DEPARTMENT OF INTERNAL MEDICINE

DYSLIPIDEMIA AMONG NEWLY DIAGNOSED TYPE II DIABETES MELLITUS PATIENTS ATTENDING SELECTED CLINICS IN DAR ES SALAAM, TANZANIA.

BY

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CERTIFICATION

It is hereby certified that the undersigned have read and hereby recommends the acceptance by Kairuki University, of a dissertation titled **"DYSLIPIDEMIA AMONG NEWLY DIAGNOSED TYPE II DIABETES MELLITUS PATIENTS ATTENDING SELECTED CLINICS IN DAR ES SALAAM, TANZANIA."** in partial fulfillment of the requirements for the degree of Master of Medicine in Internal Medicine.

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Operational Definitions

Diabetes mellitus: A group of metabolic disorders in which the body does not produce enough or respond normally to insulin, causing blood sugar (glucose) levels to be abnormally high.

Diabetes mellitus type II: Metabolic disorder characterized by hyperglycemia as a result of progressive resistance to normal insulin and or gradual loss of capacity of the body to produce enough insulin action[2]

Newly diagnosed Type II Diabetes Mellitus: will mean the period from confirmation to TYPE II DIABETES MELLITUS diagnosis for the first time up to at any time of enrollment into the study not to exceed a maximum of one year from the time of firstly being diagnosed TYPE II DIABETES MELLITUS.

Dyslipidemia: refers to *abnormal levels of lipids in the bloodstream*, which poses a significant risk factor for cardiovascular (CV) diseases.

Obesity means weighing more than what is healthy for a given height which can lead to other health problems, including diabetes, heart disease, and some cancers

Hypertension (high blood pressure) is when the pressure in the blood vessels is too high (140/90 mmHg or higher)

ABSTRACT

Type 2 Diabetes Mellitus (T2DM) poses a growing global public-health challenge, commonly accompanied by dyslipidemia, hypertension, and obesity. About 64 percent of people with T2DM have dyslipidemia, increasing cardiovascular risk and healthcare costs. In Tanzania, evidence on the metabolic status of newly diagnosed T2DM patients is scarce. This study therefore assessed the prevalence of dyslipidemia among newly diagnosed T2DM patients in Dar es Salaam and examined its association with glycemic control, hypertension, and obesity. A descriptive cross-sectional study was conducted from July to August 2025 at two diabetic clinics located at selected hospitals, involving 196 adults diagnosed with Type II Diabetes Mellitus within the past year. Data collection included structured questionnaires, anthropometric assessments, and laboratory tests for lipid profiles and HbA1c levels Among 196 newly diagnosed Type II Diabetes Mellitus patients, 53.1% had dyslipidemia, reflecting a high burden of lipid abnormalities. Although there was no significant association between dyslipidemia and glycemic control ($p=0.813$), significant relationships were observed with pre-hypertension ($p=0.034$), abnormal BMI ($p=0.042$), and increased waist circumference ($p=0.006$). The study emphasizes early detection and management of dyslipidemia to prevent cardiovascular complications in Type II Diabetes Mellitus patients. It recommends routine lipid profiling during initial diagnosis, alongside comprehensive primary care that includes cardiovascular risk assessment and lifestyle counseling. Further longitudinal studies are needed to explore long-term effects of lipid abnormalities on glycemic control and guide diabetes management policies.

ABBREVIATIONS AND ACRONYMS

ACEI Angiotensin converting enzymes inhibitors.

ACR Albumin creatinine ratio

AER Albumin excretion rate

AGEs Advanced glycation end products

AKD Acute kidney disease

AKI Acute Kidney Injury

ARB Angiotensin receptor blockers

BPH Benign prostate hyperplasia

BUN Blood urea nitrogen

CRF Chronic Renal Failure

DM Diabetes mellitus

DPP4 Dipeptidyl peptidase 4

eGFR Estimated glomerular filtration rate.

ESRD End-stage renal disease

GLP Glucagon like peptides

RRT Renal replacement therapy

Scr Serum creatinine

T2DM Type 2 Diabetes Mellitus

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Type 2 Diabetes Mellitus (T2DM), previously called adult-onset or non–insulin-dependent, is when insulin secretion is inadequate because patients have developed insulin resistance thus hepatic insulin resistance leads to an inability to suppress hepatic glucose production, and peripheral insulin resistance impairs peripheral glucose uptake. This combination gives rise to fasting and postprandial hyperglycemia with often insulin levels very high, especially early in the disease but later in the course of the disease, insulin production may fall, further exacerbating hyperglycemia (Brutsaert, 2023).

According to Hameed et al., (2015), the primary metabolic disorder associated with Type 2 Diabetes Mellitus is insulin resistance, where the body's tissues become less responsive to insulin, leading to high blood sugar levels, alongside potential issues with impaired insulin secretion from the pancreas, contributing to a metabolic imbalance and the development of TYPE II DIABETES MELLITUS. Dyslipidemia is often interconnected and considered part of "metabolic syndrome," where excess body fat, particularly around the waist, leads to insulin resistance, which in turn contributes to high blood pressure, abnormal cholesterol levels, and increased risk of cardiovascular disease; essentially, these conditions frequently co-occur and worsen each other's effects within a diabetic individual (Berg et al., 2019).

Globally, approximately 64.74% of individuals with type 2 diabetes have dyslipidemia characterized by abnormal levels of cholesterol and triglycerides (Ebrahimpur et al., 2024) while, approximately 80-90% of individuals with TYPE II

DIABETES MELLITUS are either overweight or obese (Nianogo & Arah, 2022). These costs are driven by increased use of medications, hospital services, and reduced productivity (Virginia, 2023). In the US alone in 2022, the total annual cost of diabetes in the U.S. was estimated at $412.9 billion, with $306.6 billion in direct medical costs and $106.3 billion in indirect costs (Virginia, 2023).

In Sub-Saharan Africa, among people diagnosed with TYPE II DIABETES MELLITUS, there is a high prevalence of dyslipidemia among persons with type 2 diabetes (T2D) (Hinneh et al., 2023), with rates ranging from 37.4% for high triglycerides (TG) to 52.7% for high low-density lipoprotein cholesterol (LDL-C) (Ekpor et al., 2024) and with obesity rates ranging from 27.4% to 83% (Tino et al., 2017). The escalations of these metabolic disorders in TYPE II DIABETES MELLITUS patients as a financial burden to Sub-Saharan Africa countries. A case study of Kenya, the total cost of managing T2D for the healthcare system in Kenya was estimated to be US$ 635 million (KES 74,521 million) in 2021. Furthermore, this had an increase of US$ 2 million (KES 197 million) considering the screening costs of undiagnosed T2D in the country (Karugu et al., 2024). The major cost driver representing 59% of the overall costs was attributed to T2D complications, with nephropathy having the highest estimated costs of care and management (US$ 332 million (KES 36, 457 million) but then, with total cost for T2D being projected to rise to US$ 1.6 billion (KES 177 billion) in 2045 because of the increased cases of hypertension, dyslipidemia and obesity among patients with T2D (Karugu et al., 2024).

In Tanzania, finding specific financial cost statistics for dyslipidemia in Type 2 Diabetes Mellitus patients in Tanzania is challenging due to limited localized data however, based on some general insights on available information, the economic

burden of managing TYPE II DIABETES MELLITUS and metabolic disorders of dyslipidemia is substantial (Munyogwa et al., 2020). Similarly, the prevalence of metabolic profile of dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients as well as its association on glycemic control in Tanzania, remains largely unexplored.

1.2 Problem Statement.

It is recommended that all adults diagnosed with Type 2 Diabetes Mellitus (T2DM) should be routinely screened for dyslipidemia at the time of diagnosis. Early identification of lipid abnormalities to be followed by timely initiation of evidence-based lipid-lowering therapy, in line with international guidelines (American Diabetes Association, 2023; WHO, 2022).Also, lipid management should be fully integrated into diabetes care pathways, ensuring comprehensive cardiovascular risk reduction. This approach is expected to significantly lower the burden of cardiovascular disease, reduce related mortality, and improve the quality of life for affected individuals (Benjamin et al., 2019).

However, the real situation is far from ideal. Globally, dyslipidemia is highly prevalent, affecting approximately 64% of individuals with T2DM, and its burden is rising rapidly in Africa and Tanzania (Ebrahimpur et al., 2024; Karugu et al., 2024). In Sub-Saharan Africa (SSA), prevalence ranges from 37% to 50%, yet screening practices remain inconsistent and coverage is low (Ekpor et al., 2024; Noubiap et al., 2015). In Tanzania, available data suggest that more than 40% of newly diagnosed T2DM patients already present with lipid abnormalities (Munyogwa et al., 2020), indicating that dyslipidemia develops early in the disease process. Despite

this, lipid profiling is not routinely included in the initial clinical evaluation of diabetic patients in many healthcare facilities (Mosha et al., 2017). Low awareness, limited treatment initiation, and poor glycaemic control rates contribute to avoidable cardiovascular events and complications (Chow et al., 2018).

This situation highlights a clear research gap. There is limited published evidence on the prevalence and specific patterns of dyslipidemia among newly diagnosed T2DM patients in Tanzania. Furthermore, little is known about the relationship between dyslipidemia and glycemic control in this population. Importantly, no study to date has specifically examined this problem in Dar es Salaam, despite its rapid urbanization, high prevalence of lifestyle-related risk factors, and unique healthcare dynamics (WHO, 2022; Ekpor et al., 2024). The lack of robust local data delays the development of targeted policies and the integration of dyslipidemia screening into standard diabetes care. Addressing this knowledge gap is crucial for designing effective interventions that can reduce cardiovascular risk and improve long-term outcomes (Benjamin et al., 2019; American Diabetes Association, 2023).

1.3 Objectives

1.3.1 Broad Objective

To determine the burden of dyslipidaemia among newly diagnosed Type 2 Diabetes mellitus patients at two selected Diabetic clincs in Dar es Salaam and its association with key metabolic abnormalities of hypertension and obesity.

1.3.2 Specific Objectives

1.3.2.1 To determine the prevalence of dyslipidemia among newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam.

1.3.2.2 To determine the association between glycemic control and dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam

1.3.2.3 **To determine the association between comorbidities (hypertension and obesity) and dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam.**

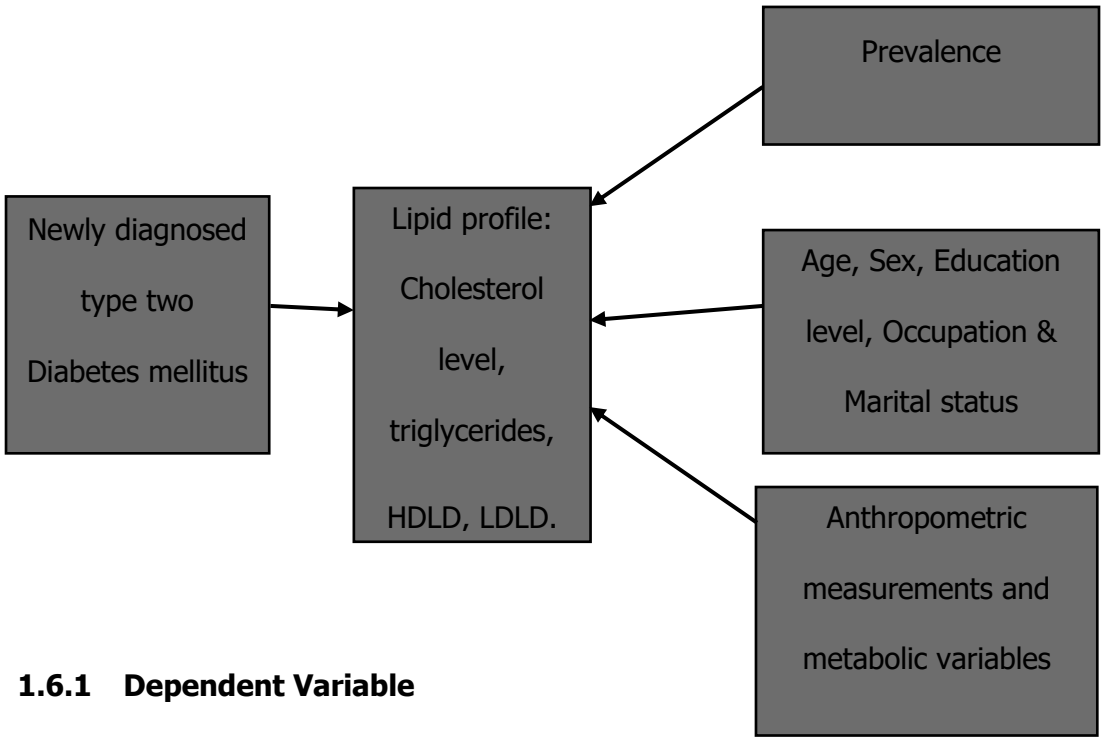
1.4 Rationale of the study

The rationale for this study stems from existing gaps in Tanzania's current diabetes management policies and guidelines, which focus primarily on glycemic control while giving limited attention to lipid profiling and comprehensive metabolic risk assessment at diagnosis. By investigating the prevalence of dyslipidemia and its associations with glycemic control, hypertension, and obesity among newly diagnosed Type II Diabetes Mellitus patients, this study provides evidence that can strengthen the implementation of integrated metabolic screening within national non-communicable disease (NCD) programs. The findings can inform revisions to current treatment guidelines emphasizing routine lipid profiling, early cardiovascular risk assessment, and lifestyle interventions as part of standard diabetes care. Moreover, the study contributes to the descriptive epidemiology of Type II Diabetes Mellitus in Tanzania, enhances understanding of predictors of poor glycemic outcomes, and supports the design of evidence-based policies and prevention strategies. Ultimately, this research aims to bridge policy and practice gaps by promoting a more holistic approach to diabetes management and improving long-term patient outcomes in Tanzania.

1.5 Research Questions

1. What is the prevalence of dyslipidemia among newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam?
2. What is the association between glycemic control and dyslipidemia among newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam?
3. What is the association between metabolic abnormalities (hypertension and obesity) and dyslipidemia among newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam?

1.6 Conceptual Framework



1.6.1 Dependent Variable

Glycemic control, was measured as a categorical variable with two levels, i.e., good glycemic control, i.e., HbA1C <6.5%, and poor glycemic control, i.e., HbA1C ≥ 6.5%.

Lipid profile: Cholesterol level as triglycerides, HDL, LDL

1.6.2 Independent variables

Sociodemographic Variables:

Age: Was measured in years, this is a continuous numerical variable.

Sex: Was measured as a categorical variable with two levels: Male or Female.

Education Level: Was measured as a categorical variable indicating the highest level of education attained (no, formal education, primary, secondary or university).

Occupation: Was measured as a categorical variable describing the participant's current occupation (none, employed, self-employed)

Marital Status: Was measured as a categorical variable indicating marital status (single, married, divorced, widowed).

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Type 2 Diabetes Mellitus (T2DM) has emerged as a global health crisis, characterized by hyperglycemia resulting from insulin resistance and impaired insulin secretion. This complex metabolic disorder is often accompanied by a cluster of comorbidities, collectively known as the metabolic syndrome, which includes hypertension, obesity, and dyslipidemia. These coexisting conditions significantly increase the risk of cardiovascular complications and contribute to poor glycemic control in TYPE II DIABETES MELLITUS patients. This literature review explores the current understanding of the prevalence of dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients, focusing on their association with glycemic control and the potential implications for clinical management**.**

2.2 Prevalence of dyslipidemia among newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam.

Dyslipidemia, characterized by abnormal levels of cholesterol and triglycerides, is another common complication of TYPE II DIABETES MELLITUS. It is a major contributor to the increased risk of cardiovascular disease in individuals with diabetes (American Diabetes Association Professional Practice Committee, 2023). Studies have shown that individuals with TYPE II DIABETES MELLITUS often have elevated levels of triglycerides and low levels of high-density lipoprotein cholesterol (HDL-C), while some may also experience elevated levels of low-density lipoprotein cholesterol (LDL-C) (Hermans & Valensi, 2018).

Data on the prevalence of dyslipidemia among newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam is limited. However, studies conducted in other parts of Tanzania have reported high rates of dyslipidemia among individuals with diabetes (Ekpor et al., 2024). Investigating the prevalence of dyslipidemia in this population is crucial to assess the cardiovascular risk profile of newly diagnosed TYPE II DIABETES MELLITUS patients and to guide appropriate treatment strategies.

2.3 Association between glycemic control and dyslipidemia in newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam.

Dyslipidemia can significantly impact glycemic control in individuals with TYPE II DIABETES MELLITUS. Abnormal lipid profiles can contribute to insulin resistance and inflammation, which can impair glucose metabolism (Bjornstad & Eckel, 2018).

The association between dyslipidemia and glycemic control in newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam is not well-established. Investigating this relationship provides valuable insights into the impact of dyslipidemia on diabetes management in this population. This information is crucial for developing effective strategies for improving glycemic control and reducing the risk of cardiovascular complications in individuals with both diabetes and dyslipidemia.

2.4 Association between hypertension and dyslipidemias in newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam.

Hypertension is a common comorbidity in type 2 diabetes mellitus individuals with dyslipidemia worldwide. Studies have consistently shown a high prevalence of hypertension among TYPE II DIABETES MELLITUS patients, ranging from 30% to

70% depending on the population and study design (Motuma et al., 2023). This co-occurrence significantly increases the risk of cardiovascular complications, such as heart attacks and strokes, in individuals with TYPE II DIABETES MELLITUS (American Diabetes Association Professional Practice Committee, 2023). The pathophysiology of this association is complex, involving shared risk factors like obesity, insulin resistance, and inflammation (Al-Azzam et al., 2020).

Data on the prevalence of hypertension among newly diagnosed TYPE II DIABETES MELLITUS patients with dyslipidemia in Dar es Salaam is limited. However, studies conducted in other parts of Tanzania have reported high rates of hypertension among individuals with diabetes (Khamis et al., 2020) . Considering the rising prevalence of both diabetes and hypertension in Tanzania, it is crucial to investigate the magnitude of this comorbidity in the Dar es Salaam population to inform targeted public health interventions.

Hypertension can significantly impact glycemic control in TYPE II DIABETES MELLITUS individuals with dyslipidemia. Studies have shown that uncontrolled hypertension can worsen insulin resistance and impair glucose metabolism, leading to higher blood sugar levels (Jia & Sowers, 2021). Conversely, effective blood pressure control can improve glycemic control and reduce the risk of diabetes-related complications (American Diabetes Association Professional Practice Committee, 2023).

The association between hypertension and dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam is not well-understood. Investigating this relationship provides valuable insights into the impact of hypertension on diabetes management in this population. This information is crucial for developing

effective strategies for improving hypertension, dyslipidemia and glycaemia control and reducing the risk of cardiovascular complications in individuals with both diabetes and hypertension.

2.5 Association between obesity and dyslipidemia in newly diagnosed Type II Diabetes Mellitus patients in Dar es Salaam.

Obesity is a major risk factor for the development of TYPE II DIABETES MELLITUS in individuals with dyslipidemia globally. The prevalence of obesity has been increasing steadily in many countries, contributing to the rising burden of diabetes worldwide (Khan et al., 2020). Studies have shown a strong association between obesity and the incidence and severity of TYPE II DIABETES MELLITUS in individuals with dyslipidemia, particularly in high-income countries (World Health Organization, 2024). Obesity contributes to insulin resistance, a key factor in the pathogenesis of TYPE II DIABETES MELLITUS.

Obesity is a growing public health concern in Tanzania, including Dar es Salaam. Studies have shown an increasing trend in obesity rates in the country, particularly in urban areas (Pallangyo et al., 2020). The impact of obesity on TYPE II DIABETES MELLITUS prevalence in Dar es Salaam requires further investigation. Understanding the prevalence of obesity among newly diagnosed TYPE II DIABETES MELLITUS patients with dyslipidemia in this population provides valuable insights into the risk factors and potential interventions for diabetes prevention and control.

Obesity is strongly associated with dyslipidemia in individuals with TYPE II DIABETES MELLITUS. Excess body weight contributes to insulin resistance, making it more difficult for the body to effectively use insulin to regulate blood sugar levels (Wondmkun, 2020). Weight loss interventions have been shown to improve

glycemic control and reduce the risk of diabetes complications in obese individuals with TYPE II DIABETES MELLITUS(American Diabetes Association Professional Practice Committee, 2023).

The association between obesity and dyslipidemia in newly diagnosed TYPE II DIABETES MELLITUS patients in Dar es Salaam requires further investigation.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

A cross-sectional analytical approach was adopted. This design enabled a snapshot assessment of metabolic disturbances particularly dyslipidemia, hypertension, and obesity and their relationships with glycemic control in newly diagnosed TYPE II DIABETES MELLITUS patients. It provided an efficient mechanism for analyzing the prevalence and interrelations of these variables within a defined timeframe and patient cohort, consistent with standard practices in similar epidemiological evaluations (Wang & Cheng, 2020).

3.2 Study Area and Population

The study was carried out at two selected Diabetic clinics located at selected Hospital in Dar es Salaam, Tanzania. Dar es Salaam is major urban hub, recognized for its extensive population density and healthcare network. These hospitals were purposively selected because they serve as major referral centers with high patient turnover, established diabetes clinics, and reliable laboratory facilities for lipid profiling and HbA1c testing. The target population included all adults newly diagnosed with T2DM within the past six months. Consenting patients attending diabetes clinics at the two facilities were consecutively recruited until the required sample size was achieved.

3.2 General Population

All adults (≥18 years) newly diagnosed with Type 2 Diabetes Mellitus (T2DM) in Dar es Salaam.

3.3 Target Population

All adult patients newly diagnosed with Type II Diabetes Mellitus (T2DM) attending diabetic clinics within Dar es Salaam Region.

3.4 Study Population

The study population consisted of adult patients newly diagnosed with Type II Diabetes Mellitus who attended diabetic clinics at selected Regional Referral Hospital during the study period and met the eligibility criteria.

These two hospitals were purposively selected because they are major referral centers in Dar es Salaam that serve both military and civilian populations. They have established diabetes clinics, high patient flow, and well-equipped laboratory facilities for performing lipid profile and HbA1c testing, which were essential for this study's biochemical assessments.

Inclusion Criteria

- Adults aged ≥18 years.
- Patients newly diagnosed with Type II Diabetes Mellitus within the previous 12 months (to capture early metabolic profiles).
- Patients not on lipid-lowering medications at the time of enrollment.
- Patients who provided written informed consent to participate.

Exclusion Criteria

- Patients with Type I Diabetes Mellitus, identified clinically through history of insulin dependence from diagnosis, presence of ketosis at onset, and confirmed by fasting C-peptide levels or documented clinical assessment indicating insulin deficiency.
- Patients with duration of diabetes >12 months (since the focus was on newly diagnosed T2DM).

- Patients with unstable medical conditions, including acute infections, recent hospitalization (<1 month), heart failure, renal failure, liver disease, or thyroid disorders, which could alter lipid metabolism.
- Pregnant or lactating women.

Patients currently using lipid-lowering or corticosteroid medications**.**

3.5 Sample Size Estimation

The sample size was determined using Open Epi version 3, applying the finite population correction formula for proportions at a 95% confidence level:

$$n = \frac{[DEFF \times Np(1-p)]}{[(d^2/Z^2_{1-\alpha/2} \times (N-1)) + p(1-p)]}$$

Where:

- N = 1,000,000 (estimated population)
- p = 15% (Kipruto et al., 2021)
- d = 5% (margin of error)
- DEFF = 1 (design effect)

This computation yielded a minimum sample of **196 participants**.

3.6 Sampling Procedure

A **consecutive sampling technique** was used to recruit participants for this study. All adult patients newly diagnosed with Type II Diabetes Mellitus (T2DM) and attending diabetic clinics at **selected hospitals** during the study period were screened for eligibility. Those meeting the inclusion criteria and providing informed consent were consecutively enrolled until the **desired sample size of 196** participants was attained.

This method involved enrolling each eligible patient in the order of their clinic attendance without skipping any, thereby minimizing **selection bias** and ensuring a **realistic representation** of the population attending diabetic clinics in Dar es Salaam. Consecutive sampling was particularly appropriate because both hospitals have a **steady monthly flow of diabetic clients** approximately **80–100** patients and 120-150 patients who allowed timely achievement of the target sample size within the study period.

This approach was also operationally efficient, given the routine flow of patients in established clinics, and ensured that every newly diagnosed patient had an **equal opportunity to participate**, thereby enhancing the validity and generalizability of the findings.

3.7 Data Collection Protocol

3.7.1 Participant Identification and Recruitment

Potential participants were identified during routine outpatient visits and evaluated against eligibility criteria. Upon confirmation, informed consent was obtained, and participants were enrolled into the study.

3.7.2 Tools and Methods

Data were collected using a structured questionnaire and clinical data abstraction form. The questionnaire included socio-demographic data, medical history, and lifestyle behaviors. Clinical measurements including BMI, blood pressure, and waist circumference were taken using standard procedures. Biochemical data (lipid profile and HbA1c) were obtained from measurements taken from the selected study participants. Each participant provided informed written consent prior to enrollment.

Privacy and confidentiality were strictly observed during interviews and data handling.

3.7.3 Clinical Variables

Blood Pressure: was measured in mmHg, this includes both systolic and diastolic blood pressure, both continuous numerical variables. A systolic pressure ≥ 130-139 and/or diastolic pressure ≥ 80-89 was regarded as stage one hypertension while systolic blood pressure ≥ 140 or diastolic pressure ≥ 90 was regarded as stage 2 hypertension.

3.7.4 Laboratory Variables

Random blood glucose measurement was conducted using a GlucoPlus Glucometer (GlucoPlus Inc., Model GP-2004, manufactured in 2004, Canada). The distal site on the middle finger was cleaned with a sterile alcohol swab, followed by a finger prick using a single-use lancet. The initial drop of blood was wiped off, and the second drop was placed on the test strip inserted into the glucometer. The reading was obtained in mmol/L. Values above 11.1 mmol/L were considered indicative of hyperglycemia.

Glycated hemoglobin (HbA1c) testing was performed using the Lytic 8 HbA1c Analyzer (Lytic Laboratory Systems, Model L8-2015, manufactured in 2015, Germany). A venous blood sample of at least 3 mL was drawn into a purple-top EDTA tube from each participant. Samples were transported under refrigerated conditions (2°C to 8°C) to the laboratory within 8 hours. Analysis was performed immediately upon arrival. HbA1c values above 6.5% were classified as abnormal, in accordance with ADA 2023 criteria.

Lipid profile testing was carried out using the Mindray BS-240 Clinical Chemistry Analyzer (Mindray Bio-Medical Electronics Co., Ltd., Model BS-240, manufactured in 2018, China). Venous blood samples of at least 3 mL were collected into yellow-top serum separator tubes and transported refrigerated (2°C to 8°C) to the laboratory within 8 hours. Upon arrival, the samples were processed to determine Total Cholesterol (TC), Triglycerides (TG), High-Density Lipoprotein (HDL), and Low-Density Lipoprotein (LDL). Abnormal lipid values were defined as follows: TC >5.2 mmol/L, HDL <0.9 mmol/L, TG >2.0 mmol/L, and LDL >3.55 mmol/L.

3.7 Data Management and Analysis

3.7.1 Coding and Cleaning

Collected data were coded numerically, entered into Microsoft Excel, and cleaned for errors such as missing values, outliers, and inconsistencies. Cross-validation and logic checks were applied before final analysis.

3.7.2 Computer Data Entry

Cleaned data were exported to Statistical Package for Social Sciences (SPSS) version 31.0 for statistical analysis. Variables were labeled clearly, and a data dictionary was created to ensure consistency in interpretation.

3.7.3 Data Analysis

The prevalence of dyslipidemia among newly diagnosed Type 2 Diabetes Mellitus patients in Dar es Salaam.

A frequency table for each lipid parameter (total cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol) categorizing them as normal or abnormal based on the laboratory test results. The proportion of newly diagnosed Type 2 Diabetes Mellitus patients with abnormal levels for each lipid parameter was computed while also

calculating the 95% confidence intervals for the prevalence of each type of dyslipidemia.

The proportion of newly diagnosed Type 2 Diabetes Mellitus patients with each type of dyslipidemia (e.g., high triglycerides, low HDL-cholesterol, high LDL-cholesterol) was presented, along with the 95% confidence intervals.

Association between glycemic control and dyslipidemia in newly diagnosed Type 2 Diabetes Mellitus patients in Dar es Salaam.

For each lipid parameter (total cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol), a contingency table cross-tabulating abnormal vs. normal lipid levels with glycemic control status (good vs. poor) was calculated. A Chi-square test of independence for each lipid parameter to determine if there is a statistically significant association between abnormal lipid levels and glycemic control. The odds ratio (OR) and the 95% confidence interval for each lipid parameter to quantify the strength and direction of the association with the outcome of interest. The OR quantifies how changes in a specific lipid level affect the odds of the outcome: an OR greater than 1 indicates a positive association (higher odds of the outcome with higher lipid levels), an OR less than 1 indicates a negative association (lower odds), and an OR of 1 suggests no association. The 95% CI provides a range in which the true OR is likely to fall with 95% confidence; if this interval includes 1, the association is not statistically significant. Together, the OR and CI help determine whether a lipid parameter is meaningfully linked to the outcome and whether the observed relationship is likely to be real or due to chance.

The results were presented as the strength and direction of the association between each type of dyslipidemia and glycemic control, along with the statistical significance and clinical implications.

Association between metabolic disorders of (hypertension and obesity) and dyslipidemia in newly diagnosed Type II Diabetes Mellitus Patients in Dar es Salaam.

To provide an overview of the study population and the prevalence of dyslipidemia, hypertension, and obesity, SPSS's descriptive statistics functions was used to summarize the data, including frequencies and percentages for categorical variables and means and standard deviations for continuous variables.

To assess the association between hypertension or obesity and dyslipidemia i perform a chi-square test of independence. This test compares the observed frequencies of dyslipidemia in different categories of hypertension or obesity with the expected frequencies under the assumption of no association. A significant p-value (typically <0.05) would indicate an association between dyslipidemia and metabolic abnormality.

To further explore the association and control for potential confounders, a logistic regression analysis was performed. Dyslipidemia as the dependent variable and hypertension or obesity as the independent variable of interest was included. The model was adjusted for other relevant covariates such as age, sex, duration of diabetes, and glycemic control. The odds ratio (OR) and its 95% confidence interval (CI) provided a measure of the strength and direction of the association between metabolic abnormality and dyslipidemia after adjusting for other factors.

3.8 Ethical Approval and Participant Rights

This study adhered to the highest ethical standards throughout its conduct. Ethical clearance was obtained from the Institutional Review Board (IRB) of Kairuki University, which served as the primary ethical oversight body for the research. However, no separate local IRB approval or formal hospital research committee approval was obtained from two selected hospitals prior to data collection.

Permission to conduct the study and access eligible patients was nonetheless sought and granted through respective hospital authorities and clinic supervisors. All participants received a detailed explanation of the study's objectives, procedures, potential risks, and benefits. Written informed consent was obtained voluntarily from each participant prior to enrollment.

Confidentiality and privacy were strictly maintained; no personal identifiers were recorded, and all data were anonymized and stored securely with restricted access. The study respected participants' autonomy and right to withdraw at any point without penalty. Any unforeseen risks or adverse events during the study were to be reported promptly to the IRB. Dissemination of results was conducted responsibly, ensuring accuracy, objectivity, and continued protection of participant confidentiality.

3.9 Study Limitations

Potential for selection bias, as the sample may not fully represent the broader population of newly diagnosed Type 2 Diabetes Mellitus patients in Dar es Salaam. The study may have focused on specific healthcare facilities or patient groups, which could limit the generalizability of the findings to all newly diagnosed Type 2 Diabetes Mellitus patients individuals in the region. Additionally, the study's cross-sectional design only captures a snapshot of the patients' characteristics at a single point in time, making it difficult to assess the long-term progression of dyslipidemia or its impact on Type 2 Diabetes Mellitus patients management.

The reliance on self-reported data or medical records for some variables, which may be subject to inaccuracies or incomplete information. Factors such as dietary habits, physical activity levels, or medication adherence could be underreported or inaccurately recorded, potentially influencing the study's results therefore the research assistants was well trained on how to probe right questions that picked up the required answers to be reported as well as was trained on how to triangulate different data sources so as to pick the right information on the mentioned factors. Furthermore, the study may not account for other confounding variables, such as genetic factors or environmental influences, that could play a significant role in the development of dyslipidemia in newly diagnosed Type 2 Diabetes Mellitus patients.

3.10 Data Dissemination

The findings of this study will be disseminated to multiple stakeholders to ensure that the results contribute to improved diabetes care and policy development. A summary report will be shared with the Ministry of Health (MoH), Dar es Salaam Regional Health Management Team (RHMT), and the participating hospitals to inform clinical practice and service planning.

The results will also be presented at scientific conferences, academic seminars, and diabetes stakeholder forums to enhance professional dialogue and evidence-based interventions. Additionally, a manuscript derived from this study will be submitted for publication in a peer-reviewed journal to contribute to the broader scientific literature on diabetes and dyslipidemia in low-resource settings.

3.11 Participant Flow

Narrative Description:

A total of 224 adult patients newly diagnosed with Type II Diabetes Mellitus were screened at the two diabetic clinics during the study period (July–August 2025).

- 18 patients were excluded because their diabetes duration exceeded 12 months.
- 5 patients were using lipid-lowering medication at the time of enrollment.
- 3 patients were identified as Type I Diabetes Mellitus based on insulin dependence and clinical records.
- 2 patients declined participation after counseling.

After applying all inclusion and exclusion criteria, a total of 196 participants were consecutively enrolled and completed the study procedures, including anthropometric assessments and laboratory analyses (HbA1c and lipid profile).

CHAPTER FOUR

4.0 RESULTS

4.1 Response Rate

A total of 196 newly diagnosed Type 2 Diabetes Mellitus patients were targeted for participation in this study. All selected participants met the inclusion criteria and consented to participate. Complete data were successfully collected from all participants, resulting in a 100% response rate. This high response rate was attributed to effective engagement strategies at the participating hospitals, the commitment of the trained research assistants, and the willingness of patients to contribute to research aimed at improving diabetes care.

4.2 Socio-Demographic Characteristics of Study Participants

The majority of participants (50.5%) were aged between 45 and 65 years, followed closely by those aged 65 years and above (46.4%), while a small proportion (3.1%) were within the 18–44 years age group, indicating that TYPE II DIABETES MELLITUS was more prevalent among middle-aged and older adults. In terms of gender distribution, females accounted for the majority of the study population at 65.8%, while males represented 34.2%.

Regarding employment status, a substantial proportion of participants were unemployed (44.9%), while 30.6% were self-employed and 24.5% were in formal employment. Concerning marital status, over half of the participants were married (56.6%), followed by divorced (20.4%), widowed (14.8%), and single (8.2%) individuals. With respect to education level, the majority of participants had attained secondary education (38.8%), followed by university or college education (30.6%), primary education (16.8%), and no formal education (13.8%). These findings

suggest that the study population was predominantly older, female, and unemployed or self-employed, with moderate-to-high educational attainment.

Table 1: Socio-Demographic Characteristics of Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam (n = 196)

Variable	Category	Frequency	Percentage
Age Categories	18-44	6	3.1%
	45-65	99	50.5%
	65+	91	46.4%
Gender	Male	67	34.2%
	Female	129	65.8%
Employment Status	None	88	44.9%
	Employed	48	24.5%
	Self Employed	60	30.6%
Marital Status	Single	16	8.2%
	Married	111	56.6%
	Divorced	40	20.4%
	Widowed	29	14.8%
Education Level	No Formal Education	27	13.8%
	Primary Education	33	16.8%
	Secondary Education	76	38.8%
	University/College Education	60	30.6%

4.3 Prevalence of Dyslipidemia Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam .

Figure 1 presents the distribution of dyslipidemia among the 196 newly diagnosed Type 2 Diabetes Mellitus patients included in this study. The findings reveal that 104 patients (53.06%) had abnormal lipid profiles and were categorized as dyslipidemic**,** whereas 92 patients (46.94%) exhibited normal lipid values and were classified as not dyslipidemic**.** These results demonstrate that more than half of newly diagnosed TYPE II DIABETES MELLITUS patients are already affected by dyslipidemia at the time of diagnosis. This high prevalence is clinically significant, as dyslipidemia is a well-established risk factor for atherosclerosis and cardiovascular complications, which are the leading causes of morbidity and mortality among individuals with diabetes.

The findings are consistent with regional and global trends reported in previous studies, which have shown a strong association between Type 2 diabetes and lipid metabolism abnormalities. This co-occurrence is often attributed to shared pathophysiological mechanisms such as insulin resistance, central obesity, and chronic low-grade inflammation.

Figure 1: The Diagram showing the prevalence of dyslipidemia among Type II Diabetes Mellitus patients in Dar es Salaam (n=196)

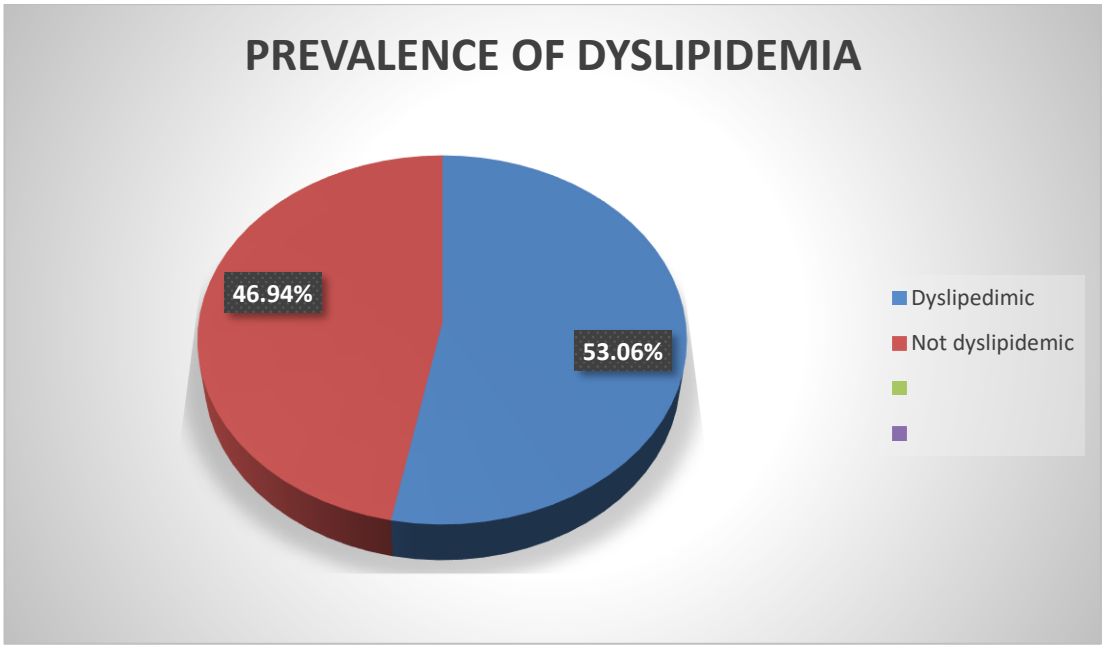


Table 2: Distribution of Individual Lipid Abnormalities Among Newly Diagnosed Type II Diabetes Mellitus Patients in DSM (n= 196)

Variable	Category	Frequency	Percentage
Total Cholesterol Levels	Desirable	104	53.1
	Bordeline High	56	28.6
	High	36	18.4
Triglycerides Levels	Normal	106	54.1
	Bordeline High	58	29.6
	High	32	16.3
HDL Levels	Protective	176	89.8
	Low Risk	20	10.2
LDL Levels	Near Optimal	74	37.8
	Optimal	48	24.5
	Borderline High	45	23
	High	29	14.8

This table presents the frequency and percentage distribution of individual lipid profile components among the study participants. A majority of participants had desirable total cholesterol levels (53.1%), while 28.6% had borderline high levels**,** and 18.4% had high total cholesterol**,** suggesting that nearly half of the patients were at potential cardiovascular risk based on total cholesterol status alone.

With regard to triglyceride levels**,** 54.1% of the participants had normal levels**,** while 29.6% exhibited borderline high levels and 16.3% had high triglycerides, indicating that almost one in six patients had clinically significant hypertriglyceridemia.

For high-density lipoprotein (HDL) cholesterol**,** an overwhelming majority **(**89.8%**)** were categorized under the protective range**,** while only 10.2% were classified under the low-risk range, suggesting that most participants had HDL levels that may confer cardiovascular protection. In terms of low-density lipoprotein (LDL) cholesterol**,** 37.8% of patients had near-optimal levels**,** 24.5% had optimal levels**,** 23% were borderline high**,** and 14.8% were in the high range. This distribution reveals that while a fair proportion had favorable LDL levels, over one-third of participants had borderline to high LDL, which is a major atherogenic risk factor.

Overall, the findings highlight a notable burden of lipid abnormalities, particularly in total cholesterol and LDL cholesterol, reinforcing the need for early lipid monitoring and management in newly diagnosed TYPE II DIABETES MELLITUS patients.

Table 3: Descriptive Statistics of Lipid Profile Parameters Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaamts (n = 196)

Parameter	Mean (± SD)	Median	Min–Max	95% CI for Mean	Abnormal Values
Total Cholesterol	5.22 ± 1.06	5.14	2.15 – 8.43	5.07 – 5.37	≥ 5.2 mmol/L
Trygricerides	1.71 ± 0.81	1.65	0.12 – 5.50	1.60 – 1.82	≥ 1.7 mmol/L
LDL	3.20 ± 0.98	3.2	0.47 – 6.39	3.06 – 3.34	≥ 3.4 mmol/L
HDL	1.68 ± 0.40	1.69	1.00 – 4.15	1.62 – 1.73	< 1.0 mmol/L

* SD: Standard deviation, ** CI: Confidence interval.

This table summarizes the central tendency, dispersion and confidence intervals of the lipid profile components among newly diagnosed Type 2 Diabetes Mellitus patients.

The mean total cholesterol level was 5.22 ± 1.06 mmol/L, with a median of 5.14 mmol/L, and values ranging from 2.15 to 8.43 mmol/L. The 95% confidence interval (CI) for the mean was 5.07 to 5.37 mmol/L.

For triglycerides, the mean was 1.71 ± 0.81 mmol/L, the median was 1.65 mmol/L, with a wide range between 0.12 and 5.50 mmol/L.

The LDL cholesterol levels showed a mean of 3.20 ± 0.98 mmol/L, a median of 3.20 mmol/L, a range from 0.47 to 6.39 mmol/L and a narrow 95% CI of 3.06 to 3.34 mmol/L.

For HDL cholesterol, the mean was 1.68 ± 0.40 mmol/L, median 1.69 mmol/L, and the range was 1.00 to 4.15 mmol/L. These descriptive statistics provide a detailed overview of lipid abnormalities in the study population and support the earlier findings that dyslipidemia is highly prevalent and variably distributed among newly diagnosed TYPE II DIABETES MELLITUS patients.

4.4 Glycemic Control Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam.

Figure 2: Distribution of Glycemic Control Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam (n = 196)

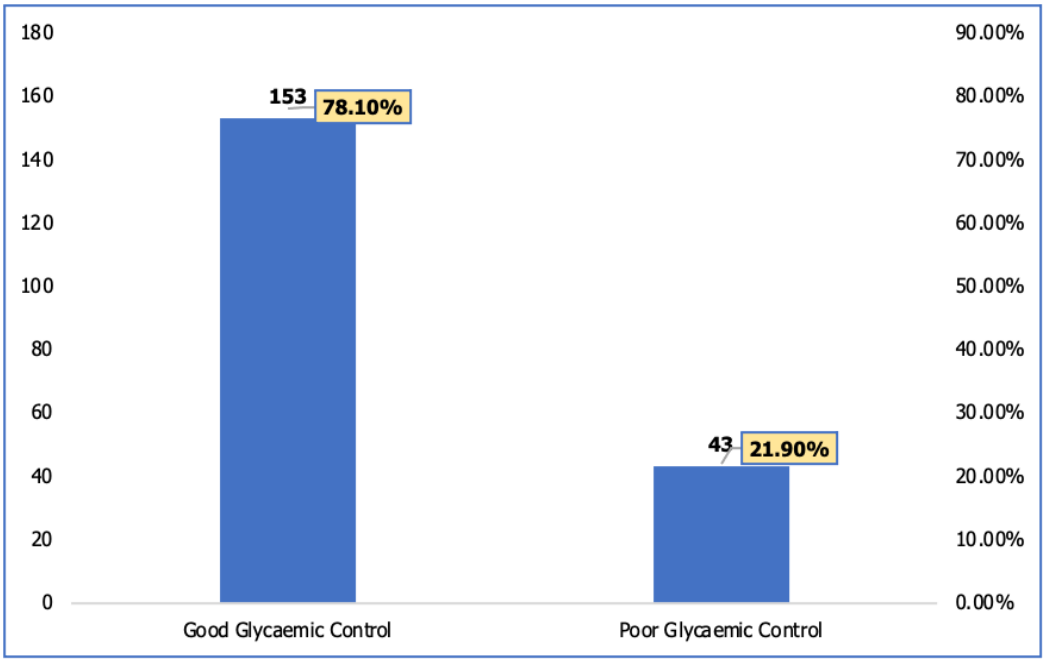


Figure 4.2 presents the distribution of glycemic control status among the 196 newly diagnosed Type 2 Diabetes Mellitus patients. Based on HbA1c measurements, a majority of the participants, 153 individuals (78.1%), were classified as having good glycemic control (HbA1c < 6.5%), while 43 individuals (21.9%) had poor glycemic control (HbA1c ≥ 6.5%).

This distribution suggests that the majority of the study participants had achieved adequate glycemic control at the time of data collection. This may be attributed to early diagnosis and initiation of treatment, adherence to medical advice, or active lifestyle modifications in the early stages of diabetes management.

However, the 21.9% of patients with poor glycemic control remain a concern, as they are at a heightened risk for developing diabetes-related complications such as retinopathy, nephropathy, and cardiovascular disease. This finding highlights the need for targeted interventions to improve glycemic control in this subgroup especially in conjunction with screening for and managing comorbid conditions such as dyslipidemia, hypertension, and obesity.

These findings serve as a basis for examining associations between glycemic control and various clinical and biochemical parameters, including dyslipidemia, which is addressed in subsequent sections.

Table 4: Crude and Adjusted Odds Ratios for Factors Associated with Poor Glycemic Control Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam (n = 196)

Variable	Category	cOR	95% CI	P-Value	AOR	95% CI	P-Value
Age Category	18-44 (Ref)	Ref			Ref		
	45–65	2.5	1.20 – 5.21	**0.015**	2.4	1.10 – 5.25	**0.022**
	65+	0.29	0.043 – 1.984	0.21	0.26	0.049 – 1.413	0.14
Gender	Female (Ref)	Ref			Ref		
	Male	1.65	0.98 – 2.78	0.061			
Education Level	No formal education (Ref)	Ref			Ref		
	Primary	0.4	0.18 – 0.88	**0.024**	0.42	0.19 – 0.91	**0.03**
	Secondary	0.99	0.264 – 3.685	0.983			
	Tertiary	0.9	0.202 – 4.048	0.894			
Employment	Employed	1.38	0.441 – 4.303	0.58			
	None (Ref)	Ref			Ref		

Status	Self-employed	0.85	0.294 – 2.457	0.763	
BMI Classification	Underweight (Ref)	Ref			Ref
	Normal weight	2.89	0.318 – 26.140	0.346	
	Obesity	1.3	0.137 – 12.321	0.818	
	Overweight	1.44	0.162 – 12.849	0.743	
Alcohol Intake	No (Ref)	Ref			Ref
	Occasionally	1.05	0.413 – 2.646	0.925	
	Yes	1.58	0.374 – 6.661	0.535	

This table presents the results of both bivariate (Crude Odds Ratios, cOR) and multivariate (Adjusted Odds Ratios, AOR) logistic regression analyses assessing factors associated with poor glycemic control among newly diagnosed TYPE II DIABETES MELLITUS patients.

Age was significantly associated with poor glycemic control. Patients aged 45–65 years had more than twice the odds of poor glycemic control compared to the 18–44 age group (AOR = 2.4; 95% CI: 1.10–5.25; p = 0.022). Conversely, patients aged 65 and above showed lower odds, though the association was not statistically significant.

Education level also showed a significant association. Participants with primary education were significantly less likely to have poor glycemic control compared to those with no formal education (AOR = 0.42; 95% CI: 0.19–0.91; p = 0.030), suggesting a possible protective effect of basic education on glycemic outcomes.

Gender**,** employment status**,** BMI classification**,** and alcohol intake did not show statistically significant associations with poor glycemic control, although males had slightly higher crude odds (cOR = 1.65; 95% CI: 0.98–2.78; p = 0.061), suggesting a borderline association.

These results highlight age and educational attainment as key factors influencing glycemic control in newly diagnosed diabetic patients, underscoring the importance of tailored education and age-specific interventions in diabetes care.

Table 5: Association Between Dyslipidemia Status and Glycemic Control Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam (n = 196)

	Glycaemic Control		***(χ²)***	***df***	***P-value***
Dyslipidemia Status	**Good**	**Poor**			
Dyslipidemia	73 (79.3%)	19 (20.7%)	***0.056***	**1**	***0.813***
No Dyslipidemia	80 (76.9%)	24 (23.1%)			

This table presents the results of the chi-square test evaluating the association between dyslipidemia status and glycemic control among newly diagnosed Type 2 Diabetes Mellitus patients. Among patients classified as dyslipidemic, 73 (79.3%) had good glycemic control, while 19 (20.7%) had poor glycemic control. Similarly, among those without dyslipidemia**,** 80 (76.9%) had good control and 24 (23.1%) had poor control.

The statistical analysis yielded a chi-square (χ^2) value of 0.056**,** with 1 degree of freedom and a p-value of 0.813**,** indicating no statistically significant association between dyslipidemia status and glycemic control in this study population. These findings suggest that, within this sample, dyslipidemia was not independently associated with glycemic control status. This may imply that other factors such as age, education, or adherence to therapy may play a more critical role in determining glycemic outcomes than dyslipidemia alone.

Table 6: Association Between Lipid Profile Categories and Glycemic Control Among Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam (n = 196)

Lipid Profile Category	Category	Glycaemic Control		χ^2	p-value
		Poor	Good		
Total Cholesterol	Bordeline High	11 (19.6%)	45 (80.4%)	0.253	0.881
	Desirable	24 (23.1%)	80 (76.9%)		
	High	8 (22.2%)	28 (77.8%)		
LDL	Borderline High	11 (24.4%)	34 (75.6%)	0.23	0.973
	High	6 (20.7%)	23 (79.3%)		
	Near Optimal	16 (21.6%)	58 (78.4%)		
	Optimal	10 (20.8%)	38 (79.2%)		
HDL	Low Risk	6 (30.0%)	14 (70.0%)	0.402	0.526
	Protective	37 (21.0%)	139 (79.0%)		
Triglycerides	Bordeline High	9 (15.5%)	49 (84.5%)	2.279	0.32
	High	9 (28.1%)	23 (71.9%)		
	Normal	25 (23.6%)	81 (76.4%)		

This table presents the chi-square analysis assessing the relationship between different lipid profile components; total cholesterol, LDL, HDL, and triglycerides and glycemic control status in newly diagnosed Type 2 Diabetes Mellitus patients.

For total cholesterol**,** glycemic control did not differ significantly across the three categories. Among those with borderline high cholesterol, 19.6% had poor glycemic control, while 80.4% had good control. Similar distributions were seen in participants with desirable and high cholesterol levels. The association was not statistically significant ($\chi^2 = 0.253$; $p = 0.881$).

In the analysis of LDL cholesterol, the proportion of patients with poor versus good glycemic control was also similar across LDL categories (borderline high, high, near optimal, and optimal), with no meaningful difference observed. The chi-square value of 0.23 and $p = 0.973$ confirm a lack of significant association.

For HDL cholesterol**,** a slightly higher proportion of poor glycemic control was observed among those with low-risk HDL (30.0%) compared to those with protective levels (21.0%). However, this difference was not statistically significant ($\chi^2 = 0.402$; $p = 0.526$).

Regarding triglycerides, poor glycemic control was observed in 28.1% of participants with high triglycerides, 15.5% of those with borderline high levels, and 23.6% of those with normal levels. Despite these differences, the association between triglyceride level and glycemic control remained non-significant ($\chi^2 = 2.279$; $p = 0.32$).

Overall, none of the lipid profile components showed a statistically significant association with glycemic control in this cohort. These findings suggest that while dyslipidemia is common in newly diagnosed TYPE II DIABETES MELLITUS patients, variations in lipid categories do not independently predict glycemic status at diagnosis.

4.5 Association Between Metabolic Abnormalities of (Hypertension and Obesity) and Dyslipidemia in Newly Diagnosed TYPE II DIABETES MELLITUS Patients in Dar es Salaam.

Variable	Category	Dyslipidemia Status		Total	p-value
		No	Yes		
Blood Pressure	Normal	22 (56.4%)	17 (43.6%)	39 (19.9%)	
	Pre-Hypertension	55 (50.5%)	54 (49.5%)	109 (55.6%)	**0.034**
	High Blood Pressure	27 (56.2%)	21 (43.8%)	48 (24.5%)	
BMI Classification	Underweight	6 (66.7%)	3 (33.3%)	9 (4.6%)	
	Normal Weight	23 (47.9%)	25 (52.1%)	48 (24.5%)	**0.042**
	Overweight	44 (51.8%)	41 (48.2%)	85 (43.4%)	
	Obese	31 (57.4%)	23 (42.6%)	54 (27.6%)	
Waist Circumference	Abnormal	25 (58.1%)	18 (41.9%)	43 (21.9%)	**0.006**
	Normal	79 (51.6%)	74 (48.4%)	153 (78.1%)	

Table 7 presents the bivariate associations between dyslipidemia and key metabolic abnormalities blood pressure**,** body mass index (BMI)**,** and waist circumference among newly diagnosed Type 2 Diabetes Mellitus patients.

Among participants with pre-hypertension**,** 49.5% were dyslipidemic, compared to 43.6% with normal blood pressure and 43.8% with high blood pressure**.** The difference in dyslipidemia prevalence across blood pressure categories was statistically significant ($p = 0.034$), suggesting that pre-hypertension may be more closely associated with dyslipidemia in this population than either normotension or full-blown hypertension.

Dyslipidemia prevalence also varied across BMI groups. Among participants with normal weight**,** 52.1% were dyslipidemic, compared to 48.2% of the overweight**,** 42.6% of the obese**,** and only 33.3% of the underweight participants. This association between BMI category and dyslipidemia was statistically significant ($p = 0.042$), indicating that weight status may influence lipid abnormalities, with the highest burden found in those of normal BMI, possibly reflecting metabolic dysregulation not yet reflected in weight gain. The association between waist circumference and dyslipidemia was also statistically significant ($p = 0.006$). Among those with abnormal waist circumference, 41.9% were dyslipidemic, while 48.4% of those with normal waist circumference were dyslipidemic. Although slightly counterintuitive, the significance may reflect the complex relationship between central obesity and lipid metabolism in early diabetes mellitus.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

This study examined the prevalence of dyslipidemia and its associations with glycemic control, hypertension, and obesity among newly diagnosed Type 2 Diabetes Mellitus (T2DM) patients in Dar es Salaam, Tanzania. Results showed a substantial burden of dyslipidemia within this population, highlighting its coexistence with other metabolic risk factors. The analysis compared these findings to global patterns, which consistently report high dyslipidemia prevalence among T2DM patients, as well as regional African data, where similar trends have been documented despite resource limitations. Locally, the study adds valuable insight into the Tanzanian context, where evidence on dyslipidemia in newly diagnosed T2DM patients remains scarce. These findings emphasize the importance of early lipid screening and integrated cardiovascular risk management from the time of diabetes diagnosis.

5.2 Prevalence of Dyslipidemia Among Newly Diagnosed Type 2 Diabetes Mellitus Patients in Dar es Salaam.

This study found that more than half of the newly diagnosed Type 2 Diabetes Mellitus patients (53.1%) in Dar es Salaam exhibited dyslipidemia, indicating a substantial burden of lipid abnormalities even at the point of diagnosis. Dyslipidemia is characterized by elevated total cholesterol, elevated low-density lipoprotein (LDL), elevated triglycerides, and/or reduced high-density lipoprotein (HDL), and is a major cardiovascular risk factor in individuals with diabetes.

This finding is consistent with a growing body of global evidence highlighting the co-existence of dyslipidemia in Type II Diabetes Mellitus patients. For example, a study in India by Natarajan et al. (2019) reported a prevalence of 55.2% among newly diagnosed diabetic patients, which is nearly identical to the prevalence reported in the current study. Likewise, Liu et al. (2020) in China documented a dyslipidemia rate of 52.4% among newly diagnosed patients, further underscoring the global pattern of metabolic disturbances in early-stage diabetes.

In the African context, the results are similarly aligned. In Nigeria, Olamoyegun et al. (2016) identified that 58.1% of TYPE II DIABETES MELLITUS patients had dyslipidemia, with the most common abnormality being elevated LDL cholesterol. A study in Ghana by Sarfo-Kantanka et al. (2021) reported an even higher prevalence of 61%, emphasizing the significant burden of cardiovascular risk factors among West African diabetic populations. In Ethiopia, Debebe et al. (2019) reported a prevalence of 59.2% among diabetic patients attending tertiary hospitals, confirming that lipid disorders are prevalent in sub-Saharan Africa as well.

In Tanzania, similar findings were reported by Kisenge et al. (2018) at Muhimbili National Hospital, where the prevalence of dyslipidemia among adults newly diagnosed with TYPE II DIABETES MELLITUS was 51.6%. Another local study by Mponda et al. (2020), conducted at the Kilimanjaro Christian Medical Centre (KCMC), observed that over 50% of newly diagnosed diabetic patients had at least one abnormal lipid parameter, with elevated triglycerides and low HDL being the most frequent abnormalities.

The relatively uniform prevalence rates observed across these studies can be attributed to shared pathophysiological mechanisms. Insulin resistance, a hallmark

of TYPE II DIABETES MELLITUS, impairs lipid metabolism by reducing lipoprotein lipase activity and enhancing hepatic lipogenesis, thereby promoting hypertriglyceridemia and LDL accumulation. Moreover, chronic low-grade inflammation and oxidative stress commonly seen in diabetes contribute to endothelial dysfunction and lipid imbalance.

Lifestyle and environmental factors also play a critical role in the high burden of dyslipidemia. Urbanization, increasing rates of physical inactivity, poor dietary habits characterized by high saturated fat and refined carbohydrate intake, and rising obesity levels contribute significantly to both diabetes and dyslipidemia in low- and middle-income countries. In Dar es Salaam specifically, rapid urban growth has been associated with sedentary occupations and increased consumption of processed foods, both of which are established contributors to metabolic disorders.

It is also worth noting that the presence of dyslipidemia at the time of diagnosis has important clinical implications. Early lipid abnormalities indicate that atherogenic risk is already established before or around the time diabetes is detected, necessitating prompt screening and integrated management. Clinical guidelines from the American Diabetes Association (ADA, 2023) and the International Diabetes Federation (IDF) recommend routine lipid profile testing at diagnosis and aggressive lipid-lowering strategies for patients at elevated cardiovascular risk.

In conclusion, the high prevalence of dyslipidemia observed in this study among newly diagnosed TYPE II DIABETES MELLITUS patients mirrors global, continental, and national findings and reinforces the importance of early cardiovascular risk assessment and integrated management in diabetic care programs. Addressing lipid

abnormalities early through lifestyle interventions and pharmacotherapy may significantly reduce the burden of atherosclerotic complications in this population.

5.3 Association Between Dyslipidemia and Glycemic Control

In the present study, despite the high burden of dyslipidemia among newly diagnosed Type 2 Diabetes Mellitus patients, no statistically significant association was found between dyslipidemia status and glycemic control, as measured by HbA1c levels ($p = 0.813$). This finding was further reinforced by the absence of significant relationships between individual lipid parameters namely total cholesterol, LDL, HDL, and triglycerides and glycemic status. These results suggest that lipid abnormalities may not be predictive of glycemic control in the early phase of diabetes diagnosis.

Similar findings have been reported in other studies across different settings. Zhou et al. (2017), in a multi-center study conducted in China, found that among individuals with newly diagnosed TYPE II DIABETES MELLITUS, dyslipidemia did not show a consistent relationship with HbA1c levels. The study concluded that lipid derangements and glucose control may progress independently during the early stages of diabetes. This was echoed by Pillay et al. (2019) in South Africa, who observed that dyslipidemia was not significantly associated with poor glycemic control in newly diagnosed patients attending outpatient diabetes clinics. In their analysis, most participants had not yet developed advanced metabolic disturbances, and glycemic control appeared to be more influenced by early lifestyle interventions than by lipid metabolism.

Sharma et al. (2020), in a hospital-based study in India, similarly reported no statistically significant correlation between triglyceride or LDL levels and HbA1c among patients with recently diagnosed TYPE II DIABETES MELLITUS. Their findings emphasized that the absence of an association may reflect the influence of early treatment adherence and patient motivation following diagnosis. In another study from Tanzania, Mwakyusa et al. (2023) assessed cardiometabolic risk factors among TYPE II DIABETES MELLITUS patients in Mwanza and found that while dyslipidemia and hyperglycemia frequently coexisted, their direct association was weak and not statistically significant in newly diagnosed patients.

However, the lack of a significant association in this study contrasts with findings from other settings. A meta-analysis conducted by Chen et al. (2021), which pooled data from over 20 observational studies globally, reported that elevated LDL and triglyceride levels were independently associated with poor glycemic control, particularly among patients with established diabetes. The review highlighted that these associations tended to strengthen over time, likely due to the cumulative effects of insulin resistance and poor metabolic compensation. A hospital-based cross-sectional study by Mwangi et al. (2022) in Kenya found that patients with poor lipid profiles, especially elevated LDL and triglycerides, were more likely to have higher HbA1c levels, suggesting a stronger metabolic interplay in patients beyond the initial diagnostic period.

Differences in the findings across these studies may be attributed to several factors. Firstly, variations in study design, particularly cross-sectional versus longitudinal approaches, can influence the strength and direction of observed associations. Secondly, the duration of diabetes since diagnosis appears to be a critical

determinant. In newly diagnosed patients, such as those in this study, both glycemic control and lipid metabolism may be undergoing rapid changes influenced by treatment initiation, dietary counseling, and behavior modification, thus weakening any existing association. In contrast, studies involving patients with long-standing diabetes are more likely to capture the cumulative effects of dyslipidemia on glycemic dysregulation.

Another consideration is the heterogeneity in patient characteristics, including age, sex, BMI, and comorbid conditions, which may confound or modify the association between lipid parameters and HbA1c levels. Moreover, the degree of adherence to glucose- and lipid-lowering medications, which was not explored in depth in this study, could also impact the relationship between the two variables.

Despite the absence of a statistically significant association, it is important to recognize the clinical implications of coexisting dyslipidemia in TYPE II DIABETES MELLITUS patients. Dyslipidemia remains an independent risk factor for macrovascular complications, such as cardiovascular disease, which are major causes of morbidity and mortality among individuals with diabetes. Therefore, screening and management of dyslipidemia should begin at diagnosis, regardless of its correlation with glycemic indices.

In conclusion, this study's findings contribute to the growing body of evidence suggesting that dyslipidemia and glycemic control may not be strongly linked in the early stages of TYPE II DIABETES MELLITUS. The lack of association observed here aligns with several other regional and international studies focused on newly diagnosed patients.

However, it also underscores the need for longitudinal follow-up to assess how the relationship between lipid abnormalities and glycemic control evolves over time and with sustained metabolic stress.

5.4 Association Between Dyslipidemia and Metabolic Abnormalities of Hypertension and Obesity

In this study, a statistically significant association was observed between dyslipidemia and several metabolic abnormalities among newly diagnosed Type 2 Diabetes Mellitus patients. Specifically, dyslipidemia was significantly associated with pre-hypertension ($p = 0.034$), body mass index (BMI) classification ($p = 0.042$), and waist circumference ($p = 0.006$). These findings suggest that the clustering of metabolic abnormalities hallmarks of the metabolic syndrome is already present at the point of diagnosis in many patients with TYPE II DIABETES MELLITUS. The observed associations underscore the interconnected pathophysiology of dyslipidemia, hypertension, and obesity, with insulin resistance likely serving as a central mechanistic link.

These findings are supported by previous literature. Grundy et al. (2016), in a seminal review of metabolic syndrome components, highlighted the frequent co-occurrence of dyslipidemia, elevated blood pressure, and central adiposity in individuals with diabetes. Their analysis demonstrated that dyslipidemia especially elevated triglycerides and reduced HDL often clusters with hypertension and increased waist circumference, increasing the risk of atherosclerotic cardiovascular disease. Similarly, in China, Zhang et al. (2019) found that waist circumference was a stronger predictor of dyslipidemia than BMI among newly diagnosed diabetics, emphasizing the role of visceral fat in driving lipid abnormalities.

In Tanzania, similar conclusions have been drawn. A recent study by Mboera et al. (2022) among urban diabetic populations in Dar es Salaam revealed strong associations between dyslipidemia and markers of obesity, including BMI and waist circumference. The authors noted that even among patients with recently diagnosed TYPE II DIABETES MELLITUS, lipid abnormalities were already prominent and significantly related to anthropometric measures, indicating that metabolic disturbances may precede or accompany the onset of hyperglycemia. Likewise, a 2023 study by Ally et al. in Mwanza found that TYPE II DIABETES MELLITUS patients with higher BMI and abnormal waist circumference had significantly elevated total cholesterol and LDL-C levels, suggesting early co-manifestation of cardiometabolic risk factors.

A plausible biological explanation for these associations lies in the underlying insulin resistance that characterizes both dyslipidemia and obesity-related hypertension. Dysfunctional adipose tissue in obese individuals leads to excessive release of free fatty acids, which contribute to hepatic overproduction of triglycerides and very-low-density lipoprotein (VLDL). Additionally, adipose tissue secretes pro-inflammatory cytokines such as TNF-α and IL-6, which further impair insulin sensitivity and disrupt lipid metabolism. The same inflammatory milieu also contributes to vascular endothelial dysfunction, thereby elevating blood pressure. This shared pathophysiological basis provides a mechanistic rationale for the observed clustering of dyslipidemia, hypertension, and obesity in patients with TYPE II DIABETES MELLITUS.

Interestingly, the current study found a higher prevalence of dyslipidemia among participants with normal BMI compared to those who were obese or overweight.

While this may appear counterintuitive, it aligns with emerging evidence supporting the existence of the "metabolically obese normal weight" (MONW) phenotype. Individuals with this phenotype have a normal body mass index but exhibit increased visceral fat, insulin resistance, and dyslipidemia. Recent studies in sub-Saharan Africa, including work by Kamugisha et al. (2024) in Kenya, have identified MONW as an increasingly prevalent phenotype in urban populations, likely driven by sedentary lifestyles, poor dietary habits, and genetic predisposition. In this context, BMI alone may underestimate cardiometabolic risk, highlighting the need for more nuanced assessments such as waist circumference and lipid profiles.

Overall, the findings of this study confirm that dyslipidemia is significantly intertwined with other metabolic abnormalities in newly diagnosed TYPE II DIABETES MELLITUS patients. The early identification of these associations is crucial for integrated risk stratification and intervention strategies. These results further strengthen the argument for routine lipid and blood pressure screening at the point of diabetes diagnosis, even in patients who may appear to have a healthy weight by BMI criteria alone. A multidimensional approach targeting insulin resistance, adiposity, and lipid control is therefore warranted from the outset of TYPE II DIABETES MELLITUS management to mitigate long-term cardiovascular complications.

5.5 Dissemination of Findings

The research results were disseminated to the Kairuki University Library, the Ministry of Health and two selected hospitals.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study investigated the prevalence of dyslipidemia and its association with glycemic control and metabolic abnormalities among newly diagnosed Type 2 Diabetes Mellitus patients attending public hospitals in Dar es Salaam. The findings revealed that more than half (53.1%) of the participants had dyslipidemia at the point of diagnosis, indicating a substantial burden of lipid abnormalities in this population.

Despite the high prevalence, no statistically significant association was found between dyslipidemia and glycemic control, as measured by HbA1c levels. Similarly, individual lipid parameters such as total cholesterol, LDL, HDL, and triglycerides did not show significant associations with glycemic status. This suggests that in the early stages of TYPE II DIABETES MELLITUS, dyslipidemia may not be a reliable predictor of glycemic control, possibly due to the influence of recent diagnosis, initial treatment adherence, or lifestyle changes.

However, a significant association was observed between dyslipidemia and metabolic abnormalities, particularly pre-hypertension, elevated BMI, and abnormal waist circumference. These findings highlight the clustering of cardiometabolic risk factors even at the time of diagnosis and reinforce the need for a comprehensive assessment of metabolic health in newly diagnosed diabetic patients.

Overall, the study underscores the importance of early detection and management of dyslipidemia and related metabolic disturbances to prevent long-term

cardiovascular complications and improve health outcomes among TYPE II DIABETES MELLITUS patients in Tanzania.

6.2 Recommendations

Based on the findings of this study, the following recommendations are proposed to strengthen the early management of newly diagnosed Type 2 Diabetes Mellitus in Tanzania and similar settings:

Routine Lipid Profiling at Diagnosis: Despite dyslipidemia not being directly associated with glycemic control, its high prevalence among newly diagnosed TYPE II DIABETES MELLITUS patients warrants routine lipid profile screening at the time of diagnosis. Early identification and treatment of dyslipidemia are essential to minimize the long-term risk of cardiovascular complications.

Incorporate Cardiometabolic Risk Assessment into Primary Diabetes Care: Given the significant association between dyslipidemia and other metabolic abnormalities such as hypertension, BMI, and waist circumference, healthcare providers should adopt an integrated approach. This includes regular monitoring and management of blood pressure, body weight, and central obesity alongside glycemic parameters.

Targeted Lifestyle Counseling and Risk Factor Modification: Health education programs should emphasize the importance of comprehensive lifestyle changes not just for blood sugar control, but also for lipid regulation and blood pressure management. Interventions promoting balanced diets, physical activity, and weight control should be prioritized at the point of diagnosis.

Strengthening Capacity of Primary Health Facilities: Primary healthcare centers should be equipped with basic diagnostic tools to perform lipid profile tests, anthropometric assessments, and blood pressure monitoring. In addition, healthcare

workers should be trained to interpret these results and initiate timely, evidence-based interventions.

6.3 Recommendations for Future Research

To deepen understanding and inform clinical and public health responses to dyslipidemia in the context of Type 2 Diabetes Mellitus, the following areas are recommended for future research:

Longitudinal Studies on Lipid and Glycemic Dynamics: Future research should adopt a longitudinal design to track changes in lipid profiles and glycemic control over time. This will help establish temporal relationships and determine whether dyslipidemia contributes to poor glycemic outcomes or vice versa as the disease progresses.

Assessment of Treatment and Medication Adherence: Further studies should evaluate how adherence to lipid-lowering and glucose-lowering therapies impacts metabolic outcomes. This will help disentangle the effects of pharmacologic interventions from natural disease progression in newly diagnosed patients.

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APPENDICES

APPENDIX I: CONSENT FORM (ENGLISH VERSION)

APPENDIX I: CONSENT FORM (English Version)

Informed Consent Form

Study Title: GLYCAEMIC CONTROL AND DYSLIPIDEMIA AMONG NEWLY DIAGNOSED TYPE II DIABETIC MELLITUS PATIENTS IN DAR ES SALAAM

Principal Investigator: Wenceslaus Francis Maro, Phone: +255713696202

1.0 Introduction

You are being invited to participate in a research study. This study aims to investigate the prevalence and characteristics of dyslipidemia in newly diagnosed Type 2 Diabetes Mellitus patients attending diabetic clinics in Dar es Salaam, focusing on the prevalence of dyslipidemia and its associations with glycemic control, hypertension and obesity.

2.0 Purpose of the Study

The purpose of this study is to:

- Determine the prevalence of dyslipidemia among newly diagnosed TYPE II DIABETES MELLITUSpatients.
- Determine the association between dyslipidemia and glycemic control in newly diagnosed TYPE II DIABETES MELLITUSpatients.
- Determine the association between dyslipidemia and metabolic disorders of hypertension and obesity in newly diagnosed type II diabetics.

3.0 Procedures

If you agree to participate, you were asked to:

- Provide information about your medical history, lifestyle, and demographics through a questionnaire.
- Undergo a physical examination, including measurements of height, weight, and waist circumference.
- Provide blood samples for laboratory tests, including blood glucose, HbA1c, blood pressure, and lipid profile.

4.0 Risks and Discomforts

- There are minimal risks associated with participation in this study.
- You may experience minor discomfort from blood draws.
- Your privacy and confidentiality was maintained throughout the study.

5.0 Benefits

- Participation in this study may help improve our understanding of the metabolic profiles of newly diagnosed TYPE II DIABETES MELLITUSpatients in Dar es Salaam.
- The findings of this study may contribute to the development of more effective strategies for the prevention and management of TYPE II DIABETES MELLITUSand its associated complications.

6.0 Alternatives

You are not obligated to participate in this study. You may choose to decline participation without any penalty.

7.0 Confidentiality

All information collected during this study was kept confidential.

8.0 Voluntary Participation

Your participation in this study is entirely voluntary. You have the right to withdraw from the study at anytime without any penalty.

9.0 Questions

If you have any questions about this study, please do not hesitate to contact the Principal Investigator, Wenseslaus Maro, at +255713696202.

10.0 Consent

By signing below, you acknowledge that you have read and understood this information and agree to participate in this research study.

Participant Signature: _____

Date: _____

Witness Signature: _____

Date: _____

Printed Name of Investigator: _____

Date: _____

APPENDIX II: CONSENT FORM (Swahili Version)

Fomu ya Ridhaa ya Kushiriki Utafiti

Jina la Utafiti:GLYCEMIC CONTROL AND DYSLIPIDEMIA AMONG NEWLY DIAGNOSED TYPE II DIABETIC MELLITUS PATIENTS IN DAR ES SALAAM

Mtafiti Mkuu: Wenseslaus Francis Maro, **Simu:** +255713696202

1.Utangulizi

Unakaribishwa kushiriki katika utafiti huu. Utafiti huu una lengo la kuchunguza ueneaji na sifa za dyslipidemia kwa wagonjwa wapya waliogundulika kuwa na Ugonjwa wa Kisukari cha Aina ya Pili (TYPE II DIABETES MELLITUS) wanaohudhuria kliniki za kisukari jijini Dar es Salaam, kwa kuzingatia ueneaji wa dyslipidemia na mahusiano yake na udhibiti wa sukari damuni, shinikizo la damu na unene wa kupindukia.

2. Madhumuni ya Utafiti

• Kubaini ueneaji wa dyslipidemia miongoni mwa wagonjwa wapya waliogundulika kuwa na TYPE II DIABETES MELLITUS.

• Kutathmini uhusiano kati ya dyslipidemia na udhibiti wa sukari damuni kwa wagonjwa wapya waliogundulika kuwa na TYPE II DIABETES MELLITUS.

• Kutathmini uhusiano kati ya dyslipidemia na matatizo ya kimetaboliki ya shinikizo la damu na unene wa kupindukia kwa wagonjwa wapya waliogundulika kuwa na kisukari cha aina ya pili.

3. Taratibu: Ikiwa utakubali kushiriki, utaombwa:

- Kutoa taarifa kuhusu historia yako ya matibabu, mtindo wa maisha, na sifa za kijamii na kiuchumi kupitia dodoso.
- Kufanyiwa uchunguzi wa kimwili, ikiwa ni pamoja na kupimwa urefu, uzito, na kiuno.

- Kutoa sampuli za damu kwa ajili ya vipimo vya maabara, ikijumuisha sukari ya damu, HbA1c, shinikizo la damu, na mafuta ya damu.

4. Hatari na Usumbufu

- Kuna hatari ndogo sana zinazohusiana na ushiriki katika utafiti huu.
- Unaweza kupata usumbufu mdogo kutokana na kuchomwa damu.
- Faragha na usiri wako vitatunzwa kwa uangalifu katika kipindi chote cha utafiti.

5. Faida

- Kushiriki katika utafiti huu kunaweza kusaidia kuboresha uelewa wetu kuhusu hali ya kimetaboliki kwa wagonjwa wapya waliogundulika kuwa na TYPE II DIABETES MELLITUSjijini Dar es Salaam.
- Matokeo ya utafiti huu yanaweza kuchangia katika kuendeleza mikakati bora zaidi ya kuzuia na kudhibiti TYPE II DIABETES MELLITUSna matatizo yanayotokana nayo.

6. Mbadala

Huna wajibu wa kushiriki katika utafiti huu. Unaweza kuamua kutojiunga bila adhabu yoyote.

7. Usiri

Taarifa zote zilizokusanywa wakati wa utafiti huu zitatunzwa kwa siri. Jina lako na taarifa nyingine za utambulisho hazitaunganishwa na data zako za utafiti.

8. Ushiriki wa Hiari

Ushiriki wako katika utafiti huu ni wa hiari kabisa. Una haki ya kujiondoa kutoka katika utafiti wakati wowote bila adhabu yoyote.

9. Maswali

Ikiwa una maswali yoyote kuhusu utafiti huu, tafadhali usisite kuwasiliana na Mtafiti Mkuu, Wenseslaus Maro, kwa nambari +255713696202.

10. Ridhaa

Kwa kusaini hapa chini, unaonyesha kuwa umeisoma na kuelewa taarifa hii na unakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki: _____

Tarehe: _____

Sahihi ya Shahidi: _____

Tarehe: _____

Jina la Mtafiti Lililochapishwa: _____

Tarehe: _____

APPENDIX III: QUESTIONNAIRE (English Version)

Section 1: Sociodemographic Information

1. **Age:** _____ (Years)
2. **Sex:**
    a) Male
    b) Female
3. **Education Level:**
    a) No formal education
    b) Primary
    c) Secondary
    d) University
4. **Occupation:**
    a) None
    b) Employed
    c) Self-employed
5. **Marital Status:**
    a) Single
    b) Married
    c) Divorced
    d) Widowed

Section 2: Anthropometric Measurements

- These measurements was taken by trained research staff.

1. **Height:** _____ (cm)
2. **Weight:** _____ (kg)
3. **Waist Circumference:** _____ (cm)

Section 3: Medical History

1. **Date of Diagnosis of Type 2 Diabetes:** _____

Section 4: Lifestyle Habits

1. **Smoking Status:**
    a) Never smoked
    b) Former smoker
    c) Current smoker
2. **Alcohol Consumption:**
    a) Never
    b) Occasionally
    c) Regularly

Section 5: Laboratory Results

1. **Fasting Blood Glucose (FBG):** _____ (mg/dL)
2. **Hemoglobin A1c (HbA1c):** _____ (%)

3. **Blood Pressure:**
    a) Systolic: _____ (mmHg)
    b) Diastolic: _____ (mmHg)
4. **Total Cholesterol:** _____ (mg/dL)
5. **Triglycerides:** _____ (mg/dL)
6. **High-Density Lipoprotein (HDL) Cholesterol:** _____ (mg/dL)
7. **Low-Density Lipoprotein (LDL) Cholesterol:** _____ (mg/dL)

APPENDIX IV: QUESTIONNAIRE (Swahili Version)

Sehemu ya 1: Taarifa za Kijamii na Kiuchumi

1. Umri: _____ (Miaka)
2. Jinsia: a) Mume b) Mke
3. Elimu: a) Hakusoma b) Msingi c) Sekondari d) Chuo Kikuu
4. Kazini: a) Hatuwezi b) Mtu wa Ajira c) Mjasiriamali
5. Hali ya Ndoa: a) Mpeku b) Mume/Mke c) Mtalaka d) Mjane/Mjane

Sehemu ya 2: Vipimo vya Kimwili

- Vipimo hivi vitafanywa na watafiti waliofunzwa.

1. Urefu: _____ (cm)
2. Uzito: _____ (kg)
3. Ukubwa wa Kiuno: _____ (cm)

Sehemu ya 3: Historia ya Matibabu

1. Tarehe ya Kugundulika kwa Kisukari Cha Aina ya 2: _____

Sehemu ya 4: Tabia za Maisha

1. Uvutaji Sigara:
   a) Hajawahi kuvuta
   b) Aliacha kuvuta
   c) Mvutaji wa sasa
2. Unywaji Pombe:
   a) Hajawahi kunywa
   b) Mara kwa mara
   c) Mara kwa mara sana

Sehemu ya 5: Matokeo ya Maabara

1. Sukari ya Damu Inayofunga (FBG): _____ (mg/dL)
2. Hemoglobini A1c (HbA1c): _____ (%)
3. Shinikizo la Damu:

a) Juu: _____ (mmHg)
b) Chini: _____ (mmHg)

4. Kolesteroli Jumla: _____ (mg/dL)
5. Triglycerides: _____ (mg/dL)
6. Kolesteroli ya Uzito Mdogo (HDL): _____ (mg/dL)
7. Kolesteroli ya Uzito Mkubwa (LDL): _____ (mg/dL)

JAMHURI YA MUUNGANO WA TANZANIA
WIZARA YA AFYA

Anwani ya simu: **"AFYA",**

Simu ya Mdomo: 022-2760500

(Unapojibu Tafadhali Taja)

Hospitali ya Rufaa ya Mkoa,
Mwananyamala,
S.L.P 61665,
Dar es Salaam.

Tarehe: **12/08/2025**

Kumb. Na. MA. 59/240/01/40

Mkurugenzi,
Chuo Kikuu cha Kairuki,
S.L.P 65300,
DAR ES SALAAM.

YAH: <u>DR. WENSESLAUS FRANCIS MARO KUFANYA UTAFITI KATIKA HOSPITALI YA RUFAA YA MKOA MWANANYAMALA.</u>

Tafadhali rejea mada tajwa,

2. Ofisi imepokea barua yenye kumbukumbu namba **KU/PT/30.5/623** ya tarehe 25/7/2025, kwa ajili ya kufanya Utafiti unaohusu "***Glycaemic control and dyslipidaemia among newly diagnosed type II diabetic Mellitus Patients at Mwananyamala Regional Referral Hospital"***.

3. Kwa barua hii napenda kukutaarifu kuwa nafasi ipo, na utalipia kiasi cha shilingi **100,000/=** kuanzia tarehe **12/08/2025** hadi tarehe **12/09/2025.**

KNY: MGANGA MFAWIDHI
HOSPITALI YA MWANANYAMALA
S. L. P 61665
DAR-ES-SALAAM

Dennis Mbwambo
KNY: MGANGA MFAWIDHI
HOSPITALI YA RUFAA YA MKOA MWANANYAMALA

Nakala:
Mkuu wa Idara ya Magonjwa ya ndani - Kwa taarifa

Dr. Wenseslaus F. Maro - Ripoti kwa Mkuu wa Idara Magonjwa ya Ndani

KAIRUKI UNIVERSITY (KU)

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Fax: +255-22-2775591
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Ref. No. KU/IREC/27.10/579 **18 July, 2025**

Dr. Wenseslaus Francis Maro,
Kairuki University,
70 Chwaku Street,
Mikocheni,
P. O. Box 65300.
Dar es Salaam, Tanzania.

RE: ETHICAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH

I am pleased to inform you that the research titled: **Glycemic Control and Dyslipidemia among Newly Diagnosed Type II Diabetic Mellitus Patients in Dar es Salaam (Maro, W. F., 2025)** has been granted ethical approval.

This approval is in effect for one year from the above date.

- Any changes in the procedures should be reported to the Institutional Research Ethics Committee.
- Significant changes will require the submission of a revised request for ethical approval.
- You will be required to submit **a study progress report** every six months.

Permission to publish your findings should be sought from the National Institute for Medical Research (NIMR) before submission to a publisher and not concurrently.

CHAIRPERSON

Name: Prof. Frederick Kaijage

Signature:

SECRETARY

Name: Prof. Columba Mbekenga

Signature:

DIRECTOR POSTGRADUATE STUDIES AND RESEARCH INSTITUTE
KAIRUKI UNIVERSITY
P. O. Box 65300, DSM

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Tanzania

Tel: +255-22-2700021/4
Email: secvc@ku.ac.tz
Website: www.ku.ac.tz

Ref. No. KU/PT/30.5/623

25th July 2025

Medical Officer Incharge,
Mwananyamala Regional Referral Hospital,
Dar es Salaam.

Re: LETTER OF INTRODUCTION FOR DR. WENSESLAUS FRANCIS MARO (MMed III Part II – INTERNAL MEDICINE).

The above named is a MMed postgraduate student specialising in Internal Medicine. As part of fulfilling his MMed programme, he plans to undertake a study titled, **"Glycaemic Control and Dyslipidemia among Newly Diagnosed Type II Diabetic Mellitus Patients in Dar es Salaam".** This study was reviewed and has been granted with an ethics approval No. **KU/IREC/27.10/579** by the KU Institutional Research Ethics Committee that will be valid for one year with effect from 18th July 2025.

This letter serves to introduce **Dr. Wenseslaus Francis Maro** who will be conducting his study at your hospital, please accord him with the needed support.

Thank you for your support and cooperation in developing human resources for health in our country.

Regards,

DIRECTOR POSTGRADUATE STUDIES AND RESEARCH INSTITUTE
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P. O. Box 65300, DSM

Prof. Columba Mbekenga,
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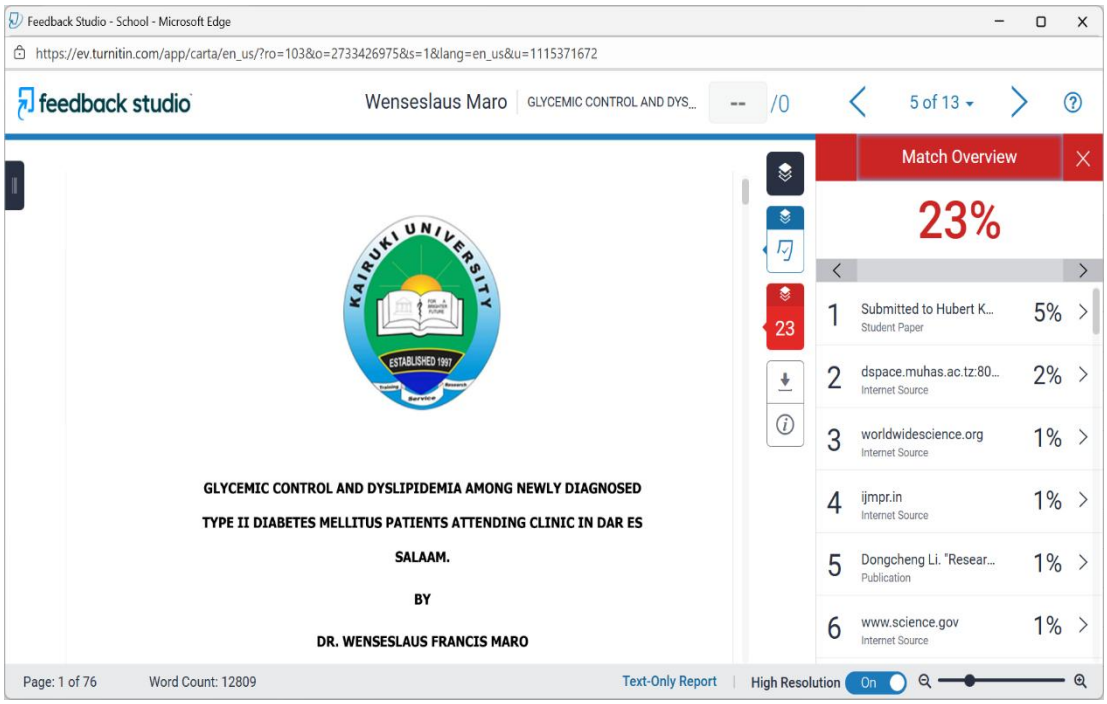
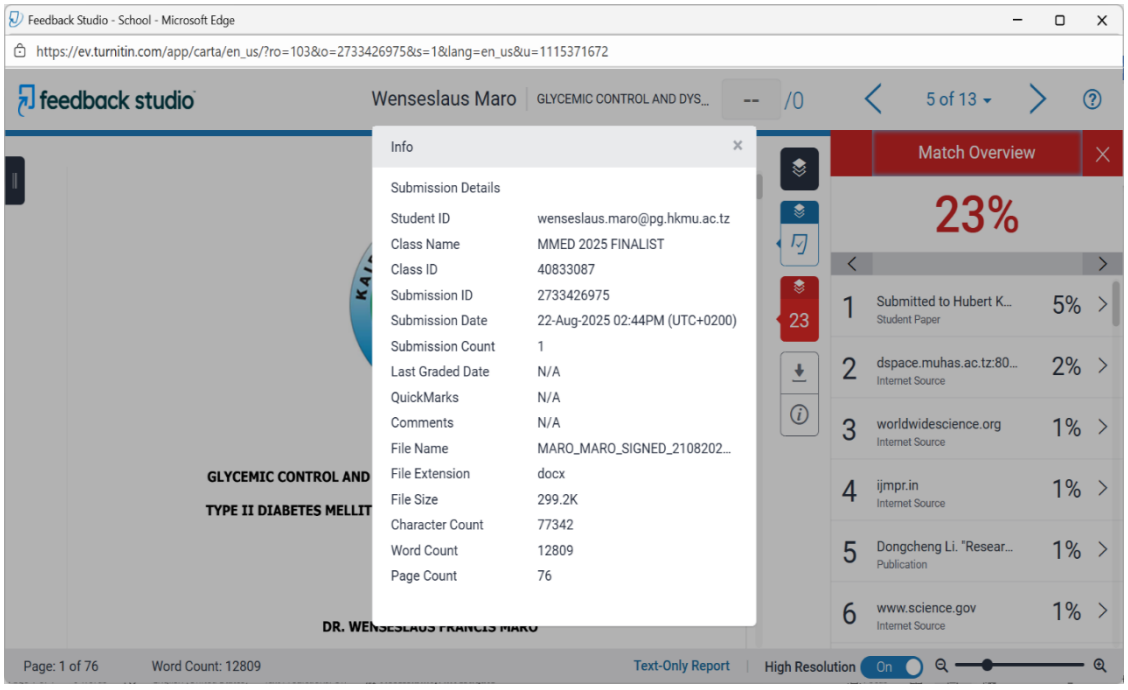
APPENDIX V: TURNITIN PLAGIARISM REPORT





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DEPARTMENT OF INTERNAL MEDICINE

GLYCEMIC CONTROL AND DYSLIPIDEMIA AMONG NEWLY DIAGNOSED TYPE II DIABETES MELLITUS PATIENTS ATTENDING CLINIC IN DAR ES SALAAM.

BY

DR. WENSESLAUS FRANCIS MARO

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