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Research Article

Dietary Practices of Type 2 Diabetes Mellitus Outpatients at Mama Lucy Kibaki Hospital, Nairobi City County, Kenya: A Cross-Sectional Survey

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Abstract

The increasing prevalence of Type 2 Diabetes Mellitus (T2DM) is a major public health challenge globally, with Kenya experiencing a rising burden of the disease. Proper dietary management is essential for blood glucose regulation and the prevention of diabetes-related complications. This study assessed the dietary practices of T2DM outpatients at Mama Lucy Kibaki Hospital, Nairobi, Kenya, and evaluated their adherence to recommended dietary guidelines. An analytical cross-sectional survey was conducted among 165 respondents using structured questionnaires to collect socio-demographic and dietary intake data. A 24-hour dietary recall, a Food Frequency Questionnaire (FFQ), and a Focused Group Discussion (FGD) were used to assess food consumption patterns and gather qualitative insights into patients' dietary behaviors. The study sample comprised 98 (59.4%) female and 67 (40.6%) male participants. Among them, 88 (53.3%) had been living with T2DM for 0-5 years while 33 (20.0%) had lived with the condition for 6-10 years. Regarding the highest level of education attained, 76 (46.1%) had completed secondary education, 45 (27.3%) primary education, and 36 (21.8%) tertiary education. Employment data showed that 79 (47.9%) of the respondents were self-employed, 35 (21.2%) were formally employed, while 28 (17.0%) were unemployed. Healthcare providers played a crucial role in offering dietary guidance, with 144 (87.3%) of respondents reporting having received dietary recommendations. Among them, 102 (61.8%) had received dietary guidance during their first visit, while 41 (24.8%) received it at a later stage. Only 22 (13.3%) of the respondents reported not having received any dietary counseling. The mean energy intake per day was 1,277 ±576 kcal, falling below the recommended dietary requirements. While staple foods such as maize, rice, and wheat-based products were widely consumed, there was poor intake of fiber-rich foods, fruits, and lean proteins. Financial constraints and limited nutritional awareness were significant hindrances to recommended dietary practices. This study found that the dietary practices of T2DM patients do not fully align with the recommended dietary guidelines for diabetes management. The findings also indicated a need for improved timely nutrition education and sustained dietary support throughout T2DM management. The inclusion of a Focused Group Discussion provided further insights into patient challenges, highlighting the need for continuous professional dietary counseling and education. Future research should examine the effectiveness of structured dietary interventions on glycemic control and long-term disease management.

Keywords

Type 2 Diabetes Mellitus, Dietary Practices, Nutrition Education and Counselling, Food Frequency Questionnaire, 24-hour Recall, Glycemic Control, Healthcare Guidance

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1. Introduction

Type 2 Diabetes Mellitus (T2DM) is a significant and growing public health concern globally, characterized by insulin resistance and chronic hyperglycemia. The prevalence of diabetes is projected to rise from 537 million adults in 2021 to 783 million by 2045, with developing regions, including Sub-Saharan Africa, experiencing the fastest growth [1]. This increase is attributed to factors such as urbanization, sedentary lifestyles, and shifts in dietary patterns toward processed and calorie-dense foods [2]. In Kenya, the prevalence of T2DM is estimated at 2.2% [3].

Proper dietary management is critical in controlling blood glucose levels and mitigating complications associated with T2DM, such as cardiovascular diseases, nephropathy, and retinopathy. The American Diabetes Association (ADA) emphasizes the importance of balanced macronutrient intake, increased consumption of fiber-rich foods, and reduced intake of refined sugars and unhealthy fats for effective diabetes management [4]. However, adherence to these dietary recommendations remains suboptimal, especially in resource-limited settings like Kenya, where socio-economic and cultural factors influence food choices [5].

Healthcare systems in Kenya, including Mama Lucy Kibaki Hospital in Nairobi, play a pivotal role in delivering dietary counseling to T2DM patients. Despite these efforts, challenges such as limited access to professional dietitians, inconsistent follow-up care, and financial constraints hinder the effectiveness of these interventions [6]. These challenges highlight the need for targeted strategies to improve dietary adherence and provide culturally appropriate nutrition education.

In addition to systemic challenges, individual patient factors such as nutritional knowledge, socio-economic status, and psychosocial influences further complicate compliance to dietary recommendations. Studies have demonstrated that financial constraints and food insecurity are significant hindrances to adopting recommended dietary practices among T2DM patients [7]. Addressing these barriers requires a multi-faceted approach that combines clinical, educational, and community-based interventions. Mama Lucy Kibaki Hospital, situated in Nairobi City County, serves a diverse patient population with varying socio-economic backgrounds. This diversity provides an opportunity to examine the dietary practices of T2DM outpatients and identify key challenges. By assessing these practices and their alignment with recommended dietary guidelines, the study aimed at informing policies and interventions that enhance the dietary management of T2DM.

2. Materials and Methods

2.1. Research Design

This study employed a cross-sectional analytical research design to assess the dietary practices of type 2 diabetes mellitus outpatients at Mama Lucy Kibaki Hospital in Nairobi City County, Kenya. The research aimed at examining factors influencing dietary habits and compliance to recommended dietary guidelines for T2DM management among the patients. Both quantitative and qualitative methods were utilized to gather and analyze data.

2.2. Study Area

Mama Lucy Kibaki Hospital, located in the Komarock Ward of the Embakasi West Sub-County in Nairobi City County, Kenya, served as the research location. The data collected at the hospital, that serves the larger Nairobi Eastlands, provides valuable insights into the dietary practices of Type 2 Diabetes Mellitus, aiding policy evaluation, identifying gaps, and guiding recommendations for improved management and further research.

2.3. Target Population

This study involved only adult (18 years and above) patients with type 2 diabetes attending routine diabetes clinics at Mama Lucy Kibaki Hospital, in Nairobi City County, Kenya. As a result, the study's findings can only be generalized to regions that share characteristics with the studied population.

2.4. Inclusion and Exclusion Criteria

Adult patients having type 2 diabetes who had been attending clinics at Mama Lucy Kibaki Hospital, had been diagnosed with the disease within the past two months or more, and were willing to participate in the study were included. It was also a must that all the patients be at least 18 years old.

Patients who were expectant and those who had a psychological or mental health disorder were not included in the study.

2.5. Sample Size Determination and Sampling Strategy

Fischer's formula [8] was used to determine the sample size for the study, with a 95% confidence level and a 5% margin of error. Given an assumed proportion of 50% for the characteristics under study, the initial calculated sample size was 323 patients. However, since the estimated monthly outpatient population at the diabetes clinic was 280, a finite population correction was applied, adjusting the sample size to 150 patients. To account for a potential 10% non-response rate, the final sample size was increased to 165 respondents.

A simple random sampling technique was employed to select participants, ensuring adherence to the inclusion and

exclusion criteria. Eligible Type 2 diabetes outpatients were assigned random numbers, and respondents were selected through a balloting process until the desired sample size was attained. Furthermore, three Focus Group Discussions (FGDs) were conducted, with six to twelve participants per group randomly chosen from the pool of 165 respondents.

2.6. Validity and Reliability

The research instruments were pretested at Mbagathi County Referral Hospital, where questionnaires were administered to 17 participants, representing approximately 10% of the total sample size. This pretesting process was instrumental in enhancing the validity and reliability of the tools by ensuring that the questions were clear and effectively captured the necessary information. Serving as a quality control measure, the pretesting facilitated the refinement of the questionnaire to improve data accuracy. Mbagathi County Referral Hospital was chosen as the pretesting site due to its comparable catchment area and population characteristics to Mama Lucy Kibaki Hospital, making it a suitable location for evaluating the effectiveness of the data collection tools.

2.7. Data Collection and Analysis Procedures

After signing the consent form, the participants responded to the questions in the main questionnaire, the 24-hour dietary recall and the Food Frequency Questionnaire with the assistance of the researcher and the four research assistants. Following participant consent, notes were taken during the Focused Group Discussions, and an audio recording was taken for later transcription.

The data was analyzed using SPSS (version 25) and Microsoft Excel to compute mean values and frequencies while NVIVO (version 15) was used to conduct qualitative data analysis. Parametric statistical tests were also performed on the data, as well considering the parametric tests assumptions. Data were presentated in tables and charts.

2.8. Ethical Considerations

Permission to conduct the study was obtained from the Kenyatta University's Graduate School, the Kenyatta University Ethics Review Committee, and NACOSTI. Approval was also granted by Nairobi City County and Mama Lucy Kibaki Hospital management. Additionally, Mbagathi County Referral Hospital approved the pre-testing of the questionnaires. Informed consent was also obtained from all participants who voluntarily participated in the study. Patient privacy and confidentiality were upheld, with the data being used solely for the study purposes. Interviews and Focused Group Discussions were as well conducted privately within the hospital. Questionnaires excluded participants names, instead coded identifiers were used and the questionnaires were securely stored at the university.

3. Results

3.1. Socio-Economic and Demographic Characteristics of the Study Population

The study had a 100% response rate which is totally acceptable as shown in Table 1 below. Among the respondents, 98 (59.4%) were female, while 67 (40.6%) were male. The majority, 51 (30.9%), were aged 50-59 years, followed by 36 (21.8%) aged 60-69 years, and 32 (19.4%) aged 40-49 years. Smaller groups included 24 (14.5%) aged 30-39 years, 17 (10.3%) aged 70 and above, and 5 (3.0%) aged 18-29 years. Regarding the duration of living with Type 2 Diabetes Mellitus (T2DM), most of the respondents, 88 (53.33%), had lived with the condition for 0-5 years, while 33 (20.00%) had lived with it for 6-10 years, 25 (15.15%) for 11-15 years, and fewer for longer durations as indicated in Table 1 below.

In terms of education, 76 (46.1%) respondents had completed secondary education, 45 (27.3%) primary education, and 36 (21.8%) tertiary education, while 8 (4.8%) had no formal education. Employment data revealed that 79 (47.9%) were self-employed, 35 (21.2%) employed, 28 (17.0%) unemployed, 15 (9.1%) pensioners, and 8 (4.8%) housewives or househusbands. Among those employed, 79 (47.9%) worked in the formal sector, 45 (27.3%) in the informal sector, and 41 (24.8%) were not in any form of employment as table 1 below indicates. This data underscores the varied demographic and socio-economic characteristics of the respondents.

Table 1. *Socio-Economical and demographic characteristics of the study population.*

Characteristic	Category	Frequency	Percent (%)
Sex	Male	67	40.6
	Female	98	59.4
Age Ranges	18 - 29 years	5	3
	30 - 39 years	24	14.5
	40 - 49 years	32	19.4

Characteristic	Category	Frequency	Percent (%)
	50 - 59 years	51	30.9
	60 - 69 years	36	21.8
	70 & above	17	10.3
	0 to 5	88	53.33
	6 to 10	33	20
	11 to 15	25	15.15
Duration of Living with T2DM	16 to 20	9	5.45
	21 to 25	5	3.03
	26 to 30	4	2.42
	31 to 35	1	0.61
	None	8	4.8
	Primary	45	27.3
Highest Education Level Attained	Secondary	76	46.1
	Tertiary	36	21.8
	Employed	35	21.2
	Unemployed	28	17
Employment Status	Pensioner	15	9.1
	Housewife/Househusband	8	4.8
	Self-employed	79	47.9
	Formal	79	47.9
Employment category	Informal	45	27.3
	Not Employed	41	24.8

3.2. Management of T2DM

Various management strategies for Type 2 Diabetes Mellitus were used by the respondents, with the majority of the respondents, 135 (81.8%), acknowledging that incorporating all available management strategies (diet, medication, and exercise) was crucial for effective control. Fifteen (9.1%) of the respondents reported having combined healthy dietary habits with medications, while 6 (3.6%) of the respondents reported that they integrated healthy dietary habits with gentle aerobic exercise. A few, 5 (3.0%) individuals understood that managing T2DM only required adherence to healthy dietary habits only, while 4 (2.4%) believed that management of T2DM consists of adhering strictly to medications or insulin only, just as shown in Table 2.

Table 2. *Management of T2DM.*

Management of T2DM	Frequency	Percent
Healthy dietary habits only	5	3.0
Adherence to medications/insulin only	4	2.4
All of the above	135	81.8
Healthy dietary habits only and gentle aerobic exercise	6	3.6

Management of T2DM	Frequency	Percent
Healthy dietary habits and medications	15	9.1

3.3. Individual Dietary Intake

Table 3 presents the descriptive statistics for individual dietary intake based on a 24-hour recall assessment. Energy intake ranged from 875 to 4009 Kcal, with a mean intake of 1276.70 Kcal (SD = 576.23 Kcal), indicating substantial variation among participants. Water consumption was recorded between 0.8 and 5 liters, with an average intake of 2.10 liters (SD = 0.96 liters). Protein intake exhibited a wide range from 0 to 235.09 grams, with a mean of 104.63 grams (SD = 36.16 grams), suggesting significant disparities in protein consumption. Carbohydrate intake varied between 36.29 and 311.03 grams, with an average intake of 104.63 (SD = 44.09 grams), reflecting diverse dietary patterns. Additionally, fruit and vegetable consumption ranged from 9.72 to 74.52 grams, with a mean intake of 26.84 grams (SD = 10.96 grams). These findings demonstrate notable heterogeneity in dietary intake, which may be influenced by individual dietary behaviors, access to food, and nutritional awareness.

Table 3. *Individual Dietary Intake.*

Item	Min	Max	Mean	S. D
Energy	875	4009	1276.7	576.23
Water	0.8	5	2.09	0.96
Protein	0	235.09	104.63	38.16
Carbohydrate	36.29	311.03	124.41	44.09
Fruits and Vegetables	9.72	74.52	26.84	10.96

An assessment of normality was also carried out. Table 4 below presents the results of the Kolmogorov-Smirnov test for normality, which assessed whether the distributions of various dietary variables followed a normal pattern. The test statistic, degrees of freedom (df = 165), and significance values (Sig.) were provided for each variable. The significance values for Energy (Kcal), Water, Protein, and Carbohydrates were all greater than 0.05, indicating that these variables did not significantly deviate from normality and can be considered approximately normally distributed. However, the Fruits and Vegetables variable had a significance value of 0.040, which is below the 0.05 threshold, suggesting that its distribution deviated significantly from normality. This means that while most of the dietary variables were normally distributed, Fruits and Vegetables did not follow a normal distribution pattern.

Table 4. *Kolmogorov-Smirnov test for normality.*

Tests of Normality	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Energy (Kcals)	0.045	165	0.670
Water	0.067	165	0.830
Protein	0.039	165	0.920
Carbohydrates	0.096	165	0.904
Fruits and Vegetables	0.050	165	0.040

3.4. Nutrition Status and Dietary Recommendation

Of the 165 individuals, 43 (26.1%) had a normal nutritional status. The majority, 66 (40.0%), were overweight. Obesity was observed in 50 (30.3%) participants, while a small proportion, 5 (3.0%), were categorized as underweight. Only 1 (0.6%) participant was classified as severely underweight. Among those who reported having received dietary recommendation, the majority, 102 (61.8%) of the respondents had received this information during their first visit, while 41 (24.8%) respondents had received dietary counselling later. Only 22 (13.3%) of the respondents reported that they had not received any guidance, just as shown in Table 5 below.

Table 5. *Nutrition Status and Dietary Recommendation.*

Nutrition Status	Frequency	Percent
Normal	43	26.1
Overweight	66	40.0
Obese	50	30.3
Underweight	5	3.0
Severely Underweight	1	0.6
Timing of receiving Dietary Recommendations	First Visit: 102	61.8
	Later: 41	24.8
	Not Received: 22	13.3

3.5. Frequency of Consumption for Various Foods by the Respondents

Table 6 presents the frequency of consumption of various food items among the study participants. The results indicate that staple foods such as cooked rice (43.6%), ‘‘ugali’’ (maize meal) (15.8%), and ‘‘*githeri”* (whole boiled maize and beans) (57.6%) were commonly consumed 2-4 times per week, while whole grain varieties of these foods showed varying levels of preference. Fruits and vegetables were consumed regularly, with cooked vegetables (37%) and whole fruits (34.5%) being eaten once a day by a significant proportion of respondents. Dairy intake varied, with fresh milk (27.9%) commonly consumed once a day, while yogurt/mala (32.1%) was mostly consumed 2-4 times per week. Protein sources, such as poultry (28.5%), boiled eggs (32.7%), and legumes (59.4%), were also frequently consumed several times per week. Processed and high-fat foods, including margarine (18.8%) and peanut butter (18.8%), were less frequently consumed. These findings suggest a dietary pattern that incorporates a mix of staple carbohydrates, proteins, fruits and vegetables, with varying intake of dairy and processed foods.

Table 6. *Frequency of Food consumption.*

Food Item	Never/<Once a Month	1-3/Month	Once a Week	2-4/Week	5-6/Week	Once a Day	2-3/Day	>3/Day	Other
Bread/Chapati/ Andazi	-	3.6	1.8	10.9	1.8	3.6	1.2	-	0.6
Bread-Whole Grains	2.4	6.7	7.3	43	5.5	15.2	2.4	-	-
Cooked Rice	0.6	7.9	8.5	43.6	1.8	1.2	-	-	-
Cooked Rice-Whole Grains	0.6	4.8	6.1	13.3	-	1.2	-	-	-
‘‘*Ugali*’’	0.6	1.2	3	15.8	4.8	5.5	-	-	-
‘‘*Ugali*’’-Whole Grains	-	1.2	3.6	41.8	15.2	6.7	6.7	-	-
Arrow Root/Sweet Potatoes/Cassava	3.6	10.3	13.9	49.1	6.7	1.8	1.2	-	-
‘‘Githeri’’ (Green/Dry Maize)	1.8	3.6	15.2	57.6	10.3	1.8	0.6	-	-
Mashed potatoes/Green bananas	9.1	10.9	20	37.6	2.4	-	-	-	-
Boiled Green Maize/Bananas	9.7	10.3	12.7	21.2	3	1.2	-	-	0.6
Porridge Processed	-	-	-	0.6	-	1.2	-	-	0.6
Porridge (Millet/Maize/etc.)	-	-	0.6	6.1	0.6	2.4	1.2	-	-
Cooked Vegetables	0.6	1.8	14.5	17.6	13.3	37	-	13.9	1.2
Raw Vegetables (Salad)	7.9	4.2	7.3	13.3	1.8	0.6	1.2	-	-
Whole/Fruits	0.6	1.8	5.5	35.2	4.8	34.5	12.7	0.6	0.6
Canned Fruits/Processed Juice	1.2	0.6	1.2	1.8	1.2	-	-	-	-
Fruit Salad/Fresh Juice	2.4	6.1	6.7	12.7	1.2	1.8	-	-	-
Fresh Milk (with Sugar)	-	-	-	2.4	-	4.2	1.2	-	-
Fresh Milk (no Sugar)	0.6	1.2	0.6	29.1	5.5	27.9	18.8	4.2	1.2
Low Fat/Skimmed Milk	0.6	1.2	0.6	2.4	-	-	-	-	-
Yoghurt/Mala	7.3	17	14.5	32.1	2.4	0.6	-	-	-
Lean/Fatty Poultry (Fried)	1.8	3.6	12.7	28.5	3	1.2	0.6	-	0.6
Lean/Fatty Poultry (Boiled)	4.2	7.3	13.9	30.3	2.4	0.6	0.6	-	0.6
Fried Eggs	1.8	3.6	10.3	21.8	0.6	1.2	-	-	-
Boiled Eggs	2.4	4.8	5.5	32.7	1.2	1.8	-	-	-
Cheese/Tuna/Omena/Meats	4.8	8.5	7.3	23	1.8	-	-	-	-
Legumes (Beans, Ndengu, etc.)	3	4.8	10.3	59.4	9.1	1.8	-	-	-

Food Item	Never/<Once a Month	1-3/Month	Once a Week	2-4/Week	5-6/Week	Once a Day	2-3/Day	>3/Day	Other
Margarine/Saturated Fats	0.6	4.2	3	18.8	0.6	5.5	-	-	0.6
Salad Oil/Mayonnaise	1.8	0.6	-	3	-	1.8	1.8	-	-
Peanut Butter	3.6	0.6	1.2	18.8	-	2.4	-	-	0.6

3.6. Qualitative Data

The Focused Group Discussions (FGDs) emphasized the significance of dietary practices in managing diabetes, particularly the need for a well-balanced diet with adequate vegetables, proteins, and minimal carbohydrates. Participants highlighted the importance of adhering to dietary advice from healthcare providers. One respondent stated, *"For managing diabetes, it's essential to focus on dietary practices. Eat according to the advice given by healthcare workers, ensuring your meals include vegetables, carbohydrates, and protein"* (FGD 3, R1). Another added, *"My routine includes a balanced diet and being physically active without idling"* (FGD 2, R2).

Family support was identified as a key factor in maintaining proper dietary habits. Respondents noted that family involvement in meal planning and food provision enhanced adherence to dietary recommendations. One participant shared, *"My family's follow-up on my dietary practices, along with seeing improvements in my health, motivates me to adhere to dietary recommendations given "* (FGD 2, R3). Another noted, *"My family supports me by helping purchase drugs and recommended foods. My children even bought me exercise equipment to ensure I stay fit"* (FGD 2, R4).

However, financial constraints were reported as a significant hindrance to maintaining a recommended diet. One respondent explained, *"Financial constraints hinder me from following the recommended diet. My busy schedule and living alone make it difficult to maintain healthy dietary habits as I tend to be forgetful"* (FGD 3, R3). Psychological challenges, such as depression, also impacted adherence to recommended dietary practices, as stated by one participant, *"I'm depressed and have lost hope. I can't follow the prescribed diet and just eat whatever is available"* (FGD 2, R2).

4. Discussion

4.1. Socio-Economic and Demographic Characteristics of the Respondents

The socio-economic and demographic characteristics of the respondents in this study provide essential insights into the context of Type 2 Diabetes Mellitus (T2DM) management at Mama Lucy Kibaki Hospital. A notable finding is the higher proportion of female participants (59.4%) compared to male participants (40.6%). This gender distribution agrees with studies conducted in other parts of Sub-Saharan Africa, which often report a higher prevalence or diagnosis rate of T2DM among women due to increased health-seeking behavior and biological susceptibility linked to hormonal and metabolic changes [9]. Locally, a study conducted at Kenyatta National Hospital similarly reported a higher proportion of female patients with T2DM, and attributed this to greater health service utilization by women compared to men [10].

The age distribution indicated that a majority of respondents fell within the age ranges of 50-59 years (30.9%) and 60-69 years (21.8%), consistent with global trends identifying middle-aged and older adults as high-risk groups for T2DM (International Diabetes Federation [IDF], 2023). A study in Ethiopia found similar trends, with peak prevalence observed in individuals aged 45-65 years [9]. In Kenya, a population-based study also identified a high burden of T2DM among individuals aged 50 years and older, emphasizing the need for targeted interventions in this age group [11].

Regarding the duration of living with T2DM, most respondents (53.3%) had been diagnosed within the past five years. This finding mirrors reports from recent studies in Kenya and other African settings, where delayed diagnosis and limited access to healthcare services contribute to shorter disease duration at the time of data collection [5]. The findings of another study conducted in Nairobi [10] similarly reported a significant proportion of newly diagnosed cases, highlighting the importance of early screening and diagnosis programs to mitigate long-term complications.

Concerning education level, it was observed that nearly half (46.1%) of the respondents had attained secondary education, followed by 27.3% with primary education and 21.8% with tertiary education. Low levels of education have been associated with poor health literacy and suboptimal compliance to dietary and treatment regimens [6]. Comparatively, a study conducted in Nakuru, Kenya found that patients with higher educational attainment were more likely to adhere to dietary recommendations [12]. This suggests that improving health education tailored to varying literacy levels could enhance diabetes management outcomes.

Employment status data revealed that 47.9% of respondents were self-employed, while 21.2% were formally employed. This aligns with Kenya's broader economic landscape, characterized by a significant informal sector [3]. Economic in-

stability associated with informal employment can exacerbate challenges in accessing healthy foods and maintaining regular follow-ups for diabetes care. Globally, studies have highlighted financial constraints as significant barriers to effective diabetes management [7-13].

Interestingly, the employment form data showed that 27.3% of participants were in informal employment, and 24.8% were not employed. The financial insecurity associated with informal and unemployed status could partially explain the reported poor adherence to dietary guidelines, as financial constraints limit access to diabetes-friendly foods, which are often more expensive [7].

4.2. Management of T2DM

The findings of this study underscore the diverse management strategies employed by Type 2 Diabetes Mellitus (T2DM) patients at Mama Lucy Kibaki Hospital, with the majority (81.8%) recognizing the importance of adopting an integrated approach involving diet, drugs, and exercise. This aligns with recommendations from the American Diabetes Association (ADA), which emphasizes the synergistic effect of combining lifestyle modifications with pharmacological interventions for optimal glycemic control [7]. Similar results were reported in a global survey where integrated management approaches were strongly associated with improved patient outcomes [5].

The proportion of respondents (9.1%) who combined healthy dietary habits with medications reflects a common trend in many resource-constrained settings, where limited access to exercise facilities or safe spaces for physical activity may hinder patients from fully incorporating exercise into their management plans [6]. Studies from Nigeria and Ethiopia also highlight the reliance on diet and medication as primary strategies among T2DM patients due to socio-economic barriers to regular physical activity [8-11] Interestingly, only 3.6% of respondents combined healthy dietary habits with aerobic exercise, and an even smaller proportion (3.0%) relied solely on dietary habits for management. This is consistent with findings from another study which reported that while Kenyan patients acknowledge the importance of diet and exercise, many face challenges such as financial constraints, lack of nutritional knowledge, and cultural influences that limit adherence [14]. Another author, [7] also observed that despite the well-documented benefits of exercise in improving insulin sensitivity and cardiovascular health, adherence remains low due to similar barriers.

The 2.4% of respondents relying exclusively on medications or insulin reflects a concerning gap in comprehensive diabetes education. This highlights the need for healthcare providers to keep emphasizing on the benefits of a multifaceted approach during counseling sessions. Locally, misconceptions about diabetes management often stem from inadequate patient education and limited access to dietitians or certified diabetes educators [10]. Internationally, studies in high-income countries, such as the United States, have shown that structured diabetes education programs significantly improve patient knowledge and adherence to integrated management plans [7].

4.3. Dietary Practices of T2DM

The descriptive statistics of individual dietary intake among the respondents revealed significant variation in energy, macronutrient, and fruit and vegetable consumption, reflecting diverse dietary behaviors and socio-economic disparities. The mean energy intake of 1276.70 Kcal (SD = 576.23) falls below the recommended daily intake for adults, consistent with findings from recent studies in low- and middle-income countries. For instance, food insecurity and financial constraints significantly limit caloric intake among T2DM patients in sub-Saharan Africa [6]. Similarly, many Kenyan T2DM patients struggle to meet their nutritional needs due to high food costs and limited access to diverse food options [14].

Water intake among participants averaged 2.10 liters (SD = 0.96), aligning with general recommendations for adequate hydration. However, the wide range (0.8 to 5 liters) indicates variability in adherence, potentially influenced by individual health beliefs or awareness of hydration benefits in diabetes management. Recent global research underscores the importance of hydration for glycemic control, as adequate water intake supports kidney function and glucose regulation [15].

The protein intake ranged from 0 to 235.09 grams, with a mean of 104.63 grams (SD = 36.16 grams), suggesting disparities in dietary quality among respondents. Protein is a critical macronutrient for T2DM management, promoting satiety and stabilizing blood glucose levels. A study in Ethiopia found that inconsistent protein intake among T2DM patients is often linked to socio-economic challenges and cultural dietary preferences [9]. Some Kenyan patients prioritize protein-rich foods, while others perceive them as unaffordable or less important compared to staple carbohydrates [10].

Carbohydrate intake averaged 960 Kcal (SD = 340.23), with a range of 280 to 2400 Kcal. This variation reflects diverse dietary patterns and differing levels of adherence to diabetes dietary recommendations. Excessive carbohydrate consumption, particularly of refined carbohydrates, poses challenges for glycemic control. Recent studies, emphasize the importance of balanced carbohydrate intake to prevent postprandial hyperglycemia and ensure sustained energy levels [7-14].

Fruit and vegetable intake, with a mean of 207.09 Kcal (SD = 84.6) and a significance value of 0.040 below the 0.05 threshold, indicated insufficient consumption relative to international recommendations. The limited intake of fruits and vegetables is a persistent issue linked to poor nutritional awareness and economic barriers. A recent study highlighted that T2DM patients in resource-constrained settings often

prioritize staple foods over fruits and vegetables due to affordability issues [6]. Similar findings were reported in Ethiopia, where dietary patterns heavily rely on staples, leaving nutrient-dense options underutilized [16].

4.4. Nutrition Status

Regarding nutritional status, 70.3% of participants were found to be overweight or obese, a finding that is consistent with global and regional studies. A study carried out in China reported that 69.4% of T2DM patients were either overweight or obese [17]. Additionally, 64% of T2DM patients in the United States were reported to be overweight or obese, further highlighting the widespread prevalence of excess weight among diabetic populations [18]. In a meta-analysis study conducted in Africa, 61.4% of T2DM patients were found to be overweight or obese, confirming the trend observed in Nairobi [19].

The high prevalence of overweight and obesity among T2DM patients is concerning due to the known association between excess weight and poor glycemic control. Overweight and obese individual with T2DM often experience insulin resistance and difficulty managing blood glucose levels [18]. A strong link has been found between high BMI and poor blood sugar control in Kenyan patients, emphasizing the need for targeted interventions to address weight management in T2DM treatment [10]. Despite this, findings from this study also identified a small proportion of underweight individuals, which contrasts with global trends where undernutrition is less common among T2DM patients [20]. This suggests that while overweight and obesity are more prevalent, some patients may still face issues related to inadequate nutrition.

4.5. Frequency of Consumption for Various Foods by the Respondents

The dietary patterns observed in the current study indicate that staple foods such as rice and maize were being consumed regularly, a finding in agreement with similar findings from other similar studies. A study in Ghana found that staple foods such as rice and maize were commonly consumed by T2DM patients, reflecting traditional carbohydrate-based diets across sub-Saharan Africa [21]. In Kenya a study reported that ugali, a maize-based meal, is frequently consumed by diabetic patients, supporting the notion that these foods remain central to the diet in many African households [22]. The consumption of vegetables and fruits in this study also mirrors regional trends, where increasing access to vegetables has been linked to better health outcomes for T2DM patients [23]. The findings on protein sources, such as poultry, eggs, and legumes, shows a diverse approach to protein intake. This is consistent with global findings that suggest lean protein sources, like poultry and legumes, are beneficial for managing blood sugar levels. Consuming plant-based proteins such as legumes has been associated with improved glycemic control in T2DM patients [24]. Additionally, the findings on relatively low consumption of processed foods like margarine and peanut butter are consistent with the notion that higher intakes of processed and high-fat foods can contribute to poor diabetes management and are generally avoided by health-conscious individuals [25].

4.6. Conclusion

This study provides valuable insights into the dietary practices, nutritional status, and management strategies of Type 2 Diabetes Mellitus (T2DM) patients at Mama Lucy Kibaki Hospital, reflecting broader trends in similar resource-constrained settings. The high prevalence of overweight and obesity among participants aligns with global findings, highlighting the critical need for targeted weight management interventions. The dietary patterns observed a heavy reliance on staple carbohydrates and varying levels of protein and vegetable intake, mirror regional trends and emphasize the challenges of achieving balanced nutrition in the face of socio-economic barriers. While many participants recognize the importance of an integrated management approach combining diet, medication, and exercise, financial constraints and limited access to exercise facilities hinder the full implementation of these strategies. These findings underscore the necessity for culturally tailored, community and facility-based interventions that address both dietary quality and the socio-economic challenges faced by T2DM patients, ultimately supporting better diabetes management and improved patient outcomes.

4.7. Recommendations

1. Enhancing Diabetes Education and Awareness Programs

Healthcare facilities should implement structured diabetes education programs tailored to different literacy levels to improve adherence to dietary and treatment guidelines. Utilizing community health workers and digital platforms can help disseminate essential diabetes management information effectively.

2. Improving Access to Affordable and Nutritious Foods

Policymakers should introduce subsidies and urban farming initiatives to make diabetes-friendly foods more affordable and accessible. Healthcare providers should collaborate with nutritionists to develop cost-effective meal plans suited to patients' socio-economic conditions.

3. Examining the Effectiveness of Structured Dietary Interventions

Future research should examine the effectiveness of structured dietary interventions on glycemic control and long-term disease management. Understanding the impact of tailored nutrition programs can help develop evidence-based strategies for better diabetes care.

Abbreviations

T2DM	Type 2 Diabetes Mellitus
FGD	Focused Group Discussion
BMI	Body Mass Index
NACOSTI	National Commission for Science, Technology and Innovation

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Author Contributions

Patrick Malusi Martin: Conceptualization, Formal Analysis, Investigation, Methodology, Project administration, Software, Writing - original draft

Judith Kimiywe: Writing, review & editing

Ann Munyaka: Writing, review & editing

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Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

Patrick Malusi Martin is a Nutrition and Dietetics Officer at Mama Margaret Uhuru Hospital, Nairobi City County. He is also a master's student at Kenyatta university and holds a Bachelor's degree from Kisii University, 2018.

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Ann Munyaka is a dedicated lecturer at Kenyatta University with a strong academic background in food science and bioscience engineering. She holds a Ph.D. in Bioscience Engineering from Katholieke Universiteit Leuven, Belgium (2005-2010), a Master's in Food Technology from Universiteit Ghent and Katholieke Universiteit Leuven, Belgium (2003-2005), and a Bachelor's in Food Science and Postharvest Technology from Jomo Kenyatta University of Agriculture and Technology. With extensive expertise in food technology and bioscience research, Dr. Munyaka is committed to advancing knowledge in her field and mentoring the next generation of scientists.

Research Field

Patrick Malusi Martin: Medical Nutrition therapy in disease management and critical care nutrition and dietetics.

Judith Kimiywe: Public Health, Nutritional Biochemistry, Nutrition and Dietetics.

Ann Munyaka: Biochemistry of food processing.