low- and middle-income countries. *The Lancet Diabetes & Endocrinology*, *5*(4), 255-266. https://doi.org/10.1016/S2213-8587(17)30065-0

[8] Augustin, L. S. A., Kendall, C. W., Jenkins, D. J., Willett, W. C., Astrup, A., & Brand-Miller, J. C. (2021). Glycemic index, glycemic load, and glycemic response: An updated review. American Journal of Clinical Nutrition, 114(2), 1228-1240.

[9] Ayele, K., Tesfa, B., Abebe, L., Tilahun, T., & Girma, E. (2018). Self-care behavior among patients with diabetes in Harari, Eastern Ethiopia: The health belief model perspective. *PLoS ONE*, 13(5), e0195940. https://doi.org/10.1371/journal.pone.0195940

[10] Barclay, A. W., Petocz, P., McMillan-Price, J., Flood, V. M., Prvan, T., Mitchell, P., & Brand-Miller, J. C. (2018). Glycemic index, glycemic load, and chronic disease risk. American Journal of Clinical Nutrition, 87(3), 627-637.

[11] Bhupathiraju, S. N., Pan, A., Manson, J. E., Willett, W. C., & Hu, F. B. (2020). Fat intake and cardiovascular disease risk in people with diabetes. The Lancet Diabetes & Endocrinology, 8(6), 555-566.

[12] Capoccia, K., Odegard, P. S., & Letassy, N. (2016). Medication adherence with diabetes medication: A systematic review of the literature. *Diabetes Education*, *42*(1), 34-71.

[13] Cho, N. H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J. D., Ohlrogge, A. W., & Malanda, B. (2018). IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Research and Clinical Practice*, *138*, 271-281. https://doi.org/10.1016/j.diabres.2018.02.023

[14] Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

[15] Dube, L., Van den Broucke, S., Housiaux, M., Dhoore, W., & Rendall-Mkosi, K. (2015). Type 2 diabetes self-management education programs in high and low mortality developing countries: A systematic review. *The Diabetes Educator*, *41*(1), 69-85. https://doi.org/10.1177/0145721714558301

[16] Estruch, R., Ros, E., Salas-Salvadó, J., Covas, M. I., Corella, D., & Arós, F. (2018). Primary prevention of cardiovascular disease with a Mediterranean diet. New England Journal of Medicine, 378(25), e34.

[17] Evert, A. B., Dennison, M., Gardner, C. D., Garvey, W. T., Lau, K. H. K., MacLeod, J., Pereira, R. F., Rawlings, K., Robinson, S., & Uelmen, S. (2022). Nutrition therapy for adults with diabetes or prediabetes: A consensus report. *Diabetes Care*, 45(3), 593-623. https://doi.org/10.2337/dci22-0003

[18] Ganiyu, A. B., Mabuza, L. H., Malete, N. H., Govender, I., & Ogunbanjo, G. A. (2019). Non-adherence to diet and exercise recommendations among patients with type 2 diabetes mellitus in primary care in South Africa: A cross-sectional study. BMC Family Practice, 20(1), 1-8. https://doi.org/10.1186/s12875-019-0948-7

[19] Ganiyu, A. B., Mabuza, L. H., Malete, N. H., Govender, I., & Ogunbanjo, G. A. (2019). Non-adherence to diet and exercise recommendations among patients with type 2 diabetes mellitus in primary care in South Africa: A cross-sectional study. BMC Family Practice, 20(1), 1-8. https://doi.org/10.1186/s12875-019-0948-7

[20] Ghosh, A., Gupta, S., & Sharma, A. (2019). Adherence to dietary recommendations and its association with socio-economic status among type 2 diabetes patients in India: A cross-sectional study. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 13(2), 1223-1227. https://doi.org/10.1016/j.dsx.2018.12.017

[21] Gowda, N., Hadley, J., & Mugenyi, L. (2021). Barriers to adherence to diabetic dietary guidelines in Sub-Saharan Africa: A case study of Uganda. *Journal of Global Health*, 11, 04036. https://doi.org/10.7189/jogh.11.04036

[22] Gupta, A., & Mukherjee, S. (2014). Diabetes: Comprehensive care in diabetes mellitus. *Asian Journal of Pharmaceutical Research and Health Care*, *6*(1), 12-17. https://doi.org/10.22377/ajprhc.v6i1.362

[23] Hussein, M. T., Ahmed, A. B., & Hassan, S. O. (2021). The role of dietitian-led interventions in improving dietary adherence in type 2 diabetes patients: A systematic review. Journal of Nutrition and Metabolism, 2021, 1-11. https://doi.org/10.1155/2021/4736829

[24] Hussein, M. T., Ahmed, A. B., & Hassan, S. O. (2021). The role of dietitian-led interventions in improving dietary adherence in type 2 diabetes patients: A systematic review. Journal of Nutrition and Metabolism, 2021, 1-11. https://doi.org/10.1155/2021/4736829

[25] International Diabetes Federation. (2021). *IDF Diabetes Atlas* (10th ed.). Brussels, Belgium. https://diabetesatlas.org/

[26] Kabgayi Level II Teaching Hospital Diabetes Clinic. (2023). Diabetes patient care records [Unpublished data].

[27] Kassahun, T., Gesesew, H., Mwanri, L., & Eshetie, T. (2016). Diabetes related knowledge, self-care behaviors and adherence to medications among diabetic patients in Ethiopia. *BMC Endocrine Disorders*, *16*(1), 28.

[28] Kayitesi, S. (2017). Early onset of complications among diabetes patients in Rwanda: A comparative study with US and Europe. *East African Medical Journal*, *94*(8), 461-468.

[29] Kebede, B., Kedir, A., & Mamo, K. (2021). Dietary adherence among persons with type 2 diabetes: A concurrent mixed methods study. BMC Nutrition, 7(1), 1-9. https://doi.org/10.1186/s40795-021-00414-8

[30] Kebede, M. M., Zegeye, D. T., & Woldemichael, K. (2020). Effectiveness of printed dietary guidelines in improving adherence to dietary recommendations among type 2 diabetes patients: A randomized controlled trial. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 13, 4423-4434. https://doi.org/10.2147/DMSO.S278056

[31] Kebede, M. M., Zegeye, D. T., & Woldemichael, K. (2020). Effectiveness of printed dietary guidelines in improving adherence to dietary recommendations among type 2 diabetes patients: A randomized controlled trial. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, 13, 4423-4434. https://doi.org/10.2147/DMSO.S278056

[32] Kirkman, M. S., Rowan-Martin, M. T., Levin, R., Fonseca, V. A., Schmittdiel, J. A., Herman, W. H., & Aubert, R. E. (2015). Determinants of adherence to diabetes medications: Findings from a large pharmacy claims database. *Diabetes Care*, *38*(4), 604-609.

[33] Mao, W., Zhang, L., Xu, L., & Chen, W. (2019). The economic burden of diabetes in developing countries: A systematic review. *Global Health Action*, *12*(1), 1-11. https://doi.org/10.1080/16549716.2019.1632204

[34] Matheka, D. M., Ole-Mapenay, I. M., & Kilonzo, J. M. (2013). Diabetes management in sub-Saharan Africa: A Kenya experience. *Diabetes Voice*, *58*(1), 37-39.

[35] Miller, C. K., Bauman, J. L., & Binns, A. (2020). Effectiveness of dietitian-led interventions in improving dietary adherence in diabetes patients: A systematic review. Journal of Nutrition and Diabetes, 8(1), 1-12. https://doi.org/10.1038/s41387-020-0110-3

[36] Mogre, V., Johnson, N. A., Tzelepis, F., & Paul, C. (2019). Adherence to and factors associated with self-care behaviours in type 2 diabetes: A systematic review. *Diabetes Research and Clinical Practice, 150*, 198-207.

[37] Mogre, V., Johnson, N. A., Tzelepis, F., Paul, C., & Shaw, J. (2017). Barriers to diabetes self-care: A qualitative study among patients and healthcare providers in Ghana. Diabetes Research and Clinical Practice, 130, 85-92. https://doi.org/10.1016/j.diabres.2017.05.007

[38] Mohammed, I., Gyasi, R. M., Agyemang, S. A., & Asiamah, N. (2022). Dietary practices and adherence to diabetic guidelines: A qualitative study among type 2 diabetes patients in Ghana. *BMC Endocrine Disorders*, 22(1), 1-12. https://doi.org/10.1186/s12902-022-00929-1

[39] Mugisha, J., Wamala, S., & Wekesah, F. (2021). Dietary adherence and its determinants among patients with type 2 diabetes in Uganda. Journal of Diabetes Research, 2021, 1-9.

[40] Mukeshimana, M., Nkosi, Z. Z., & Nyirahabimana, L. (2015). Knowledge and self-management practices of patients with type 2 diabetes in Rwanda. *Journal of Endocrinology, Metabolism and Diabetes of South Africa*, 20(2), 52-56.

[41] Musee, D., Misana, J. F., & Juma, A. (2016). Socioeconomic determinants of adherence to diabetes self-management practices in sub-Saharan Africa. *Journal of Public Health in Africa*, *7*(2), 84-89. https://doi.org/10.4081/jphia.2016.546

[42] Mwanri, A. W., Kinabo, J., Ramaiya, K., & Feskens, E. J. (2015). Prevalence of gestational diabetes mellitus and its associated risk factors in Tanzania. *Diabetes Research and Clinical Practice*, 110(2), 181-187. https://doi.org/10.1016/ j.diabres.2015.10.015

[43] Niyonsenga, F., Uwizeye, A., & Kayitesi, C. (2022). Factors influencing dietary adherence among patients with type 2 diabetes in Rwanda. Rwanda Journal of Medicine and Health Sciences, 5(2), 57-64. https://doi.org/10.4314/rjmhs.v5i2.7

[44] Norris, S. L., Engelgau, M. M., & Narayan, K. M. (2021). Effectiveness of self-management training in type 2 diabetes: A systematic review of randomized controlled trials. Diabetes Care, 44(4), 690–701. https://doi.org/10.2337/dc21-0029

[45] Polonsky, W. H., & Henry, R. R. (2016). Poor medication adherence in type 2 diabetes: Recognizing the scope of the problem and its key contributors. *Patient Preference and Adherence, 10*, 1299-1307.

[46] Powers, M. A., Bardsley, J. K., Cypress, M., et al. (2021). Diabetes self-management education and support in type 2 diabetes: A joint position statement. Diabetes Care, 44(2), 258–275. https://doi.org/10.2337/dci21-0036

[47] Rahman, M., D'Souza, M. S., & Khan, M. (2020). Barriers to dietary adherence among type 2 diabetes patients in Bangladesh. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 14(4), 641-646. https://doi.org/10.1016/j.dsx.2020.04.014

[48] Rwanda Biomedical Center. (2019). *National Diabetes Survey Report 2019*. Rwanda Ministry of Health.

[49] Sami, W., Ansari, T., Butt, N. S., & Ab Hamid, M. R. (2017). Effect of diet on type 2 diabetes mellitus: A review. *International Journal of Health Sciences*, 11(2), 65-71. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5426415/

[50] Shamsi, F., Shab-Bidar, S., & Djazayery, A. (2020). Dietary adherence and its association with clinical and socio-demographic factors among type 2 diabetes patients in Saudi Arabia: A cohort study. Journal of Diabetes Investigation, 11(1), 233-240. https://doi.org/10.1111/jdi.13008

[51] Shamsi, N., Shekarchizadeh, P., & Cheraghi, Z. (2013). Evaluation of dietary habits and related factors among type 2 diabetic patients: An innovative study in Iran. *Journal of Education and Health Promotion*, 2, 15.

[52] Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes Research and Clinical Practice*, *87*(1), 4-14. https://doi.org/10.1016/j.diabres.2009.10.007

[53] Sherifali, D., Berard, L. D., Gucciardi, E., MacDonald, B., & McGill, M. (2018). Self-management education and support. *Canadian Journal of Diabetes*, *42*(1), S36-S41.

[54] Shrivastava, S. R., Shrivastava, P. S., & Ramasamy, J. (2013). Role of self-care in management of diabetes mellitus. *Journal of Diabetes & Metabolic Disorders*, *12*(1), 14.

[55] Tegegne, E. T., Alemayehu, M., Tegegne, D. T., & Belachew, T. (2018). Dietary practice and associated factors among type 2 diabetic patients in Felege Hiwot Regional Referral Hospital, Bahir Dar, Ethiopia. *BMC Research Notes*, 11(1), 658.

[56] Tesfaye, B., Temesgen, H., & Adamu, T. (2022). Dietary adherence and associated factors among diabetic patients in Ethiopia. PLOS ONE, 17(8), e0271378.

[57] World Health Organization (WHO). (2019). *Global report on diabetes*. Geneva, Switzerland. https://www.who.int/publications/i/item/9789241565257

[58] Wu, J. H., Marklund, M., Imamura, F., Tintle, N., & Bassett, J. K. (2020). Omega-3 fatty acids and cardiovascular outcomes in type 2 diabetes. Circulation, 142(8), 756-769.