Journal of Current Health Sciences. 2026, 6(1): 1-10
DOI:10.47679/jchs.2026146
ISSN 2809-3275 (print), ISSN 2809-2236 (online)

RESEARCH ARTICLE

Adherence to Dietary Recommendations and Associated Factors Among Adults Aged 40 Years and Older with Type 2 Diabetes: A Cross-Sectional Study at Kericho County, Kenya

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Published online: 15 January 2026

Abstract

Type 2 diabetes is a major public health problem globally. There are limited data on adherence to dietary recommendations and its associated factors among type 2 diabetes patients, especially in Kericho, Kenya. Therefore, this study assessed the level and factors associated with adherence to dietary recommendations among type 2 diabetes patients aged 40+ years in Kericho County. A hospital-based cross-sectional study was conducted at Kericho County Referral Hospital in Kericho County, involving 414 type 2 diabetes patients aged 40+ years. Data was collected using validated and standardized structured questionnaires. SPSS version 26 was used to analyze data. Bivariate and multivariate logistic regression was used to identify factors associated with dietary adherence. Out of 414 participants, only 43.5% had good adherence to dietary recommendations. Multivariate logistic regression analysis showed that participants aged 70 years and above (AOR: 10.99, 95% CI: 1.61 – 25.08, p = 0.014), attained tertiary/college education (AOR: 8.20, 95% CI: 1.61 – 19.04, p = 0.021), no comorbidity (AOR: 2.78, 95% CI: 1.30 – 5.93, p = 0.008), had not experienced any complication (AOR: 3.09, 95% CI: 1.37 – 6.99, p = 0.007) had higher odds of good adherence to the recommended diet. Additionally, respondents with over 10 years since being diagnosed with diabetes (AOR: 0.57, 95% CI: 0.27 – 0.78, p = 0.024), had not received diabetes nutritional education (AOR: 0.15, 95% CI: 0.08 – 0.59, p <0.001), and lived with more than five family members (AOR: 0.43, 95% CI: 0.19 – 0.87, p < 0.001) had a lower likelihood of good adherence to dietary recommendations. The rate of dietary adherence was found to be relatively low in Kericho County, and significantly influenced with age, education level, comorbidity, diabetes-related complications, exposure to diabetes nutritional education and family structure. Provision and the implementation of structured and culturally tailored nutrition education using routine clinic-based counseling, standardized meal-planning guides, peer support groups, and regular dietitian follow-up to strengthen adherence and improve glycemic outcomes.

Keywords: Adherence, diabetes management, dietary recommendations, type 2 diabetes, Kenya

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder that poses major public health problems globally. According to the International Diabetes Federation (IDF), approximately 589 million individuals globally and 24.6 million in Africa were living with type 2 diabetes mellitus in 2024 and are projected to increase by 42% and 142% by 2050, respectively (International Diabetes Federation (IDF) Atlas, 2024). In Kenya where Kericho County is located, the national prevalence of diabetes among adults is estimated at 3.3%, affecting over 1.5 million individuals, with over 60% of new diabetes case diagnoses occurring among individuals aged 40 years or older (World Health Organization, 2024). This burden is projected to double by 2030. People aged 40 years or older face higher risks of severe complications such as retinopathy, neuropathy, nephropathy, lower limb amputations, and cardiovascular diseases. According to WHO, diabetes was attributed to approximately 3.4 million deaths globally in 2024, with diabetic-related complications, hyperglycemia, resulting in more deaths, almost 1 death in every six seconds (World

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Submitted: 10 October 2025 Revised: 01 January 2026 Accepted: 04 January 2026

Health Organization, 2024). The incidence of type 2 diabetes mellitus (T2DM) sharply increases after age 40 due to metabolic changes, reduced insulin sensitivity, and accumulation of risk factors such as inactivity, abdominal obesity, and hypertension (Arias-Gastélum et al., 2021). Diet is an essential component in T2DM management and treatment plans, and optimal adherence to dietary recommendations significantly prevents life loss by approximately 2.8% (Magkos et al., 2020). Studies report that approximately 12 million deaths and 250 million Disability-Adjusted Life Years (DALYs) were significantly attributable to dietary habits (Safiri et al., 2022; Sun et al., 2023).

The intensive lifestyle interventions, particularly dietary strategies and adherence, could significantly reduce the risk of type 2 diabetes by more than 57% (Garcia-Molina et al., 2020; Noronha et al., 2022). Dietary recommendations entail nationally and internationally endorsed dietary guidelines for effective T2DM management and complication prevention (World Health Organization, 2024). These dietary recommendations emphasize on increased intake of fruits and vegetables, fish, fibers, poultry, and milk products, and low intake of salts, fats, and sugars. Similarly, the American Diabetes Association recommends intake of nutrient-dense carbohydrate diets with higher fiber content, including fruits, whole grains, vegetables, legumes, and dairy products, while avoiding intake of sugar-sweetened beverages, minimizing intake of saturated and trans-fats, and other products such as fat-free dairy products and vegetable oils (Churuangsuk et al., 2020). Appropriate and optimal adherence to dietary practices can lower glycated hemoglobin (HbA1c) levels by approximately 2%, reduce insulin resistance progression and lower the risk of cardiovascular and diabetic-related complications (Magkos et al., 2020; Martín-Peláez et al., 2020).

Despite the significant role of dietary control in diabetes management, adherence levels and practices among type 2 diabetes patients have consistently remained poor (Mirahmadizadeh et al., 2020; Pourhabibi et al., 2022). Adherence to dietary recommendations has remained suboptimal and varied across various regions, ranging from 15.2% to 37.4% in developing countries (Xia et al., 2021). Studies have reported that adherence is influenced by factors such as age, socioeconomic status, educational attainment, social support, health literacy, food security, and access to culturally appropriate dietary counseling (Pourhabibi et al., 2022; Xie et al., 2020). Kenya has limited studies on adherence on dietary recommendations among type 2 diabetes patients. In Kericho county, there is lack of data and information on dietary practices for people with T2DM. As a result of the paucity of evidence-based research in Kericho county, the county is still struggle to identify and implement effective contextually tailored interventions and health policies. There is minimal focus on dietary practice of T2DM, and the topic is not given priority despite the fact that the country reports six in every ten T2DM patients are 40 years and above. This study fills this gap, as it helps in identifying, designing, and implementation of context-specific, evidence-based dietary programs in the region. This study quantified level of adherence to prescribed dietary recommendations and examined socio-demographic and health-related factors influencing adherence among adults aged ≥40 years with type 2 diabetes in Kericho County, Kenya. The study provides crucial insights to healthcare workers regarding management and control of type 2 diabetes from a dietary perspective.

METHODS

Study Design and Study Setting

The study adopted an institution-based cross-sectional study. The study was conducted at the Kericho County Referral Hospital from December 16, 2024, to March 28, 2025. Kericho County Referral Hospital is a major level 5 government healthcare facility in Kericho County. The diabetic clinic serves around 420 diabetic patients every month. It is an outpatient health institution specializing in diabetes, thyroid, and endocrine disorders.

Study Participant and Recruitment

The study population consisted of type 2 diabetes mellitus patients aged 40 years and above visiting the diabetic clinic of the KCRH. The patients who visited the hospital during the study period were considered the study population. The age of 40+ was targeted since DM type 2 is associated with those adults who are ageing; the above age category is independent in terms of decision-making on what to eat for their health (Musee et al., 2016). People aged 40+ years with type 2 diabetes attending the diabetes clinic, and gave consent were included. The study excluded patients with type 2 diabetes who were diagnosed less than one month, pregnant and breastfeeding women, and those with acute medical conditions requiring continuous or intense medical treatment and monitoring (such as adverse diabetes-related complications or hospitalization), to avoid confounding dietary adherence assessment and reporting.

Sample Size and Sampling Technique

The sample size was obtained using a single population proportion formula: $n = ((Z_{\alpha/2})^2 P (1 - P)) / D^2$ (Fisher et al., 1991). Where n = sample size, $Z_{\alpha/2}$ = level of confidence 95%, or reliability coefficient = 1.96, P = proportion of the population = 50% since there was a lack of data on dietary adherence in the region, and D = margin of error (0.05). 10% was added for possible nonresponse; the final sample size was 440 for the study. However, the response rate of 94.1% (n=414) was achieved. Study participants were selected using a systematic random sampling technique. The average visit of T2DM patients aged 40 years or more per day was determined from the previous diabetes clinic records. Then the total number of eligible participants was estimated within a month. The total participant estimate was divided by the sample size to get sampling interval of 2. The first eligible participant was randomly selected, then the rest were selected after every second participant in the study.

Data Collection Tools and Procedure

Data was collected using a pretested and validated structured questionnaire in the open data kit (ODK) platform administered by trained research assistants through face-to-face interviews. The questionnaires were structured in three sections that assessed socio-demographic characteristics, health-related information and adherence to dietary recommendations. Anthropometric measurements such as weight were determined using a medical scale with the subject barefoot and wearing light, one-layered clothes; height was measured using a stadiometer without shoes and caps (World Health Organization, 2017). Body mass index (BMI) was computed by dividing weight (kg) by height squared

(m^2) and was categorized based on WHO classification cutoffs, where underweight is classified as BMI < 18.5 kg/m^2, normal weight as BMI between 18.5 kg/m^2 and 24.99 kg/m^2, overweight as BMI > 25 kg/m^2, and obesity as BMI ≥ 30 kg/m^2 (Weir & Jan, 2023). Adherence to dietary recommendations was assessed using a validated and modified 9-Point Perceived Diet Adherence Questionnaire (PDAQ) (Baral et al., 2022; Zaragoza-Martí et al., 2018). The questionnaire was contextually customized based on locally consumed staple food items such as ugali, chapati, potatoes, dried beans, lentils etc (Ministry of Health, 2024; Reynolds & Mitri, 2024). PDAQ was formulated as a 7-point Likert scale response based on 7 days of assessment to answer "On how many of the last 7 days did you .....?" phrased questions, as adopted from Bai and Kumar's study (Bai & Kumar, 2020). Higher scores for each question indicated good adherence, except for items 4 and 9, which were reversed questions as they reflected unhealthy dietary choices. For items 4 and 9, higher scores were indicated poor adherence, hence in computation of total PDAQ score, the scores for these items were inverted. Patients were classified to have good dietary adherence was considered if the patients ate healthy diets on at least four days per week (mean ≥ 4.00), while mean of < 4.00 was considered poor dietary adherence. Previous studies have adopted similar scoring, computation and classification approach (Bai & Kumar, 2020; Baral et al., 2022).

Data Quality Assurance

A pretest was conducted at Kapkatet Sub County Referral Hospital within Kericho County involving 41 participants two weeks prior to the main data collection. The data collectors were trained intensively for three days on questionnaire content, data collection methods, and ethical concerns. The reliability of the tool was evaluated at pretest (n = 41) and main study (n = 414) stages, which resulted in a Cronbach's alpha coefficient of 0.728 and 0.713, respectively. This indicated to tool had good reliability. The questionnaire was translated to Kiswahili and back to English to ensure unbiased responses. The content of the questionnaire was intensively reviewed by senior experts in medical doctors, nutrition, public health, and pharmacists. These expert review team assessed content relevancy, clarity, and cultural appropriateness. The principal investigator checked the completeness, consistency, and accuracy of collected data daily.

Statistical Analysis

Collected data was downloaded and checked for completeness by the investigator using Excel 2021 before exportation to IBM SPSS version 26 for data coding, transformation and statistical analysis. Descriptive statistics such as frequency and percentages for categorical variables, and mean and standard deviation for continuous variables. All independent variables were subjected to both bivariate and multivariate logistic regression models. Religion was excluded from regression models due to extreme category imbalance, hence unstable and non-informative estimates. Associations were estimated using crude/unadjusted odds ratio (COR) and adjusted odds ratio (AOR) and a 95% confidence interval. Prior regression analyses, multicollinearity and model fit were assessed using variance inflation factors (ranged from 1.15 – 2.42), and the Hosmer–Lemeshow goodness-of-fit test ($\chi^2 = 7.92$, df = 8, $p = 0.441$), respectively. The results were considered statistically significant where the p-value was <0.05.

RESULTS OF STUDY

Socio – demographic characteristic of the study participants

Table 1 shows that among the total of 414 respondents, the majority were aged 40–54 years (44.4%) with an average age of 57.7 ± 10.8 years, were males (51.2%), and were Christians (95.2%). Similarly, the majority resided in rural settings (56.5%), attained secondary education (46.4%), and were married (90.3%). Furthermore, more than half were self-employed (54.1%) and had lived with five or fewer family members (60.9%).

Table 1. **Sociodemographic characteristics of the study participants**

Socio-demographic variables	Frequency (n = 414)	Percentage (%)
Age (years)		
40 – 54	184	44.4
55 – 69	166	40.1
≥ 70	64	15.5
Age – Mean ± SD	57.7 ± 10.8	
Gender		
Female	202	48.8
Male	212	51.2
Religion		
Christians	394	95.2
Muslims	20	4.8
Residence		
Rural	234	56.5
Urban	180	43.5
Educational Attainment		
No Formal Education	24	5.8
Primary	62	15.0
Secondary	192	46.4
Tertiary/College	136	32.9
Marital Status		
Married	374	90.3
Divorced/Separated	22	5.3
Widowed	18	4.3
Employment Status		
Unemployed	94	22.7
Self – employed	224	54.1
Formally employed	96	23.2
Family Members		
≤ 5	252	60.9
> 5	162	39.1

Health – Related Characteristics of T2DM Patients

Table 2 shows the distribution of the participants by health-related information. Almost half of the participants were diagnosed with diabetes mellitus in the previous 5–10 years, with an average duration of 9.3 ± 5.4 years. The majority of the participants had no comorbidity (51.2%), had no complications (56.5%), did not consume alcohol (71.5%), and were non-smokers (77.3%). More than half of the participants did not receive diabetes nutritional education (55.1%) and had a family history of diabetes (59.9%); only 43.0% had a normal BMI (18.5–24.5 kg/m^2), while 62.1% did not engage in regular physical activity.

Adherence to Diabetes Dietary Guidelines

The mean scores of each item of the PDAQ were determined and are shown in Table 3. The highest mean score

(4.52 [±1.051]) was obtained for the question, "On *how many of the last SEVEN DAYS have you followed a healthful eating plan such as in the Diabetic Plate?*" This was followed by a question: "*On how many of the last SEVEN DAYS did you eat foods high in fat (such as high-fat dairy products, fatty meat, fried foods or deep-fried foods)?*" with a mean score of 4.12 (±1.014). The lowest mean score was obtained for the question "*On how many of the last SEVEN DAYS did you eat foods high in sugar, such as cakes, sweets, biscuits, cookies, desserts, candies, etc.?*" Based on the PDAQ score, more than half of the participants (56.5%) in the study had poor dietary adherence, while only 43.5% had good adherence to dietary recommendations (Table 3).

Perceived Barriers Influencing Adherence to dietary Recommendations

The majority of study participants (78.5%) cited they were unable to afford the cost of the recommended diets as the main barrier to adherence to dietary recommendations. Similarly, 71.7% reported lack of diabetes nutritional education or knowledge as one of the major barriers to adherence to the recommended diet. The respondents also cited unreliable availability of the recommended diet (63.8%), difficulties in cooking or preparing the recommended diet (51.2%) and poor appetite for the recommended diet (47.8%) as important barriers to adherence to dietary recommendations (Table 4).

Factors Influencing Adherence to Dietary Recommendations

In multivariate logistic regression analysis, participants aged 70 years and above were 10.99 times more likely to have good adherence to dietary recommendations (AOR: 10.99, 95% CI: 1.61 – 25.08, p = 0.014). This large odds ratio estimates might reflect estimation instability due to small cell counts within ≥ 70 years subgroup. Similarly, patients who attained higher education, particularly secondary education (AOR: 4.64, 95% CI: 1.26–17.91, p = 0.026) or tertiary/college education (AOR: 8.20, 95% CI: 1.61 – 19.04, p = 0.021), were more likely to have good adherence to dietary recommendations. Additionally, widowed participants (AOR: 0.36, 95% CI: 0.11 – 0.79, p = 0.002) and those who resided in rural settings (AOR: 0.61, 95% CI: 0.43 – 0.84, p < 0.001), and lived with more than five family members (AOR: 0.43, 95% CI: 0.19 – 0.87, p < 0.001) had a lower likelihood of good adherence to dietary recommendations (Table 5).

Table 2. Health – related information of the respondents

Health-related information	Frequency (n = 414)	Percentage (%)
Duration since DM diagnosis		
< 5 years	94	22.7
5–10 years	182	44.0
> 10 years	138	30.3
Duration – Mean ± SD	9.3 ± 5.4	
Presence of co-morbidity		
Yes	202	48.8
No	212	51.2
Presence of complication(s)		
Yes	180	43.5
No	234	56.5
Alcohol consumption		
Yes	112	28.5
No	296	71.5
Smoking		
Yes	94	22.7
No	320	77.3
DM Nutritional Education		
Yes	186	44.9
No	228	55.1
Family History		
Yes	248	59.9
No	166	40.1
BMI kg/m2		
<18.5 kg/m2	62	15.0
18.5–24.5 kg/m2	178	43.0
24.5–29.5 kg/m2	100	24.2
>30 kg/m2	74	17.8
BMI – Mean ± SD	24.8 ± 5.8	
Physical Activity		
Yes	157	37.9
No	257	62.1

Note: DM = diabetes mellitus

Table 3. Perceived Dietary Adherence Questionnaire (PDAQ) score for type 2 diabetes patients

Item	Mean, SD
On how many of the last SEVEN DAYS have you followed a healthful eating plan such as in the Diabetic Plate?	4.52 (1.051)
On how many of the last SEVEN DAYS did you eat the number of fruit and vegetable servings you are supposed to eat based on the Food Guide/Diabetic plate?	4.08 (0.762)
On how many of the last SEVEN DAYS did you eat carbohydrate-containing foods with a low Glycemic Index/whole grain products/unprocessed food? (Example: Ugali, chapati, potatoes, dried beans, lentils, low-fat dairy products)	4.10 (0.836)
On how many of the last SEVEN DAYS did you eat foods high in sugar, such as cakes, sweets, biscuits, cookies, desserts, candies, etc.? *	3.96 (1.074)
On how many of the last SEVEN DAYS did you eat foods high in fiber, such as oatmeal, high-fiber cereals, whole-grain breads, etc.? (Example: Weetabix Whole Grain, Brown Bread etc)	4.01 (0.932)
On how many of the last SEVEN DAYS did you space carbohydrates evenly throughout the day?	4.05 (0.994)
On how many of the last SEVEN DAYS did you eat fish or other foods high in omega-3 fats, e.g., soybeans?	4.08 (0.952)
On how many of the last SEVEN DAYS did you eat foods that contained or were prepared with healthy oils, such as olive oil, Coconut/palm Oil, Sunflower Oil?	4.04 (1.033)
On how many of the last SEVEN DAYS did you eat foods high in fat (such as high fat dairy products, fatty meat, fried foods or deep-fried foods)? *	4.12 (1.014)
Overall Adherence (n, %)	
Poor	234 (56.5)
Good	180 (43.5)

Note: Asterisk (*) = Reversely scored

Table 4. Perceived Barriers Influencing Adherence to dietary Recommendations

Perceived Barriers	%
Unaffordable cost of the recommended diet	78.5
Lack of diabetes nutritional education	71.7
Unreliable availability of recommended diet	63.8
Difficulties in cooking/preparing the recommended diet	51.2
Poor appetite for the recommended diet	47.8
Difficulties in adhering to the recommended diet during eating out	37.7
Forgetfulness of recommended diet	27.3

Note: More than one response was applicable.

Table 5. Socio – demographic factors associated with adherence to dietary recommendations

Sociodemographic factors	Adherence - n (%)		OR (95% CI)		p-value
	Poor	Good	COR	AOR	
Age (years)					
40 – 54	106 (25.6%)	78 (18.8%)	ref	–	–
55 – 69	100 (24.2%)	66 (15.9%)	1.87 (0.69 – 4.01)	1.74 (0.79 – 3.84)	0.169
≥ 70	28 (6.8%)	36 (8.7%)	11.65 (1.98 – 24.72)	10.99 (1.61 – 25.08)	0.014*
Gender					
Female	104 (25.1%)	98 (23.7%)	ref	–	–
Male	130 (31.4%)	82 (19.8%)	0.71 (0.23 – 2.39)	0.89 (0.46 – 1.75)	0.726
Education Level					
No Formal Education	18 (4.3%)	6 (1.4%)	ref	–	–
Primary	22 (5.3%)	40 (9.7%)	2.93 (0.48 – 8.83)	2.68 (0.68 – 10.62)	0.158
Secondary	108 (26.1%)	84 (20.3%)	5.36 (1.35 – 17.38)	4.64 (1.26 – 17.91)	0.026*
Tertiary/College	86 (20.8%)	50 (12.1%)	7.61 (1.34 – 18.67)	8.20 (1.61 – 19.04)	0.021*
Marital Status					
Married	204 (49.3%)	170 (41.1%)	ref	–	–
Divorced/Separated	16 (3.9%)	6 (1.4%)	0.58 (0.15 – 1.46)	0.45 (0.19 – 1.35)	0.221
Widowed	14 (3.7%)	4 (1.0%)	0.43 (0.09 – 0.81)	0.36 (0.11 – 0.79)	0.002*
Residence					

Note: AOR = adjusted odds ratio, asterisk (*) = significant association, CI = confidence interval, ref = reference category, and religion was excluded as it resulted to redundancy.

Table 6. Health – related factors associated with good adherence to dietary recommendations

Health-related factors	Adherence - n (%)		OR (95% CI)		p-value
	Poor	Good	COR	AOR	
Duration since DM diagnosis					
< 5 years	52 (12.6%)	42 (10.1%)	ref	–	–
5 – 10 years	114 (26.5%)	68 (16.4%)	1.24 (0.43 – 6.79)	0.97 (0.64 – 4.23)	0.137
> 10 years	68 (16.4%)	70 (16.9%)	0.66 (0.23 – 0.87)	0.57 (0.27 – 0.78)	0.024*
Presence of co-morbidity					
Yes	104 (25.1%)	98 (23.7%)	ref	–	–
No	130 (31.4%)	82 (19.8%)	2.88 (1.41 – 6.18)	2.78 (1.30 – 5.93)	0.008*
Presence of complication(s)					
Yes	94 (22.7%)	86 (20.8%)	ref	–	–
No	140 (33.8%)	94 (22.7%)	3.18 (1.29 -7.31)	3.09 (1.37 – 6.99)	0.007*
Alcohol consumption					
Yes	66 (15.9%)	52 (12.6%)	ref	–	–
No	168 (40.6%)	128 (30.9%)	4.12 (1.58 – 9.16)	3.58 (1.37 – 7.05)	0.002*
Smoking					
Yes	56 (13.5%)	38 (9.2%)	ref	–	–
No	178 (43.0%)	142 (34.3%)	3.76 (1.27 – 9.14)	3.12 (1.13 – 8.57)	0.028*
DM Nutritional Education					
Yes	134 (32.4%)	94 (22.7%)	ref	–	–
No	100 (24.2%)	86 (20.8%)	0.21 (0.11 – 0.63)	0.15 (0.08 – 0.59)	<0.001*

Family History of DM					
Yes	140 (33.8%)	108 (26.1%)	ref	–	–
No	94 (22.7%)	72 (17.4%)	1.16 (0.13 – 5.19)	0.89 (0.11 – 4.85)	0.083
BMI					
<18.5 kg/m^2	38 (9.2%)	24 (5.8%)	ref	–	–
18.5–24.5 kg/m^2	94 (22.7%)	84 (20.3%)	0.83 (0.32 – 2.15)	0.83 (0.32 – 2.15)	0.712
24.5–29.5 kg/m^2	60 (14.5%)	40 (9.7%)	1.87 (0.72 – 4.76)	1.52 (0.62 – 3.76)	0.361
>30 kg/m^2	42 (10.1%)	32 (7.7%)	2.04 (0.69 – 6.04)	1.74 (0.48 – 3.25)	0.657
Physical Activity					
Yes	60 (14.5%)	97 (23.4%)	ref	–	–
No	122 (29.5%)	135 (32.6)	0.54 (0.17 – 1.83)	0.53 (0.15 – 1.87)	0.181

Note: AOR = adjusted odds ratio, asterisk (*) = significant association, BMI = body mass index, CI = confidence interval, DM = diabetes mellitus, ref = reference category.

Table 6 shows multivariate logistic regression analysis results on health-related factors influencing good adherence to dietary recommendations. The study showed patients who had no comorbidity (AOR: 2.78, 95% CI: 1.30 – 5.93, p = 0.008), had not experienced any complication (AOR: 3.09, 95% CI: 1.37 – 6.99, p = 0.007), were non-alcoholic (AOR: 3.58, 95% CI: 1.37 – 7.05, p = 0.002) and were non-smokers (AOR: 3.12, 95% CI: 1.13–8.57, p = 0.028) had higher odds of good adherence to the recommended diet. Additionally, respondents with over 10 years since being diagnosed with diabetes (AOR: 0.57, 95% CI: 0.27 – 0.78, p = 0.024) and who had not received diabetes nutritional education (AOR: 0.15, 95% CI: 0.08 – 0.59, p <0.001) were less likely to adhere to dietary recommendations.

DISCUSSION

Our study revealed that approximately two-fifths (43.5%) of the T2DM patients had good adherence to dietary recommendations. This adherence level is comparable with previous studies (Degefa et al., 2020; Gebeyehu et al., 2022). However, the current study's finding was lower compared to studies that found 76.2% and 77.2% of participants adhered to dietary recommendations, respectively (Ariyo et al., 2023; Jadawala et al., 2017), while higher than the study conducted in Southwest Ethiopia and Nepal, which reported that 36% and 15.6% had good adherence to dietary recommendations (Baral et al., 2022; Zaragoza-Martí et al., 2018),. This inconsistency might be attributed to variation in socioeconomics, healthcare systems, study settings and context-based barriers. The current study revealed that the unaffordable cost of the recommended diets and lack of diabetes nutritional education or knowledge were cited as major barriers to adherence to the recommended diet. These findings were consistent with previous studies conducted in low- and middle-income countries and rural settings, which reported that healthy dietary patterns are usually less affordable compared to energy-dense staple foods (Colombet et al., 2023; Pressler et al., 2022).

Similar studies in low- and middle-income countries have reported that dietary adherence in the management of chronic diseases is significantly constrained by food price fluctuations, availability of recommended foods, household economic capacity, and income instability rather than individual knowledge or motivation alone (Mirahmadizadeh et al., 2020; Xie et al., 2020). According to Colombet et al. (2023), recommended diabetes diets are typically perceived as expensive compared to calorie-dense foods or unhealthy alternatives, making adherence sustainability economically untenable for most patients in resource-limited settings. As a result, individuals may prioritize immediate household food security over long-term dietary diabetes recommendations, hence compromised diet quality despite awareness of clinical recommendations. This is exacerbated by the fact that the majority cited limited education initiatives on recommended diabetes nutrition, which could hinder choices. Similar findings have been reported by studies in Ghana and Iran (Atuahene et al., 2025; Mostafavi-Darani et al., 2020). This could be due to economic constraints, the dominance of cash crop farming in the region influencing availability and food prices, and limited health education campaigns regarding nutrition in diabetes management.

The analysis of multivariate logistic regression of our study found that diabetic patients aged 70 years and above and with higher educational attainment were more likely to have good adherence to dietary recommendations. These findings are consistent with other studies that have reported higher adherence rates among older patients (Abose et al., 2024; Baral et al., 2022). Similarly, another study in China revealed that patients aged 64 years and above were 2.21 times more likely to adhere to dietary recommendations (Xie et al., 2020). The association of older age with good adherence to diet recommendations has been attributed to fewer responsibilities and availability of spare time to engage in recommended dietary practices. A study observed that 'not having adequate time', especially among younger patients, significantly hinders adherence to dietary recommendations but also medication (Nagy et al., 2022).

Similarly to this study's finding, previous studies have reported that diabetes patients without formal education had lower odds of adhering to dietary recommendations (Ayele et al., 2018; Katsaridis et al., 2020; Mohammed et al., 2020). This might be attributed to inadequate or lack of exposure to dietary education, resulting in poor knowledge of what, how much or what type of recommended diet for diabetes. Therefore, it's crucial to improve the knowledge among diabetic patients, especially with low educational attainment, regarding recommended diet, which might significantly increase adherence rates. Our study found that widowed participants had a lower likelihood of good adherence to dietary recommendations. These findings align with previous studies that found lower odds of adherence to the recommended diet among widowed patients (Ayele et al., 2018; Zaragoza-García et al., 2021; Zeleke Negera & Charles Epiphanio, 2020).

A study in northeast Ethiopia reported widowed patients were 73% less likely to adhere to dietary recommendations (Abose et al., 2024). This was possibly

explained as widowed patients might lack adequate support systems to consistently adhere to the recommended diet. Consistent with other studies, our study reported that patients living with more than five family members had a lower likelihood of good adherence to dietary recommendations (Mirahmadizadeh et al., 2020; Xie et al., 2020). Larger households hinder adherence to the recommended diet due to often shared meals, reduced autonomy, and economic constraints leading to reliance on inexpensive unhealthy food, limiting access to the recommended diabetes-friendly diet and individualized meal planning (Ayele et al., 2018).

This study showed diabetic patients who had no comorbidity and had not experienced any complication had higher odds of good adherence to the recommended diet. These findings were supported by previous studies (Ariyo et al., 2023; Llamas-Saez et al., 2025). Absence of comorbidity or complications is often associated with a good adherence diet due to simpler medication and management regimens and lower disease-related and health burdens, which motivates consistent adherence (Jadawala et al., 2017; Magkos et al., 2020). This can also be attributed to a patient's perception of having control, and prioritization of preventive measures promotes self-care behaviour, hence better dietary adherence. Similarly, our study revealed that non-alcoholic patients and non-smokers were more likely to adhere to dietary recommendations. These findings were supported by previous (Pourhabibi et al., 2022; Xie et al., 2020). These behaviors are often associated with poor dietary and medication habits, hence lower adherence to the recommended diet, which might be attributed to their impact on cognitive and psychological state, lifestyle modification priorities, appetite control and metabolic processes. Additionally, studies have associated alcohol consumption and smoking with increased likelihood of diabetes comorbidities and complications, resulting in nonadherence to dietary recommendations (Garcia-Molina et al., 2020; Zeleke Negera & Charles Epiphanio, 2020). Therefore, healthy lifestyle behaviour among diabetes patients promotes dietary adherence and better health outcomes. Additionally, individuals with over 10 years since diabetes diagnosis and unexposed to diabetes nutritional education had lower likelihood to adhere to the recommended diet. Similar findings have been reported by various studies. These could be explained by complacency, perceived control/efficacy, and lack of information on diabetes nutrition. Therefore, regular nutrition education and counselling might improve adherence among the patients.

Limitation of the study

There are limitations to this study, including the study being conducted at one health facility and the focus on diabetes patients who visited the facility during the study duration might have been potential for selection bias, which might affect the generalizability of our findings. The study might have faced risk of adherence misclassification stemming from a cut-off that may not be strongly validated, and the possibility of residual confounding, particularly related to economic factors/food insecurity given the dominance of cost barriers. Similarly, adoption of cross-sectional design only allowed assessment of association between factors and outcome variables at a single point in time, while longitudinal predictions could not be achieved. Additionally, 9-item Perceived Dietary Adherence Questionnaires were subjective self-reporting; hence, they might lead to recall bias and social desirability bias in responses of the participants.

CONCLUSION

This study revealed that adherence to diabetic dietary recommendations was low. This was primarily attributed to the unaffordable cost of recommended diets and limited access to diabetes-specific dietary education. Older age, higher educational attainment, absence of comorbidity, lack of diabetes-related complications, non-alcoholic patients and non-smokers were significantly associated with higher likelihood of dietary adherence, while living households and being a widow reduced adherence likelihood. The findings show that non-adherence to diabetic dietary recommendation were driven by structural, economic, and contextual barriers rather than patient decisions alone. Therefore, these findings provide actionable insights that diabetes programs should integrate routine diabetic dietary education into clinical care, promote locally available and affordable dietary options, and offer targeted support to vulnerable groups especially the widowed patients. Additionally, addressing these modifiable barriers are critical to improve adherence to recommended diet and management/treatment outcomes.

DECLARATION

Ethical Considerations

The study obtained ethical approval from the Institutional and Scientific Review Board of the University of Eastern Africa, Baraton, and a permit from the National Commission for Science, Technology, and Innovation (NACOSTI/P/24/41338). Permission to conduct the study at KCRH's diabetic clinic was obtained from the KCRH administration. The objective of the study was explained to the participants, and written consent was obtained from the participants before data collection. The right of the participants who do not want to participate in the study was respected. The study observed privacy and confidentiality throughout the study.

Acknowledgement

The authors acknowledge the cooperation and support of Kericho County Referral Hospital in the data collection process facilitation.

Consent for publication

Note Applicable.

Funding

This study has not received any funding.

Availability of data and materials

The data are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Authors' Contributions

Conceptualization: Florence Wandia; Methodology: Florence Wandia, Joel Wanzala & Irine Chepngetich; Formal analysis and investigation: Joel Wanzala & Irine

Chepngetich; Writing - original draft preparation: Joel Wanzala; Writing - review and editing: Joel WanzalaFlorence Wandia & Irine Chepngetich; Resources: Florence Wandia.

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ADDITIONAL INFORMATION

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