oORIGINAL RESEARCH ARTICLE

Baseline profile of adults living with type 2 diabetes enrolled in a dietary intervention study in a hospital in Kenya

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Abstract

Type 2 diabetes (T2D) remains a health burden globally and locally, with rising prevalence and complications that impact healthcare systems and individual quality of life. Understanding the profile of individuals living with T2D can inform clinical and dietary interventions.This cross-sectional analysis formed part of a broader dietary interventions study among adults living with T2D. The study involved 32 participants selected using convenience sampling from the diabetes clinic at Gatundu Level V Hospital in Kiambu County, Kenya. The participants were predominantly female (70%), aged between 45–54 years (43.3%).The mean Body Mass Index was 27.4±4.3 kg/m², with the majority being overweight (40.0%) or obese (26.7%). Mean waist hip ratio was 0.93±0.07 in females and 0.97±0.07 in males. Mean waist circumference was 96.5± 9 and 96.2±12 among males and females, respectively. Mean glycated hemoglobin (HbA1c) was 9.8 ± 2.6% and fasting blood glucose at 10.6 ± 2.8 mmol/L. All the participants were on oral hypoglycemics, with over half (53.3%) receiving Metformin monotherapy, while 43.3% were on combined therapies, mostly Metformin and Sulfonylurea. Only 60% reported adherance to prescribed medications. Hypertension was the most frequent comorbidity affecting 60% of the participants, and blood pressure was poorly controlled with mean systolic and diastolic pressures of 142.8 ± 15.4 and 84.7 ± 8.5 mmHg, respectively. About 70% of participants reported moderate levels of stress, and physical activity assessment showed that 26.7% of participants were insufficiently active, while 73.3% achieved sufficient activity levels.The study highlights significant gaps in management of T2D, including inadequate weight control, central obesity, and poor glycemic control among majority of the participants. The use of combined therapies suggests disease progression and health system constrains, and although most participants adhered to oral hypoglycemics, high medication costs posed a barrier to optimal care. There is need for integrated, patient-centred care models.

Keywords: Type 2 diabetes, baseline profile, psychosocial factors, lifestyle

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1.0 Introduction

Type 2 diabetes (T2D) has emerged as one of the most pressing health challenges globally, with the highest burden now shifting toward low and middle income countries, including those in sub-Saharan Africa. The rising burden of diabetes not only increases demands on already strained healthcare systems but also calls for the generation of localized data to guide effective, culturally appropriate interventions (Karugu *et al.*, 2024) In Kenya, T2D is increasingly prevalent due to urbanization, dietary transitions, sedentary lifestyles, and an aging population (International Diabetes Federation, 2021). This shift not only places strain on healthcare systems but also demands more localized data to support targeted interventions that reflect the unique socio-economic and cultural context of affected populations.

Understanding the socio-demographic, clinical, psychosocial, and lifestyle characteristics of individuals living with T2D is essential to guide the development of locally relevant strategies that support better disease management and improve the health and wellbeing of people living with T2D (Silva-Tinoco *et al*., 2020). Baseline data offer an opportunity to describe the health status, living conditions, and barriers faced by individuals living with T2D. Such information is particularly useful when evaluating the effectiveness of intervention studies and for informing public health policy on T2D management (Mohamed *et al.,* 2024). Previous studies have shown that factors such as age, gender, marital status, education level, and occupation can significantly influence access to healthcare, treatment adherence, and the risk of diabetes-related complications (Karimi *et al*., 2025). Psychosocial factors like stress and the affordability of care also play a vital role in shaping health outcomes (Chilunga *et al*., 2023). Additionally, physical activity, a key modifiable lifestyle factor, remains low among many urban and peri-urban populations. The World Health Organization (WHO) recommends regular physical activity to reduce the risk of non-communicable diseases; however, cultural, environmental, and socioeconomic factors often act as barriers to achieving recommended levels (Bull *et* al., 2020). A deeper understanding of the patient profile can reveal an important insights into gaps in care delivery. For example, gender disparities often emerge in chronic disease care, with women generally exhibiting greater health-seeking behavior yet also experiencing unique burdens such as caregiving responsibilities and lower socioeconomic power (Sikka *et al.*, 2021). Educational attainment further plays a critical role in influencing knowledge, attitude, and practices related to diabetes self-care. Moreover, psychosocial aspects such as perceived stress and medication affordability are frequently overlooked despite their proven influence on treatment outcomes. Psychological stress has been shown to increase insulin resistance and complicate glycemic control (Ingrosso et al., 2023). Likewise, financial constraints often lead to poor adherence and skipped treatments, contributing to disease progression and complications. Few studies have documented patient characteristics and cardiovascular risk-factor control among T2D outpatients in Kenya (Kimando et al., 2017a).

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In addition to socio-demographic and psychosocial factors, clinical characteristics such as medication regimens, anthropometric profiles, and metabolic parameters play a major role in shaping disease progression and treatment outcomes in individuals living with T2D. Metformin remains the cornerstone of diabetes pharmacotherapy in Kenya's public sector. However, as glycaemic targets become harder to achieve with disease progression, combination therapies and newer agents like Dipeptidyl Peptidase-4 (DPP-4) and Sodium-Glucose Co-Transporter 2 (SGLT2) inhibitors are increasingly required, though their uptake remains limited by cost and availability (Kibirige, Olum, et al., 2022). Understanding prescribing patterns and medication affordability in real-world settings is important for identifying gaps in pharmacologic management and ensuring equitable access to effective therapies.

Characteristics such as high body mass index (BMI), central obesity and waist-hip ratio (WHR) are known predictors of insulin resistance, glycaemic control, and cardiovascular risk in people living with diabetes. Recent regional studies have documented rising rates of overweight and central obesity among adults living with T2D, contributing significantly to the increasing burden of diabetes complications (Ekpor *et al*., 2023). These parameters not only correlate with glycaemic and blood pressure control but also influence therapeutic decisions, including medication intensification and the integration of lifestyle interventions. Glycated Hemoglobin (HbA1c) remain a critical indicators of long-term glycaemic control, while blood pressure management is integral to reducing the risk of both microvascular and macrovascular complications in this high-risk population (Watetu *et al.,* 2019).

There is limited data documenting medication regimens, nutritional status, and metabolic profiles among adults living with T2D in Kenyan outpatient settings. Such information is important for informing the design of patient-centered, integrated sustainable diabetes care models that reflect the lived realities of affected populations.

This paper describes the baseline socio-demographic, clinical, psychosocial, lifestyle, medication, nutritional, and metabolic characteristics of adults living with T2D enrolled in a dietary intervention study at a public hospital in central Kenya. The findings offer valuable insights into the interplay between patient characteristics, therapeutic patterns, and disease control outcomes within resource-constrained, real-world healthcare environments.

2.0 Methodology

2.1 Study design and Site

This was a descriptive cross-sectional study forming the baseline phase of a broader dietary intervention, conducted at the Gatundu Level V Hospital Non-Communicable Diseases (NCD) Clinic in Central Kenya.

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2.2 Study population, sample size and sampling method

The target population comprised adults aged 18 years and above who had been diagnosed with T2D and were receiving follow-up care at Gatundu leve V hospital. Eligible participants were recruited using a convenience sampling approach. Sample size calculation was conducted using a statistical power (1−β) of 0.80, a significance threshold (α) of 0.05, and an expected effect size (Cohen's f) of 0.25. To account for a possible 20% attrition rate, the sample size was increased to 32 participants. Inclusion criteria included confirmed diagnosis of T2D, ability to understand the study procedures, and willingness to participate. Individuals with severe comorbid conditions that could interfere with glucose metabolism were excluded.

2.3 Data collection tools and procedures

Data was collected using a structured, interviewer-administered questionnaire covering four key domains. The Socio-demographic domain included age, gender, marital status, education level, and employment status. The Health-related domain included self-reported comorbidities while the third domain focused on medication adherence, evaluating how consistently participants followed prescription treatment regimens , and finally, medication affordability domain explored participants ability to access and afford their medications. In addition, two validated questionnaires were administered separately: : the 10-item Perceived Stress Scale (PSS-10) to assess psychosocial stress, and the World Health Organization's Globlal Physical Activity Questionnaire (GPAQ), to evaluated work-related, transport-related, and recreational physical activity. Height, and weight were measured using a stadiometer, calibrated digital scale, respectively, while a non-stretchable measuring tape was used to measure waist and hip circumferences. Fasting blood glucose was measured on site using the On Call Plus glucometer. Venous blood samples for HbA_1c analysis were collected into EDTA tubes, appropriately labeled, and transported under controlled cool conditions to the Bioinformatics Institute Laboratories in Nairobi. Upon arrival, samples were stored at −20 °C for short-term preservation and analyzed within 12 hours using the Laborex i100 Immunofluorescence Analyzer (Milan, Italy).The Blood pressure was recorded using an automated digital sphygmomanometer.

To minimize potential bias and ensure data quality, measures were implemented throughout the data collection process. The use of interviewer-administered questionnaires helped reduce non-response bias and allowed for immediate clarification of any participant misunderstandings. Furthermore, validated instruments that is the Perceived Stress Scale (PSS-10), and the Global Physical Activity Questionnaire (GPAQ) were employed to enhance the reliability and validity of psychosocial and lifestyle-related data. During data collection, all responses were reviewed for internal consistency and completeness, which helped minimize missing or inconsistent data.

2.4 Data management and analysis

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Data was entered into Microsoft Excel, checked for completeness, and cleaned for accuracy before analysis. Statistical analysis were conducted using SPSS version 28. Weight and height, were used to calculate Body Mass Index (BMI), while waist and hip circumference were used to calculate waist–hip ratio (WHR). Both were categorised according to WHO criteria (WHO 2025), with BMI categorized as underweight (<18.5kg/m^2), normal weight (18.5-24.9 kg/m^2), overweight (25.0-29.9 kg/m^2), or obese (≥30.0 kg/m^2). The Waist circumference was calculated by dividing waist circumference with hip circumference. Waist hip ratio and waist circumference was interpreted using sex-specific thresholds. PSS-10 (Perceived Stress Scale) scores were summed to obtain total stress scores, which were classified into low, moderate, and high perceived stress levels using the standard PSS-10 scoring method (S. Cohen *et al*., 1983). Blood pressure was classified according to WHO categories, with controlled hypertension defined as <140/90 mmHg and uncontrolled as ≥140/90 mmHg (WHO, 2025) .

Physical activity data from the GPAQ (Global Physical Activity Questionnaire) were categorized as insufficient or sufficient, following WHO guidelines (WHO 2024). Descriptive statistics,.

Descriptive statistics including means, standard deviations, and percentages, were used to summarize all variables.. Frequencies and percentages described categorical variables, while means and standard deviations summarized continuous variables. The analysis presents the baseline data collected prior to the intervention phase.

3.0 Results

3.1 Socio-demographic characteristics of study participants

The response rate was 94%: two participants withdrew from the study due to time constraints. The mean age of the participants was 56 ± 9.4 years, with the majority clustered in the 45–54 years age group (43.3%) (Table 1). Females accounted for a greater proportion of participants at 70%. Most participants were married (70%) and over half (53.3%) had completed primary education as their highest level of education. Regarding occupation, 40.0%were self-employed, 33.3% were not employed at the time of the study and the rest (26.7%) were in formal employment.

Table 1: Socio-demographic Characteristics of Study Participants (n=30)

Characteristic	Frequency (n)	Percentage (%)	Mean (± SD)
Age (years)			56 ± 9.4
30–44	2	6.7	
45–54	13	43.3	
55–64	8	26.7	
≥ 65	7	23.3	
Gender			

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Characteristic	Frequency (n)	Percentage (%)	Mean (± SD)
Male	9	30.0	
Female	21	70.0	
Marital Status			
Single	4	13.3	
Married	21	70.0	
Widowed	4	13.3	
Separated/Divorced	1	3.3	
Education Status			
Primary	16	53.3	
Secondary	10	33.3	
Tertiary	4	13.3	
Occupation			
Self-employed	12	40.0	
Employed	8	26.7	
Not employed	10	33.3	

3.2 Clinical, psychosocial, and lifestyle characteristics of participants

Comorbidity was reported in 73.3% while 26.7% had no comorbid condition. Among participants with comorbidities, 60.0% (n=18) had hypertension, and 13.3% (=4) had arthritis. In terms of medication adherence, 60% of participants reported consistent medication use, while two-fifth (40%) admitted to non-adherence. Affordability remained a notable barrier, with only 40% of participants reporting that their medications were affordable, while nearly 60% found them either fairly affordable or unaffordable. The mean systolic blood pressure was 142.8 ± 15.4 mmHg, and the mean diastolic blood pressure was 84.7 ± 8.5 mmHg. This is shown in Table 2.

The mean PSS-10 score was 20.4 ± 6.8 (score range 3–32). Stress levels were classified as low in 13.3% of participants (n = 4), moderate o in 70.0% (n=21), and high in 16.7% (n=5).. Physical activity, assessed using the GPAQ, showed that 26.7% of participants (n=8) were insufficiently active, while 73.3% (n = 22) were sufficiently active as demostrated in Table 2.

Table 2: Clinical, Psychosocial, and Lifestyle Characteristics of Participants (n=30)

Characteristic	Frequency (n)	Percentage (%)
Comorbidities	22	73.3
Hypertension	18	60
Arthritis	4	13.3
None	8	26.7
Self-Reported Medication Adherence		

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Characteristic	Frequency (n)	Percentage (%)
Adherent	18	60.0
Non-adherent	12	40.0
Medication Affordability		
Affordable	12	40.0
Fairly affordable	10	33.3
Not affordable	8	26.7
Perceived Stress Level		
Low	4	13.3
Moderate	21	70.0
High	5	16.7
Physical Activity		
Insufficiently Active	8	26.7
Sufficiently active	22	73.3

All the partcipants were on oral hypogyceamics, with 54% on Metformin monotherapy (Figure 1). Only one participant was on Sulfonylurea monotherapy. The remaining 43% were on combined therapy involving two or more oral agents(Metformin paired with agents such as Glibenclamide, Gliclazide, Glipizide,Sitagliptin, Glimepride, and Empagliflozin) Among those on combination regimens, the most frequently used combinations included Metformin with Sulfonylurea.

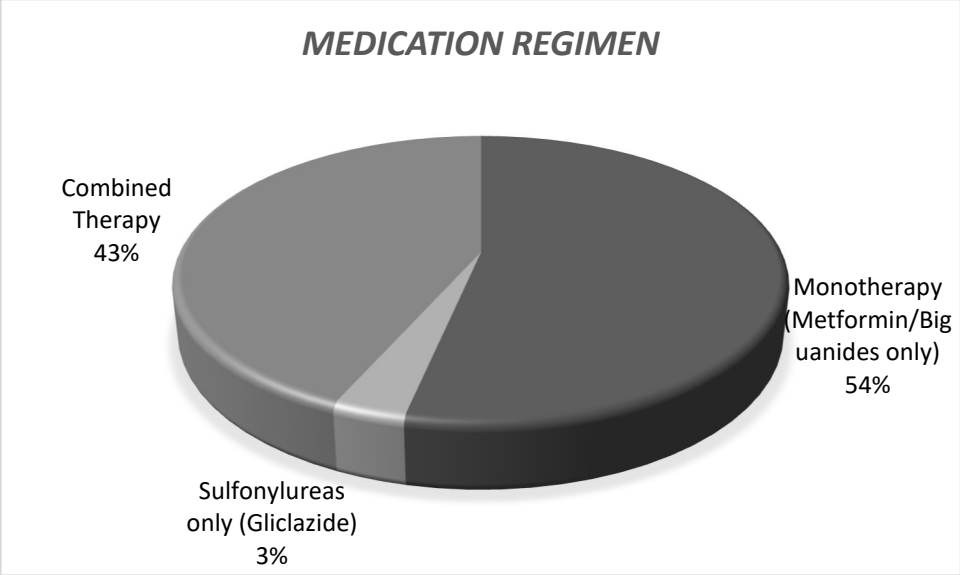

Figure 1: Medication Regimen Patterns Among Participants

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3.3.1 Anthropometric and metabolic characteristics

The anthropometric and metabolic parameters of participants are summarized in Table 3. The mean Body Mass Index (BMI) was 27.4 ± 4.3 kg/m² (range 19.3–37 kg/m²). Waist-hip ratio averaged 0.93 ± 0.07 in females and 0.97 ± 0.07 in males with mean waist circumference of 96.5 ± 9.0 cm in males and 96.2 ± 12.0 cm in females . The mean HbA1c was 9.8 ± 2.6%, fasting blood glucose was elevated averaging 10.6 ± 2.8 mmol/L.. The mean systolic and diastolic pressure readings were 142.8 ± 15.4 mmHg and 84.7 ± 8.5 mmHg, respectively. The mean duration of diabetes since diagnosis among participants was 6.82 ± 6.3 years (range 1 – 19).

Table 3: Anthropometric and Metabolic Parameters of Study Participants (n = 30)

Parameter	Mean	Standard Deviation (SD)	Range
Body Mass Index (BMI) (kg/m²)	27.4	±4.3	19.3-37
Waist-Hip Ratio	0.94	±0.07	
Male	0.97	±0.07	
Female	0.93	±0.07	
Waist Circumference			
Male	96.5	±9	87-112
Female	96.2	±12	76-126
Glycated Hemoglobin (HbA1c) (%)	9.8	±2.6	5.6 -16
Fasting Blood Glucose (mmol/L)	10.6	±2.8	
Systolic Blood Pressure (mmHg)	142.8	±15.4	106-167
Diastolic Blood Pressure (mmHg)	84.7	±8.5	69-102
Duration of Diabetes (years)	6.82	±6.3	1-19

4.0 Discussion

Most participants were middle aged women, a finding consistent with other studies reporting higher healthcare services utilization among women (Sikka *et al.*, 2021). This gender disparity likely reflects a combination of biological, behavioral, and socio- economic factors, including differences in healthcare access, dietary habits, caregiving roles, and patterns of physical activity (Desse *et al.*, 2024).Education levels among participants were notabily low, with more than half (53.3%) having attained only primary education. Low level of education attainment could influence health literacy, which can compromise an individual's ability to make informed dietary choices, adhere to treatment regimens, and practice effective self-care in diabetes management. In terms of marital status, the majority of the participants were married (70%), while 13.3% were single, 13.3%

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widowed, and 3.3% separated or divorced. Most studies suggests that individuals who are not married may face a higher risk of developing T2D compared to their married counterparts (Karimi *et al.*, 2025). Beyond disease onset, marital and social support have been shown to play a crucial role in managing chronic conditions like diabetes. A recent study conducted in Kenya among diabetic patients residing in Machakos county, reported that patients with adequate emotional, informational, and practical support were significantly more likely to achieve optimal glycemic control (Kiarie *et al.*, 2024). These findings underscore the importance of integrating family and spousal support systems into diabetes management programs, while also offering targeted interventions for individuals who lack such support networks. Employment status also emerged as a significant factor, with a notable 33.3% of participants being unemployed. Financial hardship is a well documented barrier to effective diabetes self-management, limiting access to healthcare services, essential medication, and nutritious foods (Hill-Briggs *et al.*, 2021).

In this study only 60% of participants reported adhering to their prescribed medications. A potential contributor to this could be the cost of medication, with only 40% considering their medications affordable. These findings underscore persistent economic barriers in diabetes care within resource constrained (Kibirige, Olum, et al., 2022) reaffirming the need for health systems to prioritize cost reduction strategies, insurance coverage, and medication subsidy schemes. Psychological stress was another prominent issue, with 70% of participants reporting moderate stress levels. Chronic stress has long been recognized for its negative impact on glycemic control, largely through its effect on cortisol levels and insulin sensitivity (Chilunga *et al.*, 2023) These findings highlights the psychosocial burden associated with managing T2D, particularly in lower income settings where high levels of diabetes-related distress, anxiety, and reduced quality of life have been reported among adults living with T2D (Boakye *et al.*, 2025) . In contrast, some longitudinal evidence suggests that the association between stress and diabetes risk may vary by sociodemographic factors, with occupational status modifying the relationship between perceived stress and incident diabetes (Wiernik *et al.*, 2016). Among participants, 26.7% were classified as insufficiently active, whereas 73.3% met the criteria for sufficient physical activity, suggesting relatively high engagement in exercise. These findings differ from report by Çolak *et al.*, 2016 who observed a greater prevalence of inactivity among adults living with diabetes.

Regarding medication regimen, this study found that over half of the participants were on Metformin monotherapy, which aligns with both global and Kenyan clinical guidelines that recommend Metformin as the first-line pharmacologic agent for T2D management (International Diabetes Federation, 2021; Ministry of Health Kenya, 2018). Notably, the relatively high proportion of participants on combination therapy suggests the challenges of achieving glycemic control with monotherapy alone in this population. Evidence from sub-Sahara Africa is in concurence that many patients require treatment intensification due to late presentation, progressive β-cell dysfunction, suboptimal lifestyle modification, and limited access to comprehensive diabetes education

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(Goedecke & Mendham, 2022; Ekoru *et al.*, 2019). Moreover, while newer agents such as Dipeptidyl Peptidase-4 inhibitors(DPP-4 inhibitors) (e.g., Sitagliptin), and Sodium-Glucose Co-Transporter 2 inhibitors (SGLT2 inhibitors) (e.g., Empagliflozin) offer additional glycemic and cardiovascular benefits, their limited availability and higher costs often restricts their use (Kibirige, Olum, *et al.*, 2022). These medication patterns highlights the complex interplay between patient comorbidity profiles, medication adherence, financial barriers, and psychosocial stressors in shaping T2D outcomes in resource constrained, real world clinical environments. These findings reinforce the call for health systems in Kenya and similar settings to improve early screening, sudsidize effective medication combinations, and integrate psychosocial support and lifestyle interventions into routine diabetes care (Kiarie *et al*., 2024).

Although the sample size in this study was not sufficent to calculate prevelance of overweight and obesity,the mean Body Mass Index (BMI) among participants was 27.4 ± 4.3 kg/m², placing the majority of the subject in the overweight category according to WHO criteria (WHO, 2022). A systematic review and meta analysis of data from sub- Sahara Africa, (Ekpor *et al.*, 2023) revealed that increasing rates of overweight and obesity are contributing to the rising burden of T2D. Excess weight is a known risk factor for insulin resistance and poor glycemic control highlighting the need to prioritize weight management interventions as a core components of diabetes care. Alongside BMI, waist circumference, and especially waist-hip ratio, a marker of central adiposity, averaged 0.94 ± 0.07, which is above the recommended cut-offs for both men (≥0.90) and women (≥0.85) (WHO, 2022). Elevated WHR is associated with increased cardiometabolic risks, including hypertension, dyslipidaemia, and T2D complications (Ekpor *et al.*, 2023.).

The glycaemic control in this population was notably poor with a mean HbA1c of 9.8 ± 2.6%, well above the recommended target of ≤7% (American Diabetes Association, 2024). Elevated HbA1c levels suggest persistent hyperglycaemia and inadequate disease control in a substantial proportion of participants. Systematic reviews of studies in Africa indicate that the proportion of people with diabetes achieving HbA1c targets is generally low, reflecting widespread suboptimal glycaemic control across the region (Kibirige, Chamba, *et al.*, 2022). Similarly, the mean fasting blood glucose was 10.6 ± 2.8 mmol/L, further confirming poor glycemic control.These findings are consistent with recent regional evidence indicating that suboptimal glycemic control remains a major challenge in African diabetes clinics, often driven by late presentation, limited therapeutic options, poor medication adherence, and financial barriers (Kiarie *et al.*, 2023a; Fina Lubaki *et al.*, 2022). Such control issues are significant predictor of both microvascular and macrovascular complications (Solela *et al.*, 2024). In addition to poor glucose control, blood pressure measurements reflected inadequate cardiovascular risk management, with a mean systolic pressure of 142.8 ± 15.4 mmHg, and 84.7 ± 8.5 mmHg for diastolic pressure. Uncontrolled blood pressure in individuals living with T2D significantly increases the risk of macrovascular complications such as stroke and myocardial infarction, as well as microvascular complications,

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including nephropathy and retinopathy (Kimando *et al.*, 2017). Evidence from southwestern Uganda shows that uncontrolled hypertension is highly prevalent among T2D patients and is known to be a strong predictor of adverse cardiovascular outcomes (Saasita et al., 2021).

The mean duration of diabetes since diagnosis was 6.82 ± 6.3 years, reflecting a wide range of disease progression stages within the study population. This variability could explain the diversity observed in treatment regimens and glycaemic outcomes. Similar findings have been reported in other regional studies, where long-standing diabetes is associated with increased need for combination therapies and poorer metabolic outcomes (Kiarie *et al*., 2023). These findings highlights the multidimensional challenges of diabetes care in Kenya, encompassing excess weight, central adiposity, poor glycaemic control, and hypertension reflecting common challenges in managing diabetes within low-resource outpatient settings, where multiple clinical, lifestyle and psychosocial factors intersect to influence disease outcomes.

4.1 Study limitation and strengths

The study was limited by the small sample size and the use of convenience sampling which may affect generalizability. Single center study may limit generalization to other regions with different healthcare access and socioeconomic factors.. A key strength of this study is the use of validated instruments, which enhanced the reliability and validity of psychosocial and lifestyle assessments. By integrating socio-demographic, clinical, psychosocial, lifestyle, and pharmacological factors, the study provides a comprehensive understanding of the lived experiences and challenges faced by adults living with type 2 diabetes.

5.0 Conclusion

The socio-demographic findings revealed that the majority of participants were middle-aged women with limited formal education and high unemployment rates, factors closely tied to health literacy, access to care, and capacity for effective self-management. Clinically, there was a significant burden of comorbid hypertension and high psychosocial stress, showing how medical issues, financial worries, and everyday challenges all combine to affect their ability to manage diabetes day-to-day in this community.

While half of the participants were on Metformin monotherapy, a large proportion required combined oral therapies to achieve acceptable glycaemic control, a reality that mirrors progressive disease, late healthcare seeking, and limitations in therapeutic options. Low medication adherence, driven in part by affordability challenges, further compounded these difficulties. Anthropometric and metabolic parameters confirmed prescence of known rish factors including high body weight, central obesity, poorly controlled blood glucose, and elevated blood pressure, placing participants at increased risk of diabetes related complications. These outcomes emphasize the value of integrated care models that go beyond medication to include dietary

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strategies, health education, and psychosocial interventions tailored to suit the realities of everyday life and the needs of the community.

6.0 Recommendations

Based on the findings of this baseline assessment, efforts should focus on improving access to affordable medications and supporting adherence, while implementing culturally and locally tailored dietary and lifestyle interventions. Enhancing health education to boost health literacy particularly among middle aged women with limited formal education and incorporating psychosocial support to manage stress and financial barriers are essential. Additionally, early screening and timely treatment are critical to preventing disease progression and complications. Future research should evaluate the effectiveness of these comprehensive interventions within resource-limited settings to improve long-term outcomes for this population. Policymakers are encouraged to support localized research that addresses context-specific challenges in diabetes management. Future research should aim to include larger, randomly selected samples across multiple centers to improve the generalizability of findings. Incorporating participants from diverse geographic regions with varying levels of healthcare access and socioeconomic backgrounds will allow for a more comprehensive understanding of the phenomenon under investigation.

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7.1 General acknowledgements

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7.2 Ethical Considerations

Ethical approval was granted by the Jomo kenyatta University of Agriculture and Technology ethics review committee (REF: JKU/2/4/896B). Permit was obtained from National Commission for science, Technology and Innovation (NACOSTI)(Ref No:633285). Authorization was obtained from Kiambu county governmment while approval was granted by Gatundu Level V hospital Ethics Review committee. The study adhered to the ethical principles of autonomy, confidentiality, and beneficence, and the participant provided written informed consent and had the option to withdraw at any time.

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