MAGNITUDE OF GESTATIONAL DIABETES MELLITUS AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN LIVING WITH HIV IN DAR ES SALAAM REGION, TANZANIA.

Emmanuel Absalom Mwakasumi, MD

A Dissertation Submitted in (Partial) Fulfilment of the Requirement for the Degree of Master of Public Health

Muhimbili University of Health and Allied Sciences

October 2024

Muhimbili University of Health and Allied Sciences

School of Public Health and Social Sciences

MAGNITUDE OF GESTATIONAL DIABETES MELLITUS AND ASSOCIATED FACTORS AMONG PREGNANT WOMEN LIVING WITH HIV IN DAR ES SALAAM REGION, TANZANIA.

By:

Emmanuel Absalom Mwakasumi

A Dissertation Submitted in (Partial) Fulfilment of the Requirement for the Degree of Master of Public Health

Muhimbili University of Health and Allied Sciences

October 2024

CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied sciences, a dissertation entitled: "**Magnitude of gestational diabetes mellitus and associated factors among pregnant women living with HIV in Dar es Salaam region, Tanzania.**", in partial fulfilment of the requirements for the degree of Master of Public Health at Muhimbili University of Health and Allied sciences.

Prof. Bruno F. Sunguya
(Supervisor)

Date: ----------

Mr. Elias M. Bukundi

(Co-Supervisor)

Date: ----------

DECLARATION AND COPYRIGHT

I, Emmanuel Absalom Mwakasumi, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature---------- Date ----------

This dissertation is a copyright material protected under the Berne Convention, the Copyright Act 1999 and other international and national enactment, in that behalf, on intellectual property. It may not be reproduced by any means, in full or in part, except for short extracts in fair dealing, for research or private study, critical scholarly review or discourse with an acknowledgement, without the written permission of the Directorate of Postgraduate Studies, on behalf of both the author and the Muhimbili University of Health and Allied Sciences.

ACKNOWLEDGEMENT

First, I would like to thank The Father through Jesus Christ, in him we live, move, and receive salvation of our souls.

Secondly, my outmost appreciation to my supervisors Prof. Bruno Sunguya and Mr. Elias Bukundi for the much-needed directives, support and tolerance leading to completion of this work.

Moreover, I would like to thank everyone who was part of my journey, my research assistants at Muhimbili National Hospital (MNH), Mwananyamala regional referral hospital, Temeke regional referral hospital and Amana regional referral hospital, study participants, and administrative staff of the school of public health and social sciences for their generous supports and contributions to the accomplishment of this work.

Lastly, I would like to thank My beautiful wife Grace, my daughter Eleanor and my Parents for the endless encouragement and support throughout the journey to accomplish this milestone.

DEDICATION

This work is dedicated to my wife Grace Kassimoto Mwakasumi and my daughter Eleanor. I love you guys.

ABSTRACT

Background

Evidence suggests a link between non-communicable diseases (NCDs) and HIV. People living with HIV(PLHIV) are at higher risk of metabolic syndrome including Gestational Diabetes Mellitus (GDM). Studies showing a magnitude of GDM in PLHIV are limited in Tanzania.

Objective

The study was set to determine the magnitude of GDM among pregnant women living with HIV in Dar es Salaam, Tanzania and to find out its associated factors

Materials and Methods

A cross-sectional study was conducted in Dar es salaam's three regional referral hospitals and a national hospital. Participants were pregnant women living with HIV at their 24^{th} to 28^{th} gestation age. Questionnaire was used to collect data and other anthropometric measurements were taken using various tools. GDM was the outcome variable, also analysis was conducted using both descriptive and logistic regression methods.

Results

GDM prevalent was 5.6% among 426 study participants. Women with overweight were almost ten times more likely of having GDM compared to women with normal nutritional status (AOR:9.81 95% CI 2.64-36.40, P=0.001). Women on their third pregnancy were five times more at risk of having GDM as compared to primigravida (AOR:5.66,95% CI 1.11-28.80 p=0.037). Women with high level of physical activities were 93% less likely to have GDM compared to those with low level of physical activities (AOR:0.07,95% CI 0.01-0.77 p=0.031). Those working in sales and services were 95% less likely to have GDM as compared to those working as professionals (AOR:0.53, 95% CI 0.01-0.25 p<0.001). Manual labour (AOR:0.04,95% CI 0.01-0.22p=0.001), and other jobs (AOR:0.06,95% CI 0.01-0.34 p=0.002) were also significant risk factors for GDM.

Conclusion

The prevalence of GDM among respondents was found to be 5.6%. Overweight, multi-parity, level of physical activities as well as nature of work were found to be associated with GDM.

Recommendations

Addressing the burden of GDM among pregnant women living with HIV calls for more streamlined efforts targeting interventions such as physical activities programs along the PMTCT services. Effort should target all women presenting at the facilities during ANC visits.

TABLE OF CONTENTS

CERTIFICATION i

DECLARATION AND COPYRIGHT ii

ACKNOWLEDGEMENT iii

DEDICATION iv

ABSTRACT v

TABLE OF CONTENTS vi

LIST OF FIGURES ix

LIST OF TABLES ix

ABBREVIATIONS x

OPERATIONAL DEFINITIONS xi

CHAPTER ONE 1

1.0 INTRODUCTION 1

1.1 Background 1

1.2 Problem statement 2

1.3 Conceptual Framework 3

1.4 Rationale of the Study 5

1.5 Research Questions 5

1.5.1 Main Research Question 5

1.5.2 Specific Research Questions 5

1.5.3 Research Objectives 5

1.5.4 Main Objective 5

1.5.5 Specific Objectives 5

1.5.6 Study Hypothesis 6

1.5.7 Null Hypothesis 6

1.5.8 Alternative Hypothesis 6

CHAPTER TWO 7

2.0 LITERATURE REVIEW 7
2.1 Introduction 7
2.2 Factors Associated with Gestational Diabetes Mellitus 7
2.2.1 Family History of Diabetes Mellitus 7
2.2.2 Physical Activities 8
2.2.3 Maternal Demographic Characteristics 8
2.2.4 ART use and Gestational Diabetes Mellitus 8
2.2.5 Nutrition Status 9
2.2.6 Awareness on Gestational Diabetes Mellitus among Pregnant Women 9
CHAPTER THREE 11
3.0 METHODOLOGY 11
3.1 Study Design 11
3.2 Study Area 11
3.3 Study Population 11
3.3.1 Participant Inclusion Criteria 12
3.3.2 Participant Exclusion Criteria 12
3.4 Sample Size and Sampling Technique. 12
3.4.1 Sample Size 12
3.4.2 Sampling Technique: 13
3.5 Data Source, Collection Methods and Tool. 13
3.5.1 Data Source 13
3.6 Variables and Measurements 14
3.6.1 Dependent Variable 14
3.6.2 Independent Variables 14
3.7 Training of the Research Assistants 17
3.8 Pre-Testing of Data Collection Instruments 17
3.9 Data Collection 18
3.10 Data Validity and Reliability 18
3.11 Data Management and Analysis 18
3.12 Ethical Considerations 19

3.13 Dissemination of the Research Findings....19
4.0 RESULTS....20
4.1 Characteristics of study participants....20
4.1.1 Prevalence of GDM....21
4.1.2 Factors Associated with GDM among Pregnant Women Living with HIV in Dar es Salaam, Tanzania....21
CHAPTER FIVE....24
5.0 DISCUSSION....24
REFERENCES....28
APPENDICES....36
APPENDIX I: Informed Consent (English Version)....36
APPENDIXES II: Informed Consent (Swahili Version)....38
APPENDIX III: Questionnaire (English Version)....41
APPENDIX III: Questionnaire (Swahili Version)....57
APPENDIX V: Digital Receipt....74
APPENDIX VI: Plagiarism Report....75
APPENDIX VII: Ethical Clearance....76
APPENDIX VIII: Introdution Letters....78

LIST OF FIGURES

Figure 1.1: Customized conceptual framework on the factors associated with Gestational diabetes mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania…....3

Figure 1: Conceptual frame work 4

LIST O TABLES

Table 1: Number of pregnant women attending ANC and CTC in each health facility.....13

Table 2: Social-demographic characteristics of pregnant women living with HIV in Dar es salaam, Tanzania……20

Table 1: Multivariate logistic regression analysis for the factors associated with GDM among pregnant women living with HIV in Dar es salaam, Tanzania.....22

ABBREVIATIONS

AIDS	Acquired immunodeficiency syndrome
ANC	Antenatal care clinics
AOR	Adjusted Odd Ratio
ART	Antiretroviral therapy
BMI	Body Mass index
CI	Confidence Interval
CTC	Care and treatment clinic
COR	Crude Odd Ratio.
DDS	Dietary Diversity Score
DM	Diabetes Mellitus
GDM	Gestational diabetes mellitus.
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
HIV+	Patient living with Human Immunodeficiency Virus
LMIC	Lower and middle-income countries
METS	Metabolic Equivalents
MNH	Muhimbili National hospital
MUAC	Middle upper arm circumference
MUHAS	Muhimbili university of health and allied Science
NCDs	Non-Communicable Diseases.
OR	Odd Ratio.
PLHIV	People living with HIV
PMTCT	Prevention of Mother To Child Transmission
POC	Point of Care
TDHS	Tanzania Demographics and Health survey
WWI	Weighted Wealth Index

OPERATIONAL DEFINITIONS

1. Dyslipidemia: defined as increased level of LDL and/or of triglycerides and/or de creased level of HDL and/or the use of a lipid-lowering drug (statin, fibrate) (1).

2. Eclampsia: defined as the onset of convulsions described as grand-mal type seizures first appearing before or during labor, or within 48 hours from delivery, and/or coma unrelated to other cerebral conditions in women with pre-eclamptic signs and symptoms (2).

3. Gestational diabetes mellitus: is a glucose intolerance that is first detected during pregnancy (3).

4. Hyperglycemia: is fasting glucose level of 126 mg/dl (7 mmol/liter) or more or a random blood glucose level of 200 mg/dl (11.1 mmol/liter) or more on 2 or more determinations (4).

5. Pre-Eclampsia: defined as high blood pressure (140 mmHg systolic or 90 mmHg diastolic, or increases of 30 mmHg systolic or 15 mmHg diastolic from the baseline on at least two occasions six or more hours apart) that develops from the 20th gestational week in a previously Normotensive woman, and proteinuria (2).

6. Pregnant induced hypertension: defined as syndrome of hypertension with or without proteinuria and edema, with the clinical manifestation usually occurring late in pregnancy and regressing after delivery of the conceptus (5).

7. Overweight: A body mass index (BMI) of $\geq 25\ kg\ m^{-2}$(6).

8. Obesity: A body mass index (BMI) of $\geq 30\ kg\ m^{-2}$(6).

9. Household food access: defined as the ability to acquire a sufficient quality and quantity of food to meet all household members' nutritional requirements for productive lives(7).

10. Household dietary diversity: defined as the number of unique foods consumed by household members over a given period (7).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The incidence of non-communicable diseases (NCDs) is rising rapidly in both lower- and middle-income countries (LMIC) (8,9). This surge, alongside the persistent presence of communicable diseases, results in a "double burden" of diseases (10). There is a notable connection between NCDs and Human Immunodeficiency Virus (HIV), attributed to various factors including medication (11). HIV and its treatments are significant risk factors for NCDs, as they can lead to metabolic syndrome(1). People living with HIV (PLHIV) are more prone to conditions such as glucose dysregulation, mixed hyperdylipidemias and hypertensive hert conditions(1,8).

Most published literature on risk factors for NCDs primarily focuses on the general population. There are few studies specifically targeting PLHIV, and even fewer concerning pregnant women with HIV (3,11,12). In 2015, maternal deaths from various causes were estimated at 303,000, with 99% occurring in LMIC. It was further determined that indirect causes, including NCDs and communicable diseases like HIV, accounted for nearly one-third of these maternal deaths (9).

The pathophysiology of GDM primarily revolves around pregnancy itself, which stimulates changes in maternal metabolism to support fetal growth(13). The fetus's continuous nourishment is facilitated by intricate interactions within the feto-placental maternal unit, mediated by pregnancy hormones such as growth hormone, corticotrophin-releasing hormone, human placental lactogen, progesterone, and prolactin(13). These hormones induce insulin resistance, ensuring glucose availability for the fetus. Studies have also identified additional factors contributing to the development of GDM, including pre-pregnancy insulin resistance linked to increased maternal fat deposition, reduced physical activity, and higher caloric intake(13).

GDM is linked to a higher risk of adverse pregnancy outcomes (11,14). These risks include obstructed labor due to large babies, increased rates of cesarean sections, birth trauma, postpartum hemorrhage, hypertensive pregnancy disorders, and a higher likelihood of developing diabetes and cardiovascular diseases in the future (11). Perinatal complications encompass macrosomia, birth

trauma from shoulder dystocia, neonatal hypoglycemia, hyperbilirubinemia, and a higher risk of perinatal death (14). In utero imprinting raises the risk of children born to mothers with GDM developing obesity, diabetes, and cardio-metabolic disorders as long-term complications (14). Pregnant women living with HIV face a higher risk of NCDs compared to the general population (15). Pregnancy can exacerbate cardio-metabolic conditions such as gestational diabetes and other hormonal and metabolic issues. Evidence links HIV with maternal NCD risks, including cardiovascular diseases, cancers, type 2 diabetes, and mental health challenges (1,3). Antiretroviral therapy (ART) for HIV treatment has been associated with hormonal dysregulation crucial for glucose metabolism, leading to glucose intolerance, insulin resistance, and ultimately type 2 diabetes mellitus, including GDM (13,16–18).

In Tanzania, GDM screening and treatment are not included in routine antenatal services (19). Consequently, there is limited knowledge about its prevalence in the country. Data is rarely reported in some regions, and when available, it does not specifically pertain to pregnant women living with HIV. For instance, the prevalence of GDM in the Dar es Salaam and Morogoro regions was found to be 8.5% and 19.5%, respectively (20). However, there is no available evidence specifically from a population of women living with HIV.

1.2 Problem statement

Globally 16.2% of all annual live birth (20.9 million) is associated with episode of hyperglycaemic state during pregnancy. Out of them, 17.9 million (85%) had a diagnosis of GDM (21). In Africa, the burden of GDM is ranging from 0% to 13.9%(12,22). The prevalence of GDM was 6% in Tanzania, ranging from 1.0% in rural areas to 8.4% in urban areas(22).

The extent to which GDM affects pregnant women living with HIV has not been studied in Tanzania. Despite the increase in the burden of DGM and other NCDs in the general population(23), evidence is lacking on the risk factors among women living with HIV. Only one study done in the region was in Kenya (24). The reported prevalence of GDM among women living with HIV was 2.4%. Therefore, this study was set to determine the magnitude of GDM and its associated factors among pregnant women living with HIV in Dar es Salaam, Tanzania.

1.3 Conceptual Framework

The outcome variable in this customized conceptual framework is GDM. It is explained by the presence of the following independent variables; maternal demographic characteristics, family history of Diabetes Mellitus (DM), level of physical activities, alcohol usage, ART usage, socio-economic status, level of awareness of GDM and nutritional status.

Previous studies have associated maternal demographic characteristics with GDM. Factors such as advanced maternal age and low levels of education have been linked to GDM (25–27). A family history of DM also increases the likelihood of developing GDM (14). Similarly, decreased levels of physical activity and poor nutritional status, such as being overweight, have been connected to a higher risk of GDM (25–28). An increased level of awareness about GDM has been associated with a lower risk of developing the condition (25,29). Some studies suggest that alcohol usage during pregnancy may have protective effects against GDM(30). However, the use of ART has been associated with an increased risk of GDM among users(13,16,17,31). Additionally, an increase in socioeconomic status has been linked to a higher likelihood of non-communicable diseases, including GDM, in developing countries, whereas the opposite trend is observed in developed countries(32–34).The relationship can best be described in Figure 1.1 below adopted from Zackoff (35).

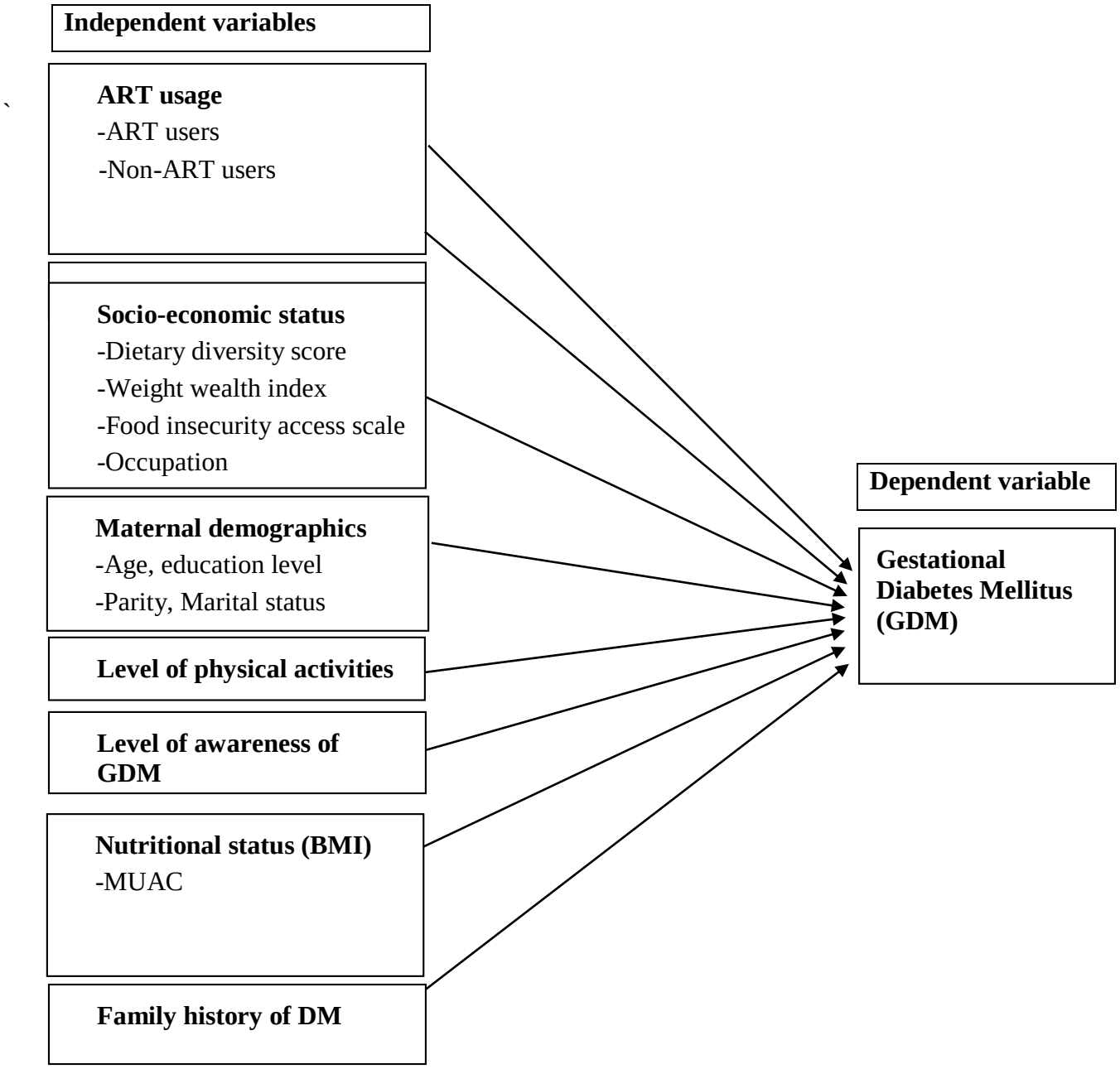


Figure 1: Conceptual frame work

1.4 Rationale of the Study

This study contributes to the body of evidence on the magnitude and risk factors associated with GDM among pregnant women living with HIV in Dar es Salaam. In addition, the findings give us a clue of what might be happening in other area, with regards to GDM among pregnant women. this study will contribute to knowledge of prevention and management of diabetic mellitus among pregnant women living with HIV. Prevention of GDM through behavioural changes like exercising and good dietary habit is of paramount importance when comes to addressing GDM.

1.5 Research Questions

1.5.1 Main Research Question

What is the magnitude and risk factors of Gestational Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania?

1.5.2 Specific Research Questions

1. What is the magnitude of Gestational Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania?
2. What are the risk factors for Gestational Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania?

1.5.3 Research Objectives

1.5.4 Main Objective

To determine the magnitude and risk factors of Gestational Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania.

1.5.5 Specific Objectives

1. To determine the magnitude of Gestational diabetes mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania.

2. To determine factors associated with Gestational Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania.

1.5.6 Study Hypothesis

1.5.7 Null Hypothesis

It was hypothesized that "there was no difference in magnitude and associated factors of GDM among pregnant women living with HIV in Dar es salaam, Tanzania."

1.5.8 Alternative Hypothesis

It was hypothesized that "there was difference in magnitude and associated factors of GDM among pregnant women living with HIV in Dar es salaam, Tanzania."

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

GDM is a significant burden affecting many African societies, particularly those in sub-Saharan Africa (22). This disease contributes silently to the cycle of ill health, impacting both maternal and fetal outcomes (36). Globally, 21.3 million pregnancies are associated with hyperglycemia, and of these, 18.4 million are attributed to GDM (37). A previous cross-sectional study revealed that the prevalence of GDM varies, ranging from 6.4% in Qatar to 16% in India (38). Evidence from sub-Saharan Africa also indicates a varying burden across countries (25). For instance, the prevalence ranges from 1.5% in rural areas to 3.8% in urban areas of South Africa, similar to the 3.7% reported in Ethiopia. In Tanzania, the burden was reported to be as high as 39% (25).

HIV in other hand continue to be a global payer in health of pregnant women, in a year 2021 19.7 million women were living with HIV and 1.3 million of them became pregnant(39). HIV prevalence among pregnant women in Tanzania was found to be 5.9%(39).In this study the double burden of HIV and GDM is our main focus.

2.2 Factors Associated with Gestational Diabetes Mellitus

2.2.1 Family History of Diabetes Mellitus

A family history or pre-pregnancy history of diabetes is widely recognized as a significant contributing factor in the development of GDM (14). Family history stands out as a crucial and primary predictor of GDM, aiding in the identification of women at high risk (14). This strategy of emphasizing family history serves as an effective approach to pinpoint high-risk individuals during screening (40), particularly in contexts where universal screening is impractical due to resource limitations(20).

2.2.2 Physical Activities

Low physical activity among pregnant women is identified as a significant factor contributing to GDM. Research indicates that pregnant women who engage in physical exercise reduce their risk of GDM by 30% compared to those who are less active (26). Similarly, higher levels of physical activity, such as regular walking, show an inverse relationship with GDM incidence (28). Pre-pregnancy physical activity in the highest quintile is associated with a 55% lower risk of GDM compared to women with the lowest activity levels, while early pregnancy physical activity correlates with a statistically significant 25% lower risk of GDM compared to women with low physical activity levels (25). Low physical activity increases the risk of GDM due to heightened insulin resistance (25). Physical activity is known to enhance carbohydrate and lipid metabolism by boosting tissue insulin sensitivity post-exercise (27), making it a fundamental strategy for both treating and preventing GDM**.**

2.2.3 Maternal Demographic Characteristics

Maternal demographic characteristics, such as age and parity, play significant roles in contributing to GDM. Pregnant women aged over 25 years, those with high BMI, multi-parity, and excessive maternal weight gain during pregnancy are at higher risk of developing GDM (16). The increased risk of GDM also heightens the likelihood of other complications such as cesarean section (CS), pre-eclampsia, third to fourth-degree perineal tears, and the subsequent development of type 2 diabetes mellitus (T2DM) (31). Moreover, uncontrolled GDM is associated with elevated risks of congenital malformations, spontaneous abortion, fetal macrosomia, birth injuries, neonatal hypoglycemia, polycythemia, and hyperbilirubinemia (41).

2.2.4 ART use and Gestational Diabetes Mellitus

HIV is a global pandemic that significantly increases maternal and perinatal morbidity and mortality due to pregnancy-related complications such as GDM (37). The placenta plays a crucial role in the pathogenesis of GDM (41,42), by facilitating normal pregnancy development and enabling the exchange of gases and nutrients between the fetus and mother (42). Viral infections like HIV and their treatment, particularly ART, can disrupt placental function, leading to

pregnancy complications (31). ART use during HIV-infected pregnancies is identified as a key factor contributing to pregnancy-related issues such as GDM (31,37,41,43).

ART is known to disrupt several hormones during pregnancy (13,16–18), including progesterone, prolactin, and leptin. Progesterone regulates insulin release during glycogen formation; decreased progesterone levels can reduce insulin production, leading to elevated plasma glucose levels and hyperglycemia, as observed in studies with rats (44,45). Leptin influences plasma glucose control by reducing food intake and increasing basal metabolic rate, thus favoring fat metabolism (46). Prolactin, similar to leptin, affects adipose metabolism; low prolactin levels are associated with glucose intolerance, type 2 diabetes mellitus, and insulin resistance, whereas higher levels are linked to a lower risk of diabetes (47).A recent study done by Minyu Li et al found that ART users are 1.59 more likely to suffer from GDM compared to ART naïve(48).

2.2.5 Nutrition Status

Pre-pregnancy obesity is clinically recognized as one of the most significant predictors of GDM (20). Studies indicate that pre-pregnancy obesity, characterized by a middle upper arm circumference (MUAC) of ≥28 cm, is widely acknowledged as a key predictor for GDM (20). This association is attributed to the proportional relationship between body fat percentage and insulin resistance (49). Pre-pregnancy overweight is a critical determinant of GDM, underscoring the importance of interventions that begin before conception for effective GDM prevention (20).

2.2.6 Awareness on Gestational Diabetes Mellitus among Pregnant Women

Low awareness about the disease is one among the factors contributing to Diabetes Mellitus among Pregnant women (29). This is evidenced, by the previous study, which reported that, women who lacked awareness on GDM are more likely to have GDM than those who are aware of the condition (29). The reason for this could be due to the fact that, awareness s of a disease is highly related to implementation of healthy behavior on preventing disease and its complication (25). The other previous study done on health literacy, which demonstrated that, individuals with lower level of health literacy are prone to inadequate use of health preventive measures, increase incidence of

chronic illness, greater healthcare utilization and poor disease outcome compared with those with the said literacy (27).

2.3.7 Alcohol Consumption

Alcohol consumption during pregnancy is widely known to cause harmful effects on the fetus, but the finding of effect of alcohol on GDM varies between different studies, a study by Minyu Li et al suggested that alcohol consumption during pregnancy may have no effect against GDM(50).Recently study however by Pavesi et al conducted in Brazil shows that there is increase in incidents of GDM among women taking alcohol during pregnancy by 1.73 as compared to those who did not consume alcohol throughout their pregnancy(51).This findings makes alcohol consumption an important factor to consider in studies related to GDM.

2.3.8 Socio-economic Status

Socio-economic status (SES) refers to an individual's or group's position and prestige in society, typically measured by factors such as income and educational attainment (32,33). It has been noted that higher socio-economic status is often linked to increased risk of non-communicable diseases in developing countries, while the opposite trend is observed in developed nations (33,34). Therefore, considering socio-economic status is crucial when examining associations between GDM and other risk factors.

Diabetes mellitus (DM) is a manageable condition primarily through lifestyle modifications, such as reducing consumption of animal proteins like red meat and increasing intake of proteins such as nuts, along with engaging in moderate physical activity, all of which have been inversely associated with GDM (31). Thus, this study aims to specifically determine the prevalence and factors associated with GDM among pregnant women living with HIV in Dar es Salaam. The overarching goal is to lay the groundwork for further research, establish guidelines, and address the condition proactively.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

A cross-sectional study employing a quantitative approach was conducted to assess the prevalence and factors associated with GDM among pregnant women living with HIV and using ART in Dar es Salaam. The cross-sectional study design was chosen for its capability to examine associations between exposures and outcomes at a single point in time.

3.2 Study Area

The study was conducted in the Dar es Salaam region, specifically at three regional referral hospitals (Mwananyamala, Amana, and Temeke) and Muhimbili National Hospital (MNH). These facilities were selected due to availability of Antenatal Care services (ANC) and Care and Treatment clinic (CTC), as well as their large populations conveniently in achieving the required sample size within time frame. Data collection took place at ANC clinics of these hospitals, as well as at the CTC for HIV.

3.3 Study Population

The study population consisted of pregnant women at their 24th to 28th weeks of gestation attending ANC or CTC clinics at the selected four facilities. This gestational age range was chosen because it corresponds to a period of increased metabolic demand as pregnancy progresses. Hormones responsible for glucose availability, through complex interactions including triggering insulin resistance, mobilize glucose for fetal consumption, potentially leading to GDM if maternal physiological factors cannot adequately balance this increase. Additionally, earlier screening might not capture women who could develop the condition later in pregnancy (13). Screening for GDM is typically recommended between 24-28 weeks of gestation, as testing later in the third trimester limits the time available for metabolic interventions (52). The accessible population included those who provided consent and were identified during the study period.

3.3.1 Participant Inclusion Criteria

The participants' inclusion criteria were pregnant women on their 24^{th} to 28^{th} weeks of gestation who were 18 years of age and above, attending ANC and CTC clinics at Mwananyamala, Temeke, Amana regional referral hospitals, and MNH, who willingly provided consent to participate in the study.

3.3.2 Participant Exclusion Criteria

The participant's exclusion criteria included patients with pre-existing DM, less than 24 weeks' gestation age, above 28 weeks' gestation age and those who refused to give consent.

3.4 Sample Size and Sampling Technique.

3.4.1 Sample Size

The Sample size was determined based on a 50% proportion, with standard normal deviate of 1.96 for 95% confidence interval and 5% margin of error. Since there were no similar studies conducted in urban Tanzania, the closer one is that of the rural setting and confers low prevalence values and hence low sample size (53). Therefore, minimum sample size was calculated as follows using 50% proportion instead of 8.4% in order to obtain maximum sample size.

For a large population:

$$n = \frac{z^2 p\,(100-p)}{\varepsilon^2}$$

Where:

n= required sample size

Z= Critical value of the standard Normal distribution for the 95% confidence interval around the true proportion which is 1.96

P= expected proportion of GDM is 50%

ε= accepted margin of error is set at 5%. From literature review of sample size calculation, if the previous prevalence is below 20%, the expected margin of error is set at 3% also, if the previous prevalence is above 20% and below 80% then the expected margin of error is set at 5%. Since the chosen prevalence is 50% which is less than 80%, then the margin of error was set at 5%.

$$n = \frac{1.96^2\ 50\ (100-50)}{5^2} = 384$$

Including non-response (10%) rate, the sample size was: 384+38= 422

Therefore, adjusting for 10% of non-response, the final sample size was set at 422 participants. For this study, the actual data collection was done among 426 participants.

3.4.2 Sampling Technique:

The study employed a convenient sampling technique, firstly health care facilities were selected for inclusion. Four facilities; Amana, Temeke, Mwananyamala, and MNH were selected, then all pregnant women who met the inclusion criteria and attended ANC and CTC services were included until the required sample size for each facility was reached. The proportions from each facility were combined until the overall sample size was achieved. The number of participants at each facility was determined using probability proportional to size. This was calculated by multiplying the total number of pregnant women enrolled at each facility (N) by the sampling fraction (F), which is 426/1801=0.2365. The calculated number of study participants is detailed in **Table 1.1** on the selected Health Facilities (HF).

Table 1: Number of pregnant women attending ANC and CTC in each health facility

Name of HF	**Population size (N)**	**Sampled population (N×F)**
Amana regional referral hospital	476	113
Temeke regional referral hospital	416	98
Mwananyamala regional referral hospital	345	82
MNH	564	133
Total	**N=1801**	**n=426**

3.5 Data Source, Collection Methods and Tool.

3.5.1 Data Source

The source of data for this study were primary and secondary source of data collection. Face to face interview using a tool adopted from a TDHS was used, and other variable measurements was done in collecting data for the study. Upon arrival to ANC all respondents were checked for vitals

and all their antenatal card examined and they were allocated to different consultation rooms as routinely done, one of the room, those who were HIV positive and meets the inclusion criteria were sent, there the research assistant or the principal researcher was waiting. After finishing routine checkups, a second phase of an interview started, consent was obtained by research assistants and went on with filling the questionnaire and take the rest of anthropometric measurements and FBG/RBG. For those who had high RBG were counselled about the importance of knowing their medical condition and they were asked to return the next day while fasting. Measurement of each variable is further explained on each variable below.

3.6 Variables and Measurements

3.6.1 Dependent Variable

The dependent variable was the status of GDM among pregnant women living with HIV between the 24th and 28th weeks of gestation, attending ANC and CTC at Amana Regional Referral Hospital, Temeke Regional Referral Hospital, Mwananyamala Regional Referral Hospital, and MNH. Plasma glucose levels were measured to diagnose GDM. Since serum glucose screening is not routine during antenatal visits, all HIV+ pregnant women at these facilities were tested for Fasting Plasma Glucose (FPG) using a handheld glucometer (Gluco Plus). If women presented while fasting for 8 hours or more, the test was conducted the same day; otherwise, they were asked to return for FPG testing the next day or during their next clinic visit while fasting. A plasma glucose level of 7 mmol/L or higher indicated GDM. To confirm the diagnosis, an oral glucose solution containing 75g of glucose was administered, and a 2-hour plasma glucose level was measured. A plasma glucose level of 11.1 mmol/L or higher confirmed GDM (53). The principal investigator and research assistants conducted the measurements. The results were recorded as a binary outcome, with GDM positive coded as 1 and negative coded as 0.

3.6.2 Independent Variables

The following independent variables were operationalised to predict the outcome variable;

- **Age and parity**: Participants were asked for their age at their last birthday and the age at which they first became pregnant. This information was verified using the client's antenatal card, which also provided data on gravidity (34).

- **Level of education:** Information on the highest level of education attained was obtained by asking participants if they had ever attended formal education and, if so, to what level. Responses were categorized from no education to post-secondary education (34).

- **Marital status:** Information was obtained by asking the question "*What is your marital status*?" from a questionnaire. The responses were coded as follows: Single (1), Currently Married (2), Divorced (3), Cohabitating (4), and Widowed (5) (33).

- **Occupation:** information of the respondent was obtained by asking *"What is your occupation, that is, what kind of work do you mainly do*?"(34).

- **Dietary diversity score:** Participants were asked to report the types of food they had consumed in the past 24 hours. A dietary diversity score (DDS) was calculated using a list of eight food groups provided by FANTA (7). These food groups included grains, roots, and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry, and liver/organ meat); eggs; vitamin A-rich fruits and vegetables; other fruits and vegetables; and foods cooked in oils/fats. A list of common foods in Tanzania was used to assess the consumption of each food group. The DDS ranged from 0 to 8, where a score of 4 or more indicated a high likelihood that the participant had consumed at least one animal source of food and at least one fruit or vegetable, in addition to a staple food like grains, roots, or tubers.

- **Food insecurity access scale:** This study assessed household food insecurity using the Household Food Insecurity Access Scale (HFIAS) over the past month, derived from a nine-item questionnaire provided by FANTA. Scores were calculated according to the HFIAS 19 Indicator Guide (7). Generally, the scores are categorized into four levels: food secure, mildly insecure, moderately insecure, and severely food insecure. In this particular

study, the mild, moderate, and severe categories were combined into one group (food insecure), resulting in two categories for HFIAS assessment (54).

- **Weighted wealth index:** The Weighted Household Wealth Index (WWI) was calculated by assigning scores to dichotomized variables representing household possessions, consumer goods, durable assets (such as televisions, bicycles, or cars), and housing characteristics (like source of drinking water, toilet facilities, and flooring materials). These variables were adapted from a previous study (55). Scores were derived using Principal Component Analysis (PCA) in SPSS. Initially, 34 variables were included in the PCA, which were iteratively reduced to 9 components. The first principal component, which accounted for 35% of the variation and had a Kaiser-Meyer-Olkin measure of sampling adequacy of 0.758 (considered acceptable), was selected as the wealth index. The wealth index for each household was weighted, ranked, and then divided into three equal wealth groups: poor, middle, and rich.

- **Nutrition Status**: In determining Nutrition status of the mother MUAC was used. A non-stretching tape was placed midway between a shoulder and an elbow to take a measurement. MUAC was chosen because this study was done to subjects from their 24th weeks of gestation, hence rendering it difficult to get an accurate pre-pregnant gestation weight without increasing the likelihood of recall bias. Pre-gestational weight is needed to set a benchmark for weight gain during pregnancy. MUAC is known to be relatively stable during course of pregnancy (56,57). In this study MUAC under 24cm was considered underweight, 24-28cm as normal and above 28cm as overweight. Assumption made in categorizing this groups was that, the change of MUAC was negligible throughout the pregnancy period and that BMI=0.1036*MUAC (mm)-3.9 (20,56,57).

- **Family History of Diabetes Mellitus and Physical Activity Factors:** Family history of Diabetes mellitus was obtained by asking a participant if they have any sibling or other family members from both maternal and paternal side with diabetes mellitus. Physical activities were assessed using adopted question from TDHS and STEPS surveys

(34,53,58). The adopted questions incorporated in the survey tool were able to assess several physical activities from walking, moderate to vigorous activities. During interview women were asked to remember their activities for an entire week prior to the interview. Data was reported as Metabolic Equivalents (METS) according to international physical activities questionnaire and was categorized into high, moderate and low METS groups.

- **Level of Awareness about GDM:** The level of awareness was detected by asking a participant if they know anything about GDM and if they have been treated on the previous pregnancies of GDM. Those who knew of the condition were regarded as those aware, and those who did not know were regarded as not aware.

- **ART use**: Respondents were asked if they are on ART on not, those on ART were regarded as "ART users" while those not in uses were regarded as "non-ART users".

3.7 Training of the Research Assistants

The principal investigator led the data collection process, assisted by eight research assistants who were registered nurses and medical officers at the ANC and CTC clinics where the research was conducted. Two days before starting data collection, the research assistants received training. To ensure competence and familiarize them with the study tools, 10 candidates who were not part of the research were used for testing during the training

3.8 Pre-Testing of Data Collection Instruments

Questionnaire was pretested to 20 pregnant women attending at ANC at Sinza Palestina hospital located in Ubungo district, the questions were adjusted accordingly to pre-test results of the pilot study so as to be effective when used in the study areas. The data obtained from the pilot study were not included in the study.

3.9 Data Collection

Data were collected in a secured room at ANC and CTC clinics using a questionnaire filled out by a research assistant. Questions were asked, and responses were recorded, with each questionnaire taking at least 20 minutes to complete while ensuring confidentiality.

Anthropometric measurements were taken using a tape measure for height, weight, and MUAC, with two readings for each measurement. Blood glucose levels were measured using plasma-calibrated handheld glucometers for random, fasting, and oral glucose tolerance tests.

For secondary data, information was gathered from system tools such as MC cohort registers, antenatal cards, and CTC2 cards. A data abstraction form was used as the data collection tool. The form included information on age, parity, and gestational age of the pregnancy.

3.10 Data Validity and Reliability

Data validity and reliability were ensured by verifying the data collection tool. These elements are crucial for minimizing errors from measurement issues in the study. Reliability refers to the accuracy and precision of a measurement procedure. The stability or test-retest reliability of the survey instrument was established through pilot testing, which demonstrated consistent results when the same survey was administered repeatedly to similar participants. The research tool was also translated into Swahili to ensure the information was clearly understood and reliable. Reliability was further assessed using Cronbach's alpha coefficient to determine the internal consistency of each tool in the questionnaire. The reliability analysis showed satisfactory discriminative power for the items in the questionnaire. The Cronbach's alpha values were approximately 0.83 for WWI, 0.86 for HIFAS, 0.88 for DDS, and 0.79 for METS, indicating that the tools and the entire questionnaire were valid and reliable (59).

3.11 Data Management and Analysis

Data were entered, cleaned and coded by using Microsoft excel and imported to SPSS version 25 for analysis. The data were summarized in percentages and tables. Each objective was analysed as follows:

- To determine the magnitude of GDM among pregnant women living with HIV in Dar es Salaam Tanzania, the proportion of women with GDM was calculated as the number of women with GDM over the total number of women interviewed.
- To determine the factors associated with GDM among pregnant women living with HIV in Dar es Salaam, Bivariate and multivariate logistic regression analysis was used, with statistical association measured by odd ratio and 95% CI. All variables found to be associated with gestation diabetes mellitus in bivariate analysis at a P-value of ≤ 0.2 were taken to multiple logistic regression analysis to control confounders(54).Age variable was also involved in multiple logistic regression as important confounder although it P values did not meet the above criteria. A P-value of < 0.05 was considered statistically significant in the analysis.

3.12 Ethical Considerations

Ethical clearance to conduct this research was granted by the MUHAS Research and Ethics Committee on April 11, 2023 (MUHAS-REC-01-2023-1613). Permission to conduct the study was also obtained from the authorities at the facilities where data were collected. Written consent was secured from all study participants, and voluntary participation was emphasized. To maintain privacy and confidentiality, unauthorized persons were prevented from accessing study information, and participants' anonymity was preserved by using participant IDs instead of names. The study's purpose and benefits were thoroughly explained to the participants. Consent forms detailed the study's purpose and associated benefits. Data collected were stored on a password-protected computer to prevent unauthorized access. No harm resulted from the study as it involved minimal invasive procedure during FPG.

3.13 Dissemination of the Research Findings

The research will be disseminated at MUHAS and rendered accessible in the MUHAS library for use. The report will be shared with all the facilities involved in this research for their internal usage. The study is also planned to be submitted to a journal for publication and be easily accessible to the public.

CHAPTER FOUR

4.0 RESULTS

4.1 Characteristics of study participants

In this study done to 426, the median age of participants was 31.0 years (SD: 5.56), and majority of them belonging to the age group of 20-35 (62.7%, n=267). Large number of them had access to different varieties of food, having a score of more than 4 in dietary diversity score (87.3%, n=372) and are food secured (85%, n=365). It has also been found that majority comes from middle-income families (59.1%, n=252). Majority are non-alcohol drinkers (94.8%, n=404) and have moderate level of physical activities (51.8%, n=219). The rest of the findings is as described in **Table 1.2** below.

Table 2: Social-demographic characteristics of pregnant women living with HIV in Dar es salaam, Tanzania

Variables	Number (n)	Percentage (%)
Employment status		
Professional	50	11.7
Clerical	6	1.4
Sales and services	157	36.9
Manual labour	132	30.9
Others	81	19
Age of a mother		
18-23 years	13	3.1
24-29 years	105	24.6
30-35 years	267	62.7
36 years and above	41	9.6
Parity		
Primigravida	116	27.2
Second pregnancy	125	29.3
Third pregnancy	94	22.1
Forth or more pregnancy	91	21.4
Marital status		
Single	71	16.7
Currently married	231	54.2
Divorced	13	3.1

Cohabiting	106	24.9
Widowed	5	1.2
Level of education		
No education	17	4.0
Primary education	81	19.0
Secondary education	235	55.2
Post-secondary education	93	21.8

4.1.1 Prevalence of GDM

The prevalence of GDM among participants was found to be 5.6%. This means out of 426 total participants, 24 were found to have GDM.

4.1.2 Factors Associated with GDM among Pregnant Women Living with HIV in Dar es Salaam, Tanzania.

Bivariate logistic regression analysis revealed significant association between high level of physical activity, overweight, third pregnancy, level of education, sales and service, unskilled labor, skilled labor and other occupational activities with GDM.

In multivariate analysis the following factors were found to be of statistical significance; overweight compared to normal weight (AOR:9.81, 95% CI 2.64-36.40, P=0.001). Third pregnancy as compared to primigravida (AOR: 5.66, 95% CI 1.11-28.80, p=0.037) and high level of physical activities compared to low level of physical activities (AOR:0.07, 95% CI0.01-0.77, p=0.031). Additionally, Mothers working in sales and services (AOR: 0.53,95% CI 0.01-0.25 P<0.001), Manual labor (AOR:0.04,95% CI 0.01-0.22 p<0.001), and other jobs (AOR:0.06,95% CI 0.01-0.342 p=0.002) were significantly less likely to experience GDM compared to those working as professionals.

Table 2: Multivariate logistic regression analysis for the factors associated with GDM among pregnant women living with HIV in Dar es salaam, Tanzania.

Variable	GDM		Bivariate Logistic Regression			Multiple Logistic Regression		
	No	Yes	COR	95%CI	p-value	AOR	95%CI	p-value
Age of the mother								
18-23	37	2						
24-29 years	202	7	0.64	0.13-3.21	0.59	0.18	0.02-1.35	0.095
30-35 years	114	5	0.81	0.15-4.36	0.81	0.35	0.05-2.48	0.290
36 yrs and above	49	10	3.78	0.78-18.28	0.10	1.62	0.23-11.48	0.627
Nutrition Status								
Normal	281	12						
Underweight	84	3	0.84	0.231-3.03	0.79			
Overweight	37	9	5.70	2.25-14.43	0.001*	9.81	2.64-36.40	0.001*
Alcohol Usage/Consumption								
Alcohol users	20	2						
Non-Alcohol user	382	22	0.58	0.13-2.62	0.476			
Marital Status								
Single	69	2						
Married	216	15	2.40	0.54-10.74	0.254			
Cohabiting	102	4	1.35	0.24-7.59	0.731			
Divorced	11	2	6.27	0.80-49.25	0.081	11.72	0.55-250.98	0.115
Widowed	4	1	8.63	0.64-116.53	0.105	5.81	0.53-63.14	0.148
Level of Physical Activities (Exercise Habit)								
Low	95	11						
Moderate	207	12	0.50	0.21-1.18	0.112	0.50	0.15-1.64	0.249
High	100	1	0.09	0.01-0.68	0.020*	0.07	0.01-0.77	0.031*
Level of Awareness (Knowledge about GDM)								
Have knowledge	69	5						
Have no knowledge	333	19	0.79	0.28-2.18	0.646			
Level of Education								
No education	13	4						
Primary school	78	3	0.13	0.03-0.62	0.011*	0.11	0.01-1.11	0.062
Secondary school	222	13	0.19	0.05-0.67	0.009*	0.17	0.02-1.24	0.080
Post-seconday school	89	4	0.15	0.03-0.66	0.012*	0.20	0.02-1.90	0.161

Variable	GDM		Bivariate Logistic Regression			Multiple Logistic Regression		
Employment Status								
Professional	41	9						
Clerical	5	1	0.91	0.10-8.78	0.94			
Sales & services	151	6	0.18	0.06-0.54	0.002*	0.53	0.01-0.25	<0.001*
Manual labour	127	5	0.18	0.06-0.57	0.003*	0.04	0.01-0.22	<0.001*
Others	78	3	0.17	0.05-0.68	0.012*	0.06	0.01-0.342	0.002*
Family History of DM								
History of DM	26	2						
No history of DM	376	22	0.76	0.17-3.41	0.721			
Parity								
Primigravida	113	3						
2^{nd} pregnancy	120	5	1.57	0.37-6.72	0.544			
3rd pregnancy	84	10	4.48	1.20-16.80	0.026*	5.66	1.11-28.80	0.037*
4^{th} and more	85	6	2.66	0.65-10.94	0.175	4.26	0.85-21.433	0.079
Dietary Diversity Score								
More than 4 scores	352	20						
Less than 4 scores	50	4	1.41	0.46-4.29	0.547			
Weighted Wealth Index								
Poor	16	1						
Middle	239	13	0.87	0.11-7.08	0.897			
Rich	147	10	1.09	0.13-9.06	0.938			
Food Insecurity Access Scale								
Food secure	342	22						
Food insecure	60	4	1.14	0.38-3.45	0.817			
ART								
ART users	402	24						
Non-ART users	0	0						

Note: ** significant at p-value <0.05*

COR: Crude odd ratio, AOR: Adjusted Odds Ratio, CI: Confident interval

CHAPTER FIVE

5.0 DISCUSSION

The study was set to assess the magnitude of GDM among women living with HIV attending ANC and CTCs of the four selected high-level facilities in Dar es salaam, Tanzania. It further aimed to determine factors associated with GDM among the pregnant women living with HIV. Of all 426 of pregnant women living with HIV participants of this study, 5.6% were diagnosed with GDM. Level of education, occupation, high level of physical activities, third pregnancy and overweight were significant predictors of GDM.

The magnitude of GDM among women living with HIV in Dar es salaam was found to lower than GDM in general population reported in Dar es Salaam at 8.5%(20). The finding is also slightly lower than GDM in Tanzania's general population reported to be 6% (22,60).This might be so due to the fact that, pregnant women with HIV are more likely to seek medical expertise than those in general population(26) . This behavior makes them aware of risk factors for other NCDs including dietary risks, hence becoming less likely to be affected with GDM by avoiding the risk attributed to other NCDs (28). Methodology of this study may also contribute to the lower prevalence found in this study. It was also found that the prevalence in this study was double to that in the neighbor county of Kenya (61). Unlike this study, the Kenyan study was done in semi-urban setting at Eldoret (61). Living in urban area is associated with higher prevalence of GDM than in rural areas and semi-urban areas (20).The study also had a small sample size of PLHIV. This might explain why the prevalence that was found was lower compared to this study, as sample size to draw unambiguous conclusion was limited (61).

In this study, one of the important factors associated with GDM was found to be level of physical activities, high level of physical activities was found to offer protection against GDM. This may be due to the fact, that increases physical activities utilize excesses carbohydrates and lipids and hence increases tissue insulin sensitivity and therefore lowering risk of GDM (37). The finding agrees with previous studies (25,26,28). Inactivity reduces cellular response to insulin and as a result predisposing an individual to Diabetes (1).Compared to the respondent who had lower level

of physical activities ,those who had higher level of physical activities had 97 less chance of having GDM, this is significant as it shows that the entire cause of the disease can be altered by increased level of physical activities of the mother. In this light it is important to deal with this medical condition as its prevention is cost effective and it can be easily implemented if proper health education will be provided to the mothers during their antenatal visits.

Overweight of the mother showed increased odds of GDM by almost 10 folds in this study. Due to the risk that overweight carries it is important to address this issue early in the cause of the pregnancy than later. Different studies have come to the same conclusion that overweight is one of very important predictor of GDM (20,62). Being overweight is associated with increased body fats (adipose) and making cells unresponsive to insulin released post-meal and hence risk of having GDM (49).Overweigh has been associated with multiple NCDs from hypertension , coronary heart diseases and other NCDs to name the few, if this condition is left an addressed will continue to deepen or society in a cycle of ill health, as currently modernization, eating habits and sedentary life style is on trend in developing countries dragging this countries in similar trend in shown in developed countries (63).

Grand multi-parity has been long suspected of causing multiple health risk to the mother (16). In this study women on their third pregnancy had a five-fold risk of having GDM as compared to primigravida. This is in agreement with another studies shows grand parity is a risk factor for GDM (31,41,64).Grand multi-parity apart from its involvement in causing GDM, it has been associated with increased risk of hypertension, premature rupture of membranes , intrauterine fetal death and other adverse effect of mother and the child(65).This calls for a multi-disciplinary approach as the issue affects the health of both mother and child and society as a whole. Family planning advocacy will help in tackling the problem of GDM and other NCDs associated with this medical condition which in turn will increase overall maternal and child health.

Occupation involving high physical demands, often called blue collar jobs were found to offer protective values against GDM in this study. Women working in sales and services, manual labor and other activities such as agriculture were less likely to have GDM compared to those working as professionals. Similarly to the findings obtained in level of physical activities, blue collar jobs

demands high level of physical activities and there for help in burning excess food and as he result protecting a person from getting GDM as one of type 2 diabetes(38). Different studies has shown the shown that increase level of physical activities offer protection from different non communicable disease in this case GDM(28,66).

Hypotheses which was put forward could not be addressed as there were no respondents who were not on ART during the study period due to detect and treat policy adopted by Tanzania government.

Study Limitation

Due to test and treat HIV policy, this study could not assess the association between GDM and ART usage. All 426 participants were on ART regime during the study, and therefore the effect of ART on GDM could not be ascertained. The other limitation included likelihood of recall bias as the research was done at health facility and not at their homes where they could fact check with a spouse and others house members mainly when comes to nutritional, family history and wealth index. Finally measuring nutrition status by a means of MUAC has its own challenges as it is not method commonly used in measuring nutrition status in adult, so modification was made to make it suitable for this group of participants.

Mitigation

Biases were minimized during the training of research assistants by emphasizing the importance of obtaining accurate responses to ensure the study's accuracy was not compromised. Additional biases were reduced by selecting a larger sample size, which decreases the likelihood of results being due to chance alone. Study limitations were further mitigated by establishing well-justified inclusion and exclusion criteria. Furthermore, to reduce memory bias written record were used to fact check whenever necessary, antenatal card was useful tool as it contained information on social-demographic characteristics and maternal demographic characteristics. Measurements errors was reduced by measuring each item twice. Glucose tolerance test was administered to all who were found to have GDM in FBG to confirm the accuracy of measurement and diagnosis made.

Conclusion

GDM was prevalent among 5.6% of pregnant women living with HIV in Dar es salaam, Tanzania. This magnitude is slightly lower compared to that of general population reported in Dar es salaam (8.5%), and that of a country (6%). Also, this study found factors associated with GDM, including physical inactivity, overweight, third parity, manual labor such as sales and services.

Recommendations

Although the magnitude of GDM was slightly lower than that of general population, the reported burden is still of public health importance, and therefore, efforts are still needed to screen and manage GDM along other PMTCT services in Tanzania.

- This burden can be addressed through specific and tailored interventions along the reported risk factors. Through encouraging physical activities among pregnant women living with HIV attending ANC and PMTCT services, targeting specific sub populations such as those in the third or more pregnancies, with overweight, and those working in manual labor and other informal unskilled labors including sales and services, may help to curb this burden in Tanzania and other areas with similar contexts.
- This finding also calls for policy changes when it comes for GDM management, we recommend that random glucose measurement be included in routine antenatal visits check from 24^{th} week to detect and treat the disease condition early for better outcome for both mothers and babies.
- Further studies exploring the link between HIV and other NCDs including HIV need to be done as there is a paucity of data in this subject, the findings will help better the health outcome of people living with HIV.

REFERENCES

1. Lagathu C, Béréziat V, Gorwood J, Fellahi S, Bastard JP, Vigouroux C, et al. Metabolic complications affecting adipose tissue, lipid and glucose metabolism associated with HIV antiretroviral treatment. Expert Opin Drug Saf [Internet]. 2019;18(9):829–40. Available from: https://doi.org/10.1080/14740338.2019.1644317

2. Bilano VL, Ota E, Ganchimeg T, Mori R, Souza JP. Risk factors of pre-eclampsia/eclampsia and its adverse outcomes in low- and middle-income countries: A WHO secondary analysis. PLoS One. 2014;9(3):1–9.

3. Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. Lancet [Internet]. 2009;373(9677):1773–9. Available from: http://dx.doi.org/10.1016/S0140-6736(09)60731-5

4. Cakir M, Altunbas H, Karayalcin U, Umpierrez GE, Kitabchi AE. Hyperglycemia: An independent marker of in-hospital mortality in patients with undiagnosed diabetes [1] (multiple letters). J Clin Endocrinol Metab. 2003;88(3):1402.

5. Zhang J, Zeisler J, Hatch MC, Berkowitz G. Epidemiology of Pregnancy-induced Hypertension. 1997;19(2):218–32.

6. Loos RJF, Yeo GSH. The genetics of obesity: from discovery to biology. Nat Rev Genet. 2022;23(2):120–33.

7. Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (Version 2) [Internet]. 2006. Available from: www.fantaproject.org

8. Mascolini M. What speeds aging with HIV-and what can be done about it. Res Initiat Action. 2010;15:1–59.

9. Harries AD, Kumar AM V., Satyanarayana S, Lin Y, Takarinda KC, Tweya H, et al. Communicable and non-communicable diseases: connections, synergies and benefits of integrating care. Public Heal Action. 2015 Sep 19;5(3):156–7.

10. Bygbjerg IC. Double burden of noncommunicable and infectious diseases in developing countries. Science (80-). 2012;337(6101):1499–501.

11. Wendland EM, Torloni MR, Falavigna M, Trujillo J, Dode MA, Campos MA, et al. Gestational diabetes and pregnancy outcomes-a systematic review of the World Health Organization (WHO) and the International Association of Diabetes in Pregnancy Study Groups (IADPSG) diagnostic criteria [Internet]. 2012. Available from: http://www.biomedcentral.com/1471-2393/12/23

12. Biadgo B, Ambachew S, Abebe M, Melku M. Gestational diabetes mellitus in HIV-infected pregnant women: A systematic review and meta-analysis. Diabetes Res Clin Pract [Internet]. 2019;155:107800. Available from: https://doi.org/10.1016/j.diabres.2019.107800

13. Papp E, Balogun K, Banko N, Mohammadi H, Loutfy M, Yudin MH, et al. Low Prolactin and High 20-α-Hydroxysteroid Dehydrogenase Levels Contribute to Lower Progesterone Levels in HIV-Infected Pregnant Women Exposed to Protease Inhibitor-Based Combination Antiretroviral Therapy. J Infect Dis. 2016 May 15;213(10):1532–40.

14. Mitanchez D, Yzydorczyk C, Siddeek B, Boubred F, Benahmed M, Simeoni U. The offspring of the diabetic mother - Short- and long-term implications. Best Pract Res Clin Obstet Gynaecol. 2015 Feb 1;29(2):256–69.

15. Hoffman RM, Newhouse C, Chu B, Stringer JSA, Currier JS. Non-communicable Diseases in Pregnant and Postpartum Women Living with HIV: Implications for Health Throughout the Life Course. Curr HIV/AIDS Rep. 2021;18(1):73–86.

16. Papp E, Mohammadi H, Loutfy MR, Yudin MH, Murphy KE, Walmsley SL, et al. HIV Protease Inhibitor Use during Pregnancy is Associated with Decreased Progesterone Levels, Suggesting a Potential Mechanism Contributing to Fetal Growth Restriction. In: Journal of Infectious Diseases. Oxford University Press; 2015. p. 10–8.

17. Tiliscan C, Aramă V, Mihăilescu R, Munteanu DI, Streinu-Cercel A, Ion DA, et al. Leptin expression in HIV-infected patients during antiretroviral therapy. Germs. 2015;5(3):92–8.

18. Holt E,Peery H.Basic medical Endocrinology forth edition.Academic press.2010.p 277-290.

19. Tanzania Ministry of Health/RCHS:Focused Antenatal Care Malaria and Syphilis in Pregnancy.Orientation package for service providers.7-1-2002.

20. Mwanri AW, Kinabo J, Ramaiya K, Feskens EJM. Prevalence of gestational diabetes mellitus in urban and rural Tanzania. Diabetes Res Clin Pract [Internet]. 2014;103(1):71–8. Available from: http://dx.doi.org/10.1016/j.diabres.2013.11.021

21. Ogurtsova K, da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. Diabetes Res Clin Pract [Internet]. 2017;128:40–50. Available from: http://dx.doi.org/10.1016/j.diabres.2017.03.024

22. Natamba BK, Namara AA, Nyirenda MJ. Burden, risk factors and maternal and offspring outcomes of gestational diabetes mellitus (GDM) in sub-Saharan Africa (SSA): a systematic review and meta-analysis. BMC Pregnancy Childbirth. 2019;19(1):1–11.

23. Ndumwa HP, Kessy AT, Amani DE, Kitambala E, Ngowi JE, Kapologwe N, et al. Mitigating the Rising Burden of Non-Communicable Diseases through Locally Generated Evidence-Lessons from Tanzania. Ann Glob Heal. 2023;89(1):1–12.

24. Pastakia SD, Njuguna B, Onyango BA, Washington S, Christoffersen-Deb A, Kosgei WK, et al. Prevalence of gestational diabetes mellitus based on various screening strategies in western Kenya: A prospective comparison of point of care diagnostic methods. BMC Pregnancy Childbirth. 2017;17(1):1–9.

25. Hall V, Thomsen R, Henriksen O, Lohse N. Diabetes in Sub Saharan Africa 1999-2011: Epidemiology and public health implications. A systematic review. BMC Public Health. 2011;11.

26. Koivusalo SB, Rönö K, Klemetti MM, Roine RP, Lindström J, Erkkola M, et al. Gestational Diabetes Mellitus Can Be Prevented by Lifestyle Intervention: The Finnish Gestational

Diabetes Prevention Study (RADIEL): A Randomized Controlled Trial. Diabetes Care. 2016;39(1):24–30.

27. Grunnet LG, Hjort L, Minja DT, Msemo OA, Møller SL, Prasad RB, et al. High prevalence of gestational diabetes mellitus in rural tanzania—diagnosis mainly based on fasting blood glucose from oral glucose tolerance test. Int J Environ Res Public Health. 2020 May 1;17(9).

28. Hayashi A, Oguchi H, Kozawa Y, Ban Y, Shinoda J, Suganuma N. Daily walking is effective for the management of pregnant women with gestational diabetes mellitus. J Obstet Gynaecol Res. 2018;44(9):1731–8.

29. Mdoe MB, Kibusi SM, Munyogwa MJ, Ernest AI. Prevalence and predictors of gestational diabetes mellitus among pregnant women attending antenatal clinic in Dodoma region, Tanzania: An analytical cross-sectional study. BMJ Nutr Prev Heal. 2021;4(1):69–79.

30. Joosten MM, Chiuve SE, Mukamal KJ, Hu FB, Hendriks HFJ, Rimm EB. Changes in Alcohol Consumption and Subsequent Risk of Type 2 Diabetes in Men. 2011;60(January).

31. Berghella, V. (Ed.). (2017). Maternal-Fetal Evidence Based Guidelines (3rd ed.). CRC Press. https://doi.org/10.1201/9781315200910.

32. Conger RD, Donnellan MB. An interactionist perspective on the socioeconomic context of human development. Annu Rev Psychol. 2007;58:175–99.

33. Liu J, Liu E, Leng J, Pan L, Zhang C, Li W, et al. Indicators of socio-economic status and risk of gestational diabetes mellitus in pregnant women in urban Tianjin , China. Diabetes Res Clin Pract [Internet]. 2018; Available from: https://doi.org/10.1016/j.diabres.2018.08.023

34. MoHCDGEC, MoH, NBS, OCGS. Tanzania demographic and health survey and malaria indicator survey (TDHS-MIS) 2015–16. In. Dar es Salaam, Tanzania, and Rockville, Maryland, USA; 2016.

35. Zackoff MW, Real FJ, Abramson EL, Li STT, Klein MD, Gusic ME. Enhancing Educational Scholarship Through Conceptual Frameworks: A Challenge and Roadmap for

Medical Educators. Vol. 19, Academic Pediatrics. Elsevier Inc.; 2019. p. 135–41.

36. Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Di Renzo GC, Roura LC, McIntyre HD, Morris JL DH. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus: A pragmatic guide for diagnosis, management, and care. Int J Gynaecol Obstet. 2015 Oct;131 Suppl 3:S173-S211.DOI10.1016/S0020-7292(15)30033-3.

37. Fowler MG, Qin M, Fiscus SA, Currier JS, Flynn PM, Chipato T, et al. Benefits and Risks of Antiretroviral Therapy for Perinatal HIV Prevention. N Engl J Med. 2016 Nov 3;375(18):1726–37.

38. Al-Kuwari MG. Prevalence and predictors of gestational diabetes in Qatar [Internet]. Vol. 40, Diabetologia Croatica. 2011. Available from: https://www.researchgate.net/publication/269396914

39. Mboya E, Mizinduko M, Balandya B, Mushi J, Sabasaba A, Amani DE, et al. HIV burden and the global fast-track targets progress among pregnant women in Tanzania calls for intensified case finding: Analysis of 2020 antenatal clinics HIV sentinel site surveillance. PLoS One [Internet]. 2023;18(10 October):1–17. Available from: http://dx.doi.org/10.1371/journal.pone.0285962

40. Nombo AP, Mwanri AW, Brouwer-Brolsma EM, Ramaiya KL, Feskens EJM. Gestational diabetes mellitus risk score: A practical tool to predict gestational diabetes mellitus risk in Tanzania. Diabetes Res Clin Pract [Internet]. 2018;145:130–7. Available from: https://doi.org/10.1016/j.diabres.2018.05.001

41. Amirhessami-Aghili N, Spector SA. Humman immunodeficieny virus type 1 infection of human placenta: potential route for fetal infection . Vol. J virol. 1991. 65:2231-6.

42. Kim M, Park HJ, Seol JW, Jang JY, Cho YS, Kim KR, et al. VEGF-A regulated by progesterone governs uterine angiogenesis and vascular remodelling during pregnancy. EMBO Mol Med. 2013 Sep;5(9):1415–30.

43. Van Dyke RB, Chadwick EG, Hazra R, Williams PL, Seage GR. The PHACS SMARTT study: Assessment of the safety of in utero exposure to antiretroviral drugs. Vol. 7, Frontiers in Immunology. Frontiers Media S.A.; 2016.

44. Costrini N V., Kalkhoff RK. Relative effects of pregnancy, estradiol, and progesterone on plasma insulin and pancreatic islet insulin secretion. J Clin Invest. 1971;50(5):992–9.

45. Ashby JP, Shirling D, Baird JD. Effect of progesterone on insulin secretion in the rat. J Endocrinol. 1978 Mar;76(3):479-86. doi: 10.1677/joe.0.0760479. PMID: 204724.

46. Frühbeck G, Salvador J. Relation between leptin and the regulation of glucose metabolism. Diabetologia. 2000 Jan;43(1):3-12. doi: 10.1007/s001250050002. PMID: 10663211.

47. Lopez-Vicchi F, De Winne C, Brie B, Sorianello E, Ladyman SR, Becu-Villalobos D. Metabolic functions of prolactin: Physiological and pathological aspects. Vol. 32, Journal of Neuroendocrinology. Blackwell Publishing Ltd; 2020.

48. Li M, Chen Y, Wang Y, Wang H, Ding X, Li G. Maternal gestational diabetes in singleton pregnancies conceived by ART may be modified by periconceptional B vitamins. Front Nutr. 2023;9(January).

49. Lindsay RS. Gestational diabetes: causes and consequences. Vol. 9, British Journal of Diabetes and Vascular Disease. 2009. p. 27–31.

50. Hu SL, He BT, Zhang RJ. Association between maternal alcohol use during pregnancy and gestational diabetes mellitus: a meta-analysis. Int J Diabetes Dev Ctries. 2021;41(2):189–95.

51. Pavesi E, Da Silva Amorim MV, Boing AF, Wagner KJP. Influence of alcohol and tobacco consumption on maternal and perinatal outcomes of puerperal women attended at the brazilian national health system. Rev Bras Saude Matern Infant. 2023;23:1–8.

52. Rani PR, Begum J. Screening and Diagnosis of Gestational Diabetes Mellitus , Where Do We Stand. 2016;1–4.

53. Mghanga FP, Maduhu EA, Nyawale HA. Prevalence and associated factors of gestational diabetes mellitus among rural pregnant women in southern Tanzania. Ghana Med J. 2020 Jun 1;54(2):82–7.

54. Ahamada H, Sunguya BF. The Burden of Undernutrition and Its Associated Factors Among Children Below 5 Years of Age in Bambao Region, Comoros. Front Nutr. 2022 Apr 26;9.

55. Sunguya BF, Zhu S, Mpembeni R, Huang J. Trends in prevalence and determinants of stunting in Tanzania: An analysis of Tanzania demographic health surveys (1991-2016). Nutr J. 2019 Dec 10;18(1).

56. Phuong Nguyen URKGCEL nguyen,Hoa PTN and RM. Mid-upper-arm and calf circumferences are useful predictor of underweight in women of reproductive age in northern Vietnam. Food Nutr Bull . 2014;35(no.3).

57. Ricalde AE, Velásquez-Meléndez G, Cristina A, Tanaka ' A, De Siqueira AAF. Revista de Saúde Pública Mid-upper arm circumference in pregnant women and its relation to birth weight* Perímetro braquial da gestante e sua relação com o peso ao nascer. 1998.

58. Health MOF, Medical NFOR. Ministry of Health and Social Welfare. Tanzania Steps Surveys Report.https://www.researchgate.net/publication/311065616. 2013;

59. Taber KS. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. Res Sci Educ. 2018;48(6):1273–96.

60. Macaulay S, Dunger DB, Norris SA. Gestational diabetes mellitus in Africa: A systematic review. PLoS One. 2014;9(6).

61. Pastakia SD, Kosgei WK, Christoffersen-Deb A, Kiragu B, Hector JN, Anusu G, et al. Risk of Dysglycemia in Pregnancy amongst Kenyan Women with HIV Infection: A Nested Case-Control Analysis from the STRiDE Study. J Diabetes Res. 2021;2021.

62. Bouthoorn SH, Silva LM, Murray SE, Steegers EAP, Jaddoe VWV, Moll H, et al. Low-educated women have an increased risk of gestational diabetes mellitus: the Generation R Study. Acta Diabetol. 2015 Jun 1;52(3):445–52.

63. Bigna JJ, Noubiap JJ. The rising burden of non-communicable diseases in sub-Saharan Africa. Lancet Glob Heal [Internet]. 2019;7(10):e1295–6. Available from: http://dx.doi.org/10.1016/S2214-109X(19)30370-5

64. Almahmeed B, Shah BR, Mukerji G, Ling V, Booth GL, Feig DS. Effect of multiparity and ethnicity on the risk of development of diabetes: a large population-based cohort study. Diabet Med. 2017;34(11):1637–45.

65. Muniro Z, Tarimo CS, Mahande MJ, Maro E, Mchome B. Grand multiparity as a predictor of adverse pregnancy outcome among women who delivered at a tertiary hospital in Northern Tanzania. BMC Pregnancy Childbirth 19. 2019;5(222).

66. Rute-Larrieta C, Mota-Cátedra G, Carmona-Torres JM, Mazoteras-Pardo V, Barroso-Corroto E, Navarrete-Tejero C, et al. Physical Activity during Pregnancy and Risk of Gestational Diabetes Mellitus: A Meta-Review. Life. 2024;14(6):1–21.

APPENDICES

APPENDIX I: Informed Consent (English Version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES (MUHAS)

DIRECTORATE OF RESEARCH AND PUBLICATIONS

INFORMED CONSENT

Consent to participate in this study

Greetings! My name is **Emmanuel Mwakasumi.** I am conducting a study on the magnitude and factors associated with Gestation Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania

Purpose of the study

This study aims at collecting information from the pregnant women who are attending their ANC services and CTC in Dar-es- salaam, which will help on understanding the magnitude and factors associated with Gestation Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania. You are being asked to participate in this study because you may have particular knowledge and experiences that may be important for this study.

What participation involves

If you agree to participate in this study, the researcher will interview you in depth or discuss with you some questions on the magnitude and factors associated with Gestation Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania. The interview will take 45 minutes to 1 hour

Confidentiality

I would like to assure you that all the information collected will be confidential. Only people working in this study will have access to the information. We will not use names on the records of the information you provide.

Risks.

No harm is anticipated to come upon joining this study.

Rights to withdrawal and alternatives

Taking part in this study is completely at your will. If you choose not to participate in this study or if you decide to stop participating in the study, you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled.

Benefits

The information you provide will help in portraying a clear picture on the magnitude and factors associated with Gestation Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania. This information will turn into help of development of effective interventions for raising awareness among pregnant women living with HIV on the magnitude and factors associated with Gestation Diabetes Mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania

Who to contact if you have any question about this study

In case of any questions about this study please don't hesitate to contact **Principal Investigator, Emmanuel A Mwakasumi**; Muhimbili University of Health and Allied Sciences (MUHAS), P.O. Box 65001, Dar es Salaam (Tel. No. +255714916166). And any questions about right to conduct this study, you may call **Chairman of University Research and Publication Committee, Dr Nahya Salim Masoud** P.O .Box 65001, Dar es Salaam Tel, 2150302-6, **Or Prof Bruno Sunguya and Mr Elias Bukundi** who are the supervisors of this study**; Tel: +255685217272 and +255764207615 respectively.**

Do you agree? Yes…….. No……

Participant agrees ……..... Participants does not Agree. ……...…

I, …… Have read the contents of this consent form and my questions have been adequately answered. I therefore agree to participate in this study.

Signature of the participant ……Date ……

Signature of the interviewer …….. Date ……

APPENDIXES II: Informed Consent (Swahili Version)

Chuo Cha Afya Na Sayansi Shirikishi Muhimbili (MUHAS)

Kurugenzi Ya Utafiti Na Machapisho

Fomu Ya Ridhaa

Ridhaa ya kushiriki katika utafiti huu

Salamu! Naitwa **Emmanuel A Mwakasumi**, ninafanya utafiti kuhusu ukubwa na mambo yanayohusiana na kisukari wakati wa ujauzito miongoni mwa wajawazito wanaoishi na VVU jijini Dar es Salaam, Tanzania.

Malengo ya utafiti

Utafiti huu unalenga kukusanya taarifa kutoka kwa wajawazito wanaohudhuria huduma zao za cliniki na matibabu ya vvu jijini Dar-es- salaam, ambazo zitasaidia kuelewa ukubwa wa tatizo la kisukari wakati wa ujauzito na mambo yanayohusiana na kisukari wakati wa ujauzito miongoni mwa wajawazito wanaoishi na virusi vya ukimwi jijini Dar es Salaam, Tanzania. Unaombwa kushiriki katika utafiti huu kwa sababu unaweza kuwa na maarifa na uzoefu mahususi ambao unaweza kuwa muhimu kwa utafiti huu.

Ushiriki

Ukikubali kushiriki katika utafiti huu, mtafiti atakuhoji kwa kina au kujadili na wewe baadhi ya maswali kuhusu ukubwa na mambo yanayohusiana na tatizo la kisukari wakati wa ujauzito na mambo yanayohusiana na kisukari wakati wa ujauzito miongoni mwa wajawazito wanaoishi na virusi vya ukimwi jijini Dar es Salaam, Tanzania. MahojiaNo yatachukua dakika 45 hadi saa 1

Usiri

Ningependa kukuhakikishia kuwa taarifa zote zitakazokusanywa kutoka kwako zitakuwa ni siri, watu wanaofanya kazi katika utafiti huu tu ndio wanaweza kuziona taarifa hizi. Hatutaweka jina lako au taarifa yoyote ya utambulisho kwenye kumbukumbu za taarifa utakazozitoa.

Madhara

Hakuna madhara yanayotarajiwa kukupata kutokana na kushiriki kwako katika utafiti huu.

Haki ya kujitoa na mbadala wowote

Kushirika katika utafiti huu ni uchaguzi wako, kama utachagua kutoshiriki au utaamua kusitisha kushiriki hutapata madhara yoyote. Unaweza kusitisha kushiriki katika utafiti huu muda wowote hata kama ulisharidhia kushiriki. Kukataa kushiriki au kujitoa katika utafiti huu hakutasababisha adhabu yoyote au upotevu wa faida yoyote unayotakiwa kupata. Lakini, kuzingatia umuhimu wako katika utafiti huu, unaombwa kushiriki kikamilifu katika mahojiNo tutakayofanya.

Faida

Taarifa utakazotoa zitasaidia katika kuonesha picha ya wazi juu ya ukubwa na mambo yanayohusiana na kisukari wakati wa ujauzito miongoni mwa wanawake wajawazito wanaoishi na VVU jijini Dar es Salaam, Tanzania. Habari hii itageuka kuwa msaada wa maendeleo ya afua madhubuti za kuongeza uelewa kwa wanawake wajawazito wanaoishi na VVU juu ya ukubwa na sababu zinazohusiana na kisukari cha ujauzito miongoni mwa wajawazito wanaoishi na VVU huko Dar es Salaam, Tanzania.

Mawasiliano

Kama una maswali kuhusu utafiti huu unaweza kuwasiliana na mtafiti, **Emmanuel Mwakasumi**;**,** Chuo Kikuu cha Tiba na Sayansi Shirikisi Muhimbili, S.L.P 65001, Dar es Salaam, (Simu. No. 255714916166). Na kama una maswali yoyote kuhusu haki zako kama mshiriki unaweza kupiga simu kwa Mwenyekiti wa kamati ya chuo ya utafiti na machapisho, **Dr Nahya Salim Masoud** Simu namba: 2150302-6, 2152489 au **Prof. Bruno Sunguya (simu namba +255685217272) na Mr Elias Bukundi** (**simu namba +255764207615)** ambao niwa simamizi wa utafiti huu.

Makubaliano

Unakubali kushiriki katika utafiti huu?

NDIYO ☐

HAPANA ☐

Nimesoma na kuielewa hii fomu. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki_____

Tarehe ya makubaliano _____

APPENDIX III: Questionnaire (English Version)

QUESTIONNAIRE ON THE MAGNITUDE AND FACTORS ASSOCIATED WITH GESTATIONAL DIABETES MELLITUS AMONG PREGNANT WOMEN LIVING WITH HIV IN DAR ES SALAAM REGION, TANZANIA.

Questionnaire Number:

_____ Hospital ___

Researcher code:

SECTION A; DEMOGRAPHIC CHARACTERISTICS OF THE PARICIPANTS

Put a tick (√) for each of the response of your choice, fill in the gap or brackets as deemed necessary

No	Question	Response	Brackets
1.	How old were you at your last Birthday (years)?	Fill in (years) (……)	
2.	How old were you when you were pregnant for the first time?	Fill in ……(years)	

3.	What is your marital status?	1. Married 2. Never married 3. Divorced 4. Widowed 5. Living together	
4	Does your husband/partner have other wives?	1. Yes 2 No 3 Don't know	
5.	What is the highest level of your education?	1. No education 2. Primary education 3. Secondary education 2. Post-secondary education	
6.	What is the highest level of your education?	1. No education 2. Primary education 3. Secondary education 4. Post-secondary education	

7.	How many people are living in your Household?	1. Fill in number ……..	
8.	How many children under 5 years of Age are living in this household?	1. Boys: …….. 2. Girls: ……..	
9.	What is the main occupation of the head of the household?	1. Unskilled manual labor 2. Employee 3. Food seller 4. Businessman/Businesswoman 5. Farmer 6. Small mining activities 7. Other: please specify ……	

10.	What is the main source of drinking water for members of your household?	1. Piped water 2. Dug well 3. Water from spring 4. Rain water 5. Surfaced water (River/lake/pond) 6. Bottle water 7. Other: please specify …….	
11.	Where is that water source located?	1. In own dwelling 2. In own yard/plot 3. Elsewhere	
12.	In the past two weeks, was the water From this source Not available for at least one complete day?	1. Yes 2. No 3. Don't kNow	
13.	What method does the household use to treat drinking water?	1. Use water filter 2. Boil water 3. Add chlorine/bleach 4. No treatment 5. Other: please specify ……	
14.	What kind of toilet facility do members of your household usually use?	1. Improved pit latrine 2. Unimproved pit latrine 3. Pour flush latrine 4. No toilet/bush/farms 5. Other: please specify ……	
15.	Do you share this toilet with other Households?	1. Yes 1. No (Go to Question 17)	

16.	Including your own household, how many use this toilet facility?	1. Less 10 households 2. More than 10 households Don't kNow	
17.	Where is this toilet facility located?	1. In own dwelling 2. In own yard/plot Elsewhere	
18.	What type of fuel does your household mainly use for cooking?	1. Bottled Gas 2. Electricity 3. Charcoal 4. Firewood 5. Paraffin/Kerosene 6. Crop residuals, straw, grass 3. Other: Please specify ……..	
19.	Is this cooking usually done in the house, in a separated building, or outdoors?	1. In the house 2. In a separated building 3. Outdoors 7. Other: please specify ……	

20.	What is the main source of energy for lighting in the household?	1. Electricity 2. Solar panel 3. Candle 4. Kerosene lamps 5. Other: please specify ……	
21.	How many rooms in this household are used for sleeping?	Fill number of rooms ……	
22.	Does this household own any livestock, herds, other farms animals, or poultry?	1. Yes 2. No (GO to question 24)	

23.	How many of the following animals do this household own?	1. Cows ……. 2. Cattle ……. 3. Goats ……. 4. Sheep ……. 5. Chicken/Poultry …… 6. Other: please specify …….	
24.	Does any member of this household own any agricultural land?	1. Yes 2. No (Go to question 27)	
25.	How many agricultural lands do members of this household own?	Fill in number …….	
26.	Does your household have: 1. A functional television 2. A functional radio 3. A functional fixed-phone 4. A functional computer 5. A functional refrigerator 6. A functional Generator 7. An electrical iron	If YES how many? Please state 1. Yes/No …… 2. Yes/No …… 3. Yes/No …… 4. Yes/No …… 5. Yes/No …… 6. Yes/No …… 7. Yes/No ……	
27.	Does any member of this household own: 1. A watch? 2. A mobile phone? 3. A bicycle? 4. A motorcycle 5. An animal drawn cart? 6. A car or truck? 7. A boat with a motor?	If YES how many? Please state 1. Yes/No …… 2. Yes/No …… 3. Yes/No …… 4. Yes/No …… 5. Yes/No …… 6. Yes/No …… 7. Yes/No ……	

28	Does any member of this household have a bank account?	1. Yes 2. No	
29.	What is the main source of food in the household come from?	1. Own crop farming 2. Purchasing food 3. Supply from relatives/friends 4. Government rations Other: please specify …….	
30.	What food do you commonly eat in the house?	*Can select more than one option* 1. Legumes and nuts 2. Grains, roots, and tubers 3. Dairy products (milk yogurt, cheese) 4. Flesh food (meat, fish, poultry, and liver/organ meat) 5. Eggs 6. Fruits 7. Cassava and banana 8. Vitamin A-rich fruits and vegetables Other: please specify ……	

31.	Does the household use water and soap, or other cleansing agent at the place for hand washing?	1. Soap or detergent (bar, liquid, powder, paste) 2. Ash, mud, sand 3. None	

SECTION B; FACTORS ASSOCIATED WITH GESTATIONAL DIABETES MELLITUS (GDM)

32	How many times have you ever conceived? (If prime go to number 35)	(……)	
33	What was the birth weight of the previous child?	(…….) Kg	

34	1. Have you ever had a caesarian section due to a big baby?	1) Yes 2) No	
35	How many months pregnant are you? Do you remember the date of your last menstrual period?	(……) (Convert it in weeks and verify it in Antenatal card)	
36	Have you ever had a pregnancy that miscarried, was aborted, or ended in stillbirth?	1) Yes 2) No	
Anthropometric measurements and Biochemical measurements			
37	Weight in Kg	(……..) kg	
38	Height in centimeters	(……...) cm	
39	MUAC (middle upper arm circumference)	(…….) cm	
40	Fasting blood glucose: mmol/l	mmol/l ⌊_⌋⌊_⌋ . ⌊_⌋⌊_⌋	
41	Oral glucose tolerance test	mmol/l ⌊_⌋⌊_⌋ . ⌊_⌋⌊_⌋	
Work			
I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do Not consider yourself to be a physically active person. Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate			
42	Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like lifting heavy loads, manual construction work, digging etc for at least 10 minutes continuously?	1) Yes 2) No (go to Q 48)	( )

43	In a typical week, on how many days do you do vigorous-intensity activities as part of your work?	Number of days ⌊__⌋	
44	How much time do you spend doing vigorous-intensity activities at work on a typical day?	Hours : minutes ⌊__⌋⌊__⌋ : ⌊__⌋⌊__⌋	
45	Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate such as brisk walking, carrying light loads, doing chores like cleaning, washing or ironing clothes etc ,for at least 10 minutes continuously?	1) Yes 2) No	
46	In a typical week, on how many days do you do moderate-intensity activities as part of your work?	Number of days ⌊__⌋	
47	How much time do you spend doing moderate-intensity activities at work on a typical day?	Hours : minutes ⌊__⌋⌊__⌋ : ⌊__⌋⌊__⌋	
Travel to and from places			
The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship			
48	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	1) Yes 2) No (go to Q51)	
49	In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?	Number of days ⌊__⌋	
50	How much time do you spend walking or bicycling for travel on a typical day?	Hours : minutes ⌊__⌋⌊__⌋ ⌊__⌋⌊__⌋	
Recreational activities			
The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure), [Insert relevant terms].			
51	Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases	1)Yes	

	in breathing or heart rate like running, playing football etc, for at least 10 minutes continuously? (USE SHOWCARD)	2) No (go to Q 57)	
52	In a typical week, on how many days do you do vigorous-intensity sports, fitness or recreational (leisure) activities?	Number of days └─┘	
53	How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘	
54	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking, cycling, swimming, dancing etc for at least 10 minutes continuously?	1) Yes 2) No	
55	In a typical week, on how many days do you do moderate-intensity sports, fitness or recreational (leisure) activities?	Number of days └─┘	
56	How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?	Hours : minutes └─┴─┘ : └─┴─┘	
Family and personal history of NCDs			
57	Have you ever suffered or are you currently on treatment of any of the following diseases? hypertension, heart diseases, Kidney disease or any other Non-infectious diseases	1) Yes 2) No If Yes Mention……..	
58	Is there any history of diabetes among your family members? , that's is maternal side, paternal side and your siblings.	1) Yes 2) No	

Level of awareness of GDM			
59	Do you know what Gestation diabetes mellitus is?	1) Yes 2) No	
60	Have you ever been treated of GDM on your previous pregnancy (if Not prime gravida)	1) Yes 2) No	
ART usage			
61	Are you on ART?	) Yes) No	
62	Were you on ART prior to conception of this pregnancy?	1) Yes 2) No	( )

Adopted from TDHS and WHO STEPwise approach to chronic disease risk factor surveillance-Instrument v2.1 (Tanzania).

MATERNAL BEHAVIOUR RISK FACTORS Now I am going to ask you some questions about various health behaviors. this includes things like smoking and drinking alcohol			
63	Have you **ever** consumed an alcoholic drink such as beer, wine, spirits, fermented cider or local made brewery?	1) Yes 2) No (go to Q 71)	
64	Have you consumed an alcoholic drink within the past 12 months?	1) Yes 2) No	
65	During the past 12 months, how frequently have you had at least one alcoholic drink? (READ RESPONSES, USE SHOWCARD)	1) Daily 2) 5-6 days per week 3) 1-4 days per week 4) 1-3 days per month 5) Less than once a month	
66	Have you consumed an alcoholic drink since becoming pregnant?	1) Yes 2) No (go to Q 71)	
67	During this pregnancy, on how many occasions did you have at least one alcoholic drink?	Number……	

68	During this pregnancy, when you drank alcohol, on average, how many standard alcoholic drinks did you have during one drinking occasion? (USE SHOWCARD)	Number…….	
69	During this pregnancy, what was the largest number of standard alcoholic drinks you had on a single occasion, counting all types of alcoholic drinks together?	Largest number……	
70	During this pregnancy, how many times did you have four or more standard alcoholic drinks in a single drinking occasion?	Number of times……	
71	Do you currently smoke any tobacco products, such as cigarettes, cigars or pipes? *(USE SHOWCARD)*	1) Yes 2) No (go to Q 76)	
72	Do you currently smoke tobacco products daily?	1) Yes 2) No	
73	How old were you when you first started smoking daily?	Age in years…….	
74	Do you remember how long ago it was? *(RECORD ONLY 1, NOT ALL 3)*	Years……. Months ……. Weeks…….	
75	On average, how many of the following do you smoke each day?	Manufactured cigarettes └__┘└__┘ Hand-rolled cigarettes └__┘└__┘ Pipes full of tobacco └__┘└__┘ Cigars, cheroots, cigarillos └__┘└__┘	

Household food and nutrition status

NO	QUESTION	RESPONSE OPTIONS	Brackets
76	In the past four weeks, did you worry that your household would not have enough food?	1) Yes 2) No (go to Q 77)	….|___|
76.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
77.	In the past four weeks, were you or any household member Not able to eat the kinds of foods you preferred because of a lack of resources?	1) Yes 2) No (go to Q 78)	….|___|
77.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
78.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	1) Yes 2) No (go to Q79)	….|___|
78.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks)	….|___|

		3 = Often (more than ten times in the past four weeks)	
79.	In the past four weeks, did you or any household member have to eat some foods that you really did Not want to eat because of a lack of resources to obtain other types of food?	1) Yes 2) No (go to Q80)	….|___|
79.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
80.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	1) Yes 2) No (go to Q 81)	….|___|

80.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
81.	In the past four weeks, did you or any other household member have to eat fewer meals in a day because	1) Yes 2) No (go to Q 82)	….|___|

	there was not enough food?		
81.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
82.	In the past four weeks, was there ever No food to eat of any kind in your household because of lack of resources to get food?	1) Yes 2) No (go to Q 83)	….|___|
82.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|

83.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	1) Yes 2) No (Go to Q 84)	
83.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	

84.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	1) Yes 2) No (Go to Q 85)	
84.a	How often did this happen?	1 = Rarely (once or twice in the past four weeks) 2 = Sometimes (three to ten times in the past four weeks) 3 = Often (more than ten times in the past four weeks)	….|___|
85	Now I would like to ask you about the types of foods that you or anyone else in your household ate Yesterday during the day and at night. Read the list of food, place one in the box if anyone in the house hold ate the food in question and a zero if No one in the house ate the food		
A	Any [INSERT ANY LOCAL FOODS, E.G. UGALI, NSHIMA], bread, rice Noodles, biscuits, cookies, or any other foods made from millet, sorghum, maize, rice, wheat, or [INSERT ANY OTHER LOCALLY AVAILABLE GRAIN]?	….|___|	
B	Any pumpkin, carrots, squash, or sweet potatoes that are yellow or orange inside?	… |___|	
C	Any white potatoes, white yams, manioc, cassava or any other foods made from roots or tubers?	….| _____|	

D	Any dark, green, leafy vegetables such as cassava leaves, bean leaves, kale, spinach, pepper leaves, taro leaves, and amaranth leaves?	….|_____|	
E	Any other vegetables?	…. |_____|	
F	Any ripe mangoes, ripe papayas or [INSERT ANY OTHER LOCALLY AVAILABLE VITAMIN A-RICH FRUIT?	….|_____|	
G	Any other fruits?	….| _____|	
H	Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?	….|_____|	
I	Any eggs?	….|__|	
J	Any fresh or dried fish or shellfish?	….|___|	
K	Any foods made from beans, peas, or lentils?	….|___|	
L	Any cheese, yogurt, milk or other milk products?	….|__|	

APPENDIX III: Questionnaire (Swahili Version)

DODOSO JUU YA UKUBWA NA MAMBO YANAYO HUSIANA NA UGONJWA WA KISUKARI WAKATI WA UJAUZITO MIONGONGONI MWA WANAWAKE WAJAWAZITO WANAOISHI NA MAAMBUKIZI YA VIRUSI VYA UKIMWI WANAOISHI DAR ES SALAAM, TANZANIA.

Namba ya dodoso:

_____ _____ Hospitali ___ Namba ya mtafiti:

SECTION A; Demografia za Mama Mjamzito

Jaza jibu katika nafasi zilizo achwa wazi,

Namba	Swali	Jibu	Mabano
1.	Una umli gani? /ulikua una miaka mingapi kwenye kumbukumbu yako ya kuzaliwa iliopita?	Jaza miaka (……)	
2.	Ulikua na umri gani ulipopata ujauzito wa kwanza?	Jaza miaka (……)	

3.	Ipi ni hali yako ya ndoa?	1. Nimeolewa 2. Sijaolewa 3. Mtalaka 4. Mjane 5. Tunaishi pamoja	
4	Mumeo/Mwenzi wako ana wake wengine au wenza wengine?	1. Ndio 2 Hapana 3 Sijui	
5.	Umesoma shule?	1. Ndio 2. Hapana (nenda swali la 7)	
6.	Umesoma kwa kiwango gani	1. Shule ya msingi 2. Shule ya sekondari 3. Elimu juu ya sekondari	

7.	Watu wangapi wanaishi kwenye nyumba yako?	1. Jaza idadi……..	
8.	Watoto wangapi chini ya miaka mitaHapana wanaishi kwenye nyumba yako/kaya yako	1. Wakiume: …….. 2. Wakike: ……..	
9.	Mkuu wa kaya yako anafanya shughuli gani ya kiuchumi?	1. Kibarua 2. Muajiriwa 3. Muuza chakula 4. Mfanya biashara 5. Mkuliama 6. Mchimbaji mdogo wa madini 7. Shughuli nyinginezo (zitaje) ……	

10.	Maji ya kunywa yana patikana kutoka vyanzo gani?	1. Maji ya bombaPiped water 2. Kisima Dug well 3. chemchemWater from spring 4. maji ya mvuaRain water 5. maji kutoka madimbwini ,bwawani au ziwani 6. maji ya chupa 7. Vyanzo vingine: tafadhali zitaje…….	
11.	Wvyanzo hivo viko wapihere is that water source located?	1. Nyumbani 2. Kwenye kiwanja chetu 3. Kwingineko	
12.	Kwa wiki mbili zilizopita, maji kutoka vyanzo hivi kuna wkati hayakupatikana kwa takriban siku nzima?	1. Ndio 2. Hapana 3. Sijui	
13.	Njia gani inatumika kutibu maji ili yawe salama kwa matumizi?	1. Matumizi ya chujio 2. Kuchemsha 3. Kuweka vidonge vya krolini mfaHapana water gurd 4. Hatuya tibu 5. Njia nyiginezo: zitaje tafadhali ……	
14.	Choo cha mtindo gani mna tumia?	1. Choo cha shimo kilicho boreshwaImproved pit latrine 2. Choo cha shimo kisicho boreshwa Unimproved pit latrine 3. Choo cha ku flashi 4. Hakuna choo,vichaka na mashambaHapana toilet/bush/farms	

		5. Aina nyingine: tafadhali zitaje……	
15.	Mnatumia choo hiki na kaya nyingine?	1. Ndio 2. Hapana (Nenda swali la 17)	
16.	Jumla ya kaya ngapi zinatumi choo hicho ukijumlisha na kaya yako	1. Chini ya kaya 10 Less 10 households 2. Kaya zaidi ya 10 3. Sijui	
17.	Choo kiko wapi?	1. Ndani ya nyumba yetu 2. Kweye eneo letu 3. Sehemu nyingine	
18.	Aina gani ya vyanzo vya nishati mnatumia kwenye kupikiaWhat type of fuel does your household mainly use for cooking?	1. Jiko la gesi 2. Umeme 3. Mkaa 4. kuni 5. Mafuta ya taa 6. Mabua ,vifuu 7. Vingine: tafadhali elezea ……..	
19.	Mnapikia ndani, jengo jingine au nje?	1. Ndani ya nyumba 2. Jingo linguine la pembeni 3. Nje/uwanjani 4. Sehemu nyingine tafadhali eleza……	

20.	Mnatumia chanzo gani cha nishati ya mwanga nyakati za usiku?	1. Umeme wa tanesko 2. Umeme wa juaSolar panel 3. Mishumaa 4. Taa za chemli /mafuta ya taa 5. Nyinginezo: tafadhali elezea ……	
21.	Kuna vyumba vingapi vya kulala katika kaya yako?	Jaza idadi ……	
22.	Mnamiliki wanyam au ndege wowote wa kufugwa?	1. Ndio 2. Hapana (nenda swali la 24)	
23.	Mna wanyama kma hawa wangapi?	1. Ng'ombe……. 2. Mbuzi ……. 3. Kondoo ……. 4. Kuku/ndege wengine …… 5. Wanyama wenginer: tafadhali wataje …….	
24.	Mtu yoyote kwenye kaya ana miliki ardhi kwa ajili yakilimo/mashamba?	1. Ndio 2. Hapana (Nenda swali la 27)	
25.	Mashamba mangapi watu wa kaya yenu wana miliki?	Weka idadi …….	
26.	Kaya yenu ina: 8. Tivii inayofanya kazi 9. Redio inayofanya kazi 10. Simuya mezani inayofaya kazi 11. Computer inayo fanya kazi 12. Jokofu linalo fanya kazi 13. Jenerata linalofanya kazi? 14. Pasi ya umeme	Kama NDIO ,ngapi? Tafadhali eleza 1. Ndio/Hapana …… 2. Ndio/Hapana …… 3. Ndios/Hapana …… 4. Ndio/Hapana …… 5. Ndio/ Hapana…… 6. Ndio/Hapana …… 7. Ndio/Hapana ……	

27.	Kuna mtu yoyote a ndani ya kaya yako anamiliki 1. Saa? 2. Simu ya mkoNoni? 3. Baskeli? 4. Pikipiki? 5. Mkokoteni wa kuvutwa wanyama? 6. Garia 7. Mtumbwi wenye injini	Kama NDIO, vingapi? Weka idadi 1. Ndio/Hapana …… 2. Ndio/Hapana …… 3. Ndio/Hapana …… 4. Ndio/Hapana …… 5. Ndio/Hapana …… 6. Ndio/Hapana …… 7. Ndio/Hapana ……	
28	Kuna mtu kwenye kayayako iiwemo wewe an akaunti ya benki?	1. Ndio 2. Hapana	
29.	Njia kuu ya upatikanaji wa chakula katika kaya ni ipi?	1. Kilimo 2. Manunuzi ya chakula sokoni 3. Kupewa na ndugu na marafiki 4. Msaada wa serikari Nyingine: tafadhali taja …….	
30.	Chakula gani kinaliwa mara kwa mara katika familia?	*Unaweza chagua jibu Zaidi ya moja* 1. Jamii ya kunde na jamii ya karanga 2. Nafaka,mizizi na mashina (mfaNo mahindi ,viazi) 3. Bidhaa zitokanazo na maziwa (Maziwa,mtindi,jibini ,siagi,) 4. Nyama (ya nfombe, samaki, Ndege, na maini/onyama za ndani) 5. Mayai 6. Matunda 7. Mihogo na ndizi 8. Matunda yenye vitamin A 9. Vingine;taja ……	

31.	Katika kaya mnatumia maji na sabuni au vitakasa mikoNo sehemu ya kunawia mikoNo?	1. Sabuni (ya mche,ya maji,ya unga) 2. Majivu, Matope, Mchanga 3. Hapana	
SECTION B; MAMBO YENYE UHUSIANO NA UGONJWA WA KISUKARI CHA UJAUZITO (GDM)			
31	Unaujauzito wa miezi mingapi? Unakumbuka tarehe ya hedhi yako ya mwisho?	(……) (angalia kwenye kadi ya kliniki kuthibitisha)	
32	Hii ni mara ya ngapi unabeba ujauzito? (kama ni mara ya kwanza nenda number 36)	(……)	
33	Uzito wa mtoto wako aliepita wakati wa kuzaliwa ulikua kiasi gani?	(…….) kg	
34	Ulishawahi fanyiwa operesheni ya kujifungua sababu ya mtoto kua mkubwa sana?	1) Ndio 2) Hapana	
36	Umeshawahi kupata ujauzito uliotoka, ulioutoa au mtoto aliezaliwa amekufa.	1) Ndio 2) Hapana	
Vipimo vya uzito,urefu na kiwango cha sukari vya mama mjamzito			
37	Uzito	(……..) kg	
38	Urefu katika sentimita	(……...) cm	
39	MUAC	(…….) cm	
40	Kipimo cha sukari baada ya kutokula kwa masaa 8: mmol/l	mmol/l ⌊__⌋__⌋ . ⌊__⌋__⌋	
41	Kipimo cha sukari baada ya masaa 2 ya kunywa ‘glucosi’	mmol/l ⌊__⌋__⌋ . ⌊__⌋__⌋	
Mazoezi ya Viungo			
Sasa nitaendelea kukuuliza kuhusu muda unaotumia kufanya shughuli mbalimbali zinazohusu mazoezi ya viungo katika wiki moja ya kawaida. Tafadhali ujibu maswali haya hata kama unadhani wewe si mtu wa			

kufanya mazoezi mara kwa mara. Kwanza tafakari kuhusu muda unaotumia kufanya kazi. Tunaposema kazi tunamaanisha shughuli zozote unazofanya zikiwemo zinazokuingizia kipato na zisizokuingizia kipato, mfaHapana kuvua samaki, masomo, shughuli za nyumbani, kilimo, kuvuna mazao, kutafuta kazi n.k. Katika kujibu maswali haya 'shughuli za kutumia nguvu – kasi sana ni shughuli ambazo zinahitaji nguvu nyingi na husababisha ongezeko kubwa katika kupumua au mapigo ya moyo, shughuli za kutumia nguvu-kasi kiasi ‘ ni shughuli zinazohitaji nguvu ya kiasi na husababisha ongezeko dogo katika kupumua na mapigo ya moyo			
Kazi			
42	Je, kazi yako inahusisha shughuli za kutumia nguvu ambazo zinaongeza kasi ya kupumua na mapigo ya moyo kama vile kubeba mizigo mizito, kumwaga zege, kupiga kokoto, kuchota maji, kusomba mazao, kilimo au kazi za ujenzi kwa angalau dakika 10 mfululizo?	1) Ndio 2) Hapana (Nenda swali la 48)	( )
43	Katika wiki ya kawaida, ni kwa siku ngapi unafanya shughuli hizo za kutumia nguvu nyingi katika kazi yako?	Idadi ya siku ⌊__⌋	
44	Unatumia muda gani kufanya shughuli za nguvu katika siku moja ya kazi?	saa : dakika ⌊__⌋⌊__⌋ : ⌊__⌋⌊__⌋	
45	Kazi yako inahusisha shughuli za kutumia nguvu kiasi ambazo zinaongeza kidogo kasi ya kupumua na mapigo ya moyo kama vile kutembea kwa haraka, kubeba mizigo isiyo mizito, kudeki, kufagia, kuosha vyombo, kufua, kupika, kupiga pasi, kuvuna mazao kwa angalau dakika 10 mfululizo?	1) Ndio 2) Hapana	
46	Katika wiki ya kawaida, ni kwa siku ngapi unafanya shughuli hizo za kutumia nguvu kiasi katika kazi yako?	Idadi ya siku ⌊__⌋	
47	Unatumia muda gani kufanya shughuli za nguvu kiasi katika siku moja ya kazi?	Masaa :Dakika ⌊__⌋⌊__⌋ : ⌊__⌋⌊__⌋	

Safari ya kwenda na kurudi toka sehemu moja hadi nyingine			
Maswali yafuatayo hayahusishi shughuli unazofanya wakati wa kazi ambazo umeshazitaja. Sasa ningependa kukuuliza kuhusu aina ya usafiri unaotumia kwenda sehemu mbalimbali kama vile sokoni, shambani, kanisani, msikitini n.k.			
48	Una kawaida ya kutembea kwa miguu au kwa kutumia baiskeli kwa angalau dakika 10 mfululizo wakati unapokwenda mahali fulani?	1) Ndio 2) Hapana (Nenda Swali La 51)	
49	Katika Wiki Ya Kawaida, Unatumia Siku Ngapi Kutembea Kwa Miguu Au Kwa Kutumia Baiskeli Kwa Angalau Dakika 10 Mfululizo Wakati Unapokwenda Mahali Fulani?	Idadi Ya Siku └─┘	
50	Unatumia Muda Gani Kutembea Kwa Miguu Au Kwa Kutumia Baiskeli Katika Siku Moja Ya Kawaida?	Masaa : Dakika └─┴─┘ └─┴─┘	
Mazoezi wakati wa mapumziko			
Sasa nitakuuliza maswali yahusuyo shughuli mbalimbali unazofanya wakati wako wa mapumziko, kwa mfaHapana mazoezi ya viungo, michezo mbalimbali n.k. Usijumuishe shughuli unazofanya wakati wa kazi au kusafiri ambazo umeshajitaja hapo awali.			
51	Una kawaida ya kushiriki katika shughuli za michezo au mazoezi ambazo zinaongeza kwa kiasi kikubwa kasi ya kupumua au mapigo ya moyo kama vile kukimbia, kuruka kichura, kuinama na kuinuka, kuruka viunzi, kucheza nmpira kwa angalau dakika 10 mfululizo? (TUMIA SHOWCARD)	1) Ndio 2) Hapana (Nenda swali la 56)	
52	Katika wiki ya kawaida, unatumia siku ngapi kufanya shughuli hizo za michezo au mazoezi?	Number of days └─┘	
53	Katika siku ya kawaida, unatumia muda gani kufanya shughuli hizo za michezo au mazoezi?	Masaa : Dakika └─┴─┘ : └─┴─┘	
54	Una kawaida ya kushiriki katika shughuli za michezo au mazoezi ambazo zinaongeza kwa kiasi kidogo kasi ya kupumua au mapigo ya moyo kama vile kuendesha, baiskeli, kutembea, kuogelea, kuimba	1) Ndio 2) Hapana	

	kwa vitendo kwa angalau dakika 10 mfululizo? (TUMIA SHOWCARD)		
55	Katika wiki ya kawaida, unatumia siku ngapi kufanya shughuli hizo za michezo au mazoezi?	Idadi ya siku └─┘	
56	Katika siku ya kawaida, unatumia muda gani kufanya shughuli hizo za michezo au mazoezi?	Masaa : dakika └─┴─┘ : └─┴─┘	
Historia ya familia na binafsi kuhusu magfoinjwa yasipo ambukizwa			
57	Umewahi kuugua au uko katika matibabu ya magonjwa ya moyo, presha, magonjwa ya figo na magonjwa mengine yasio ambukiza?	1) Ndio 2) Hapana Kama ndio taja……	
58	Kuna historia ya ugonjwa wa sukari katika familia yenu au Kuna mtu/watu mwenye kisukari katika familia yenu upande wa mama baba au ndugu zako wa kuzaliwa tumbo moja?	1) Ndio 2) Hapana	
Uelewa wa ugonjwa kisukari cha ujauzito			
59	Unaufahamu ugonjwa wa kisukari cha ujauzito?	1) Ndio 2) Hapana	
60	Umeshawahi kutibiwa ugonjwa wa kisukari cha ujauzito katika mimba zilizo pita (kama huu sio ujauzito wa kwanza kwako)	1) Ndio 2) Hapana	
Matumizi ya dawa za kufubaza virusi vya UKIMWI			
61	Unatumia Dawa Za Kufubaza Virusi Vya Ukimwi?	1) Ndio 2) Hapana	
62	Ulikua Unatumia Dawa Aza Kufubaza Virusi Vya Ukimwi Hata Kabla Ya Kupata Ujauzito Huu?	1) Ndio 2) Hapana	

Adopted from TDHS and WHO STEPwise approach to chronic disease risk factor surveillance-Instrument v2.1 (Tanzania).

Tabia hatarishi za mama Sasa nitakuuliza maswali yanayohusiana na tabia/mazoea mbalimbali yanayohusu afya. Haya Yanahusisha masuala ya uvutaji sigara/tumbaku, unywaji wa pombe.			
63	Je, umewahi kutumia kinywaji chenye kilevi (kama vile bia, mvinyo, pombe kali au pombe ya kienyeji) katika miezi 12 **iliyopita**? *(TUMIA kadi ya kielelezo AU TOAMIFANO)*	1) Ndio 2) Hapana (nenda swali la 71	
64	Je umekunywa kinywaji chenye kilevi ndani ya miezi 12 iliyopita?	1) Ndio 2) Hapana	
65	Katika miezi 12 iliyopita, ni mara ngapi umekunywa angalau kinywaji kimoja chenye kilevi? (MSOMEE MAJIBU, TUMIA kadi ya kielelezo)	1) Kila siku 2) Siku 5-6 kwa juma 3) Siku 1-4 kwajuma 4) Siku 1-3 kwa mwezi 5) Chini ya mara 1 kwa mwezi	
66	Umetumia kinywaji chenye kilevi (kama vile bia, mvinyo, pombe kali au pombe ya kienyeji) tangu ulipo pata ujauzito huu? (TUMIA kadi ya kielelezo AU TOA MIFANO)	1) Ndio 2) Hapana (nenda swali la 71)	
67	Tangu ulipo pata ujauzito huu, ni mara ngapi umekunywa angalau kinywaji kimoja chenye kilevi?	Mara…….	
68	Tangu ulipo pata ujauzito huu ulipokunywa kinywaji chenye kilevi, kwa makisio ulikunywa vinywaji vingapi (standard drinks) kwa mkupuo (TUMIA KADI YA KIELELEZO)	Mara……..	

69	Tangu ulipo pata ujauzito huu, ulipokunywa kinywaji chenye kilevi , ni kiasi gani kikubwa ulichokunywa (standard drink) siku uliyokunywa zaidi kwenye mkupuo mmoja ukijumlisha vinywaji vyote?	Idadi kubwa zaidi ya vinywaji ……	
70	Tangu ulipo pata ujauzito huu, ni mara ngapi umekunywa Kinywaji chenye kilevi (standard drink); 4 au zaidi; kwenye mkupuo mmoja?	Mara ……..	
71	Je, kwa sasa unavuta aina yoyote ya tumbaku kama vile sigara, kiko, sigaraya kusokota n.k?	1)Ndio 2) Hapana (Nenda swali la 76)	
72	Kama Ndio, Kwa sasa unavuta sigara au tumbaku kila siku?	1)Ndio 2) Hapana	
73	Ulikuwa na umri gani ulipoanza kuvuta sigara kila siku kwa mara ya kwanza?	Umri (miaka)…….	
74	Unakumbuka ni muda gani uliopita? (JIBU MOJA TU)	Miaka…… Miezi……. Wiki……	
75	Kwa wastani, unavuta kiasi gani kwa siku cha kila moja ya aina zifuatazo za tumbaku?	Sigara zinazotengenezwa viwandani └__┘└__┘└__┘ Sigara /tumbaku za kusokota kwa mikoNo └__┘└__┘└__┘ Kiko kilichojazwa tumbaku/sigara └__┘└__┘└__┘ Biri(Cigars) └__┘└__┘└__┘ Aina nyingine └__┘└__┘└__┘	

		Aina nyingine (zitaje tafadhali): |___|___|___|___|___|___|___|	

Hali ya lishe ya Mama na kaya kwa ujumla

No	Swali	Majibu	MabaNo
76	Kwa wiki nne zilizopita, ulikua na wasiswasi wa nyumba yako kutokua na chakula cha kutosha?	3) Ndio 4) Hapana (Nenda swali la 68)	….|___|
76.a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
77.	Kwa wiki nne azilizopita ,wewe au mtu katika nyumba yako alishindwa kula chakula alicho taka/tamani sababu ya kipato kidogo	3) Ndio 4) Hapana (Nenda swali la 69)	….|___|
77.a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
78.	Kwa wiki nne zilizopita, wewe au mtu katika nyumba yako alishindwa kula chakula cha kutosha sababu ya changamoto za kipato?	1) Ndio 2) Hapana (Nenda swali la 70)	….|___|

78.a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
79.	Kwa wiki nne zilizopita, wewe au mtu katika nyumba yako ulikula chakula usichokipenda kutokana na changamoto za kipato cha kukuwezesha kupata chakulka kingine?	1) Ndio 2) Hapana (Nenda swali la 71)	….|___|
79.a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
80.	Kwa wiki nne zilizopita, wewe au mtu katika nyumba yako ulikula chakula kidogo/kisichokutosha/usichoshiba?	1) Ndio 2) Hapana (Nenda swali la 72)	….|___|

80a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|

81	Kwa wiki nne zilizopita, wewe au mtu katika nyumba yako alikula milo michache kwa kwasbabu ya ukosefu wa chakula?	1) Ndio 2) Hapana (Nenda swali la 73)	….|___|
81a.	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
82	Kwa wiki nne zilizopita kuna wakati kulikua hakuna chakula cha aina yoyote kwa ajiri ya kula sababu ya changamoto ya kipato?	1) Ndio 2) Hapana (Nenda swali la 74)	….|___|
82a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|

83	Katika wiki nne zilizopita kuna wakati wewe au mtu yoyote katika familia yako alilala njaa sababu ya ukosefu wa chakula?	1) Ndio 2) Hapana (Nenda swali la 75)	
83a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	
84	Katika wiki nne zilizopita kuna wakati wewe au mtu yoyote katika familia yako alishinda njaa kutwa na kulala njaa sababu ya ukosefu wa chakula?	1) Ndio 2) Hapana (Nenda swali la 76)	
84a	Imetoke mara ngapi?	1 = kwa nadra (mara moja au mbili kwa wiki nne zilizo pita) 2 = mara chache (mara tatu mpaka kumi kwa wiki nne zilizo pita) 3 = Mara kwa mara (Zaidi ya mara kumi kwa wiki nne zilizopita)	….|___|
85	Sasa nataka kukuuliza kuhusu vyakula ambayo wewe au mtu yoyote ndani ya familia yenu alikula jana kwanzia asubuhi adi usiku, soma orodha hii ya vyakula alafu utaandika moja kama mtu yoyote akiwemo wewe kwenye familia alitumia aina hio ya chakula na sifuri kama hamna alie kula aina hio ya chakula.		
A	Vyakula vyote vya asili ya nafaka(wanga) kama Wali ,Ugali, Mkate ,tambi,maandazi,keki,biskuti ,vitumbua au vyakula vyovyote vitengenezwavyo na Mahindi,Mchele,Soya,NgaHapana ,Uwele na kadhalika	….|___|	
B	Maboga, karoti, viazi vitamu vyenye rangi ya njaNo au ya machungwa kwa ndani.	… |___|	

C	Viazi vitamu vyenye rangi nyeupe,magimbi ,mihogo ,viazi mviringo au vyakula vyovyote vina vyo chimbwa kama mizizi	….| _____|	
D	Mboga za majani zenye rangi ya kijani au kijani iliokolea kama Kisamvu,Mjani ya maharage,spinachi, matembele na nyinginezo	….|_____|	
E	Mboga nyingine za majani?	…. |_____|	
F	Embe mbivu, Papai bivu au [weka tunda lolote lenye wingi wa vitamin A?	….|_____|	
G	Tunda lolote lingine?	….| _____|	
H	Nyama ya ng'ombe,nyama ya ngurue,nyama ya Kondoo/Mbuzi,Sungura au nyama pori na nyinginezokama kuku,bata ndege wengine ,pia nyama kama maini ,figo,moyo au nyama za ndani zozote	….|_____|	
I	Mayai?	….|__|	
J	Samaki wabichi wa lio kaushwa au aina yyingine ya samaki wenye Makome	….|___|	
K	Vyakula vyovyote vilivyo tengenezwa kwa maharage ,njegere au jamii ya kunde	….|___|	
L	Vyakula vyenye Jibini ,Siagi ,maziwa ya mtindi au vyakula vingine vitokanavyo na maziwa	….|__|	

APPENDIX V: Digital Receipt

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	Emmanuel Mwakasumi
Assignment title:	Dissertation Reports
Submission title:	Magnitude of Gestational Diabetes Mellitus and Associated ...
File name:	Dissertation_-_Mwakasumi.docx
File size:	247.75K
Page count:	39
Word count:	8,510
Character count:	47,845
Submission date:	02-Jul-2024 12:46PM (UTC+0300)
Submission ID:	2411587682



Copyright 2024 Turnitin. All rights reserved.

APPENDIX VI: Plagiarism Report



Magnitude of Gestational Diabetes Mellitus and Associated Factors Among Pregnant Women Living with HIV in Dar Es Salaam Region, Tanzania

ORIGINALITY REPORT

28%	26%	11%	15%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	dspace.muhas.ac.tz:8080 Internet Source	4%
2	Submitted to Muhimbili University of Health and Allied Sciences Student Paper	3%
3	link.springer.com Internet Source	2%
4	nutrition.bmj.com Internet Source	1%
5	dx.doi.org Internet Source	1%
6	academic.oup.com Internet Source	1%
7	Lucas L. Shilugu, Bruno F. Sunguya. "Stunting in the Context of Plenty: Unprecedented Magnitudes Among Children of Peasant's Households in Bukombe, Tanzania", Frontiers in Nutrition, 2019	1%

APPENDIX VII: Ethical Clearance

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, INNOVATION AND PUBLICATIONS

In reply quote;
Ref. No.DA.282/298/01.C/1613 Date: 11/04/2023

MUHAS-REC-01-2023-1613

Emmanuel Absalom Mwakasumi,
School of Public Health and Social Sciences,
MUHAS.

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: GESTATION DIABETIC MELLITUS: MAGNITUDE, ASSOCIATION TO ANTIRETROVIRAL THERAPY USAGE AND OTHER RISK FACTORS AMONG PREGNANT WOMEN LIVING WITH HIV IN DAR ES SALAAM REGION, TANZANIA.

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subject research.

APPROVAL DATE: 11/04/2023
EXPIRATION DATE OF APPROVAL: 10/04/2024

STUDY DESCRIPTION:
Purpose:
The purpose of this cross sectional study is find the magnitude of Gestation diabetic mellitus among pregnant women living with HIV in Dar es Salaam, Tanzania and to find out its association with ART usage and other risk factors.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014489.pdf and in the MUHAS archives.

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1038; Direct Line:+255-22-2152489;Telefax:+255-22-2152489;E-mail:drp@muhas.ac.tz;Web:https://www.muhas.ac.tz

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Nahya Salim Masoud
Chairman, MUHAS Research and Ethics Committee

cc; Director of Postgraduate Studies,
MUHAS

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1038; Direct Line:+255-22-2152489;Telefax:+255-22-2152489;E-mail:drp@muhas.ac.tz;Web:https://www.muhas.ac.tz

APPENDIX VIII: Introdution Letters

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.604/2019

21st April, 2023

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

RE: INTRODUCTION LETTER OF EMMANUEL ABSALOM MWAKASUMI

We would like to inform you that the bearer of this letter is Emmanuel Absalom Mwakasumi with Reg. No. HD/MUH/T.604/2019 is a student at School of Public Health and Social Sciences in the Muhimbili University of Health and Allied Sciences (MUHAS) " pursuing Master of Public Health (MPH).

As part of his studies, he will be doing an elective research titled: "***Gestation Diabetic Mellitus: Magnitude, Association to Antiretroviral Therapy Usage and Other Risk Factors Among Pregnant Women Living with HIV in Dar es Salaam Region, Tanzania.***" He is being supervised by Prof. Bruno Sunguya (main supervisor) from School of Public Health and Social Sciences – MUHAS, Dr. Elias Bukundi (Co-Supervisor) from School of Public Health and Social Sciences – MUHAS and Dr. Hellen Mrina from Department of Obstetrics and Gynecology MNH.

The Ethical Clearance for doing the said research has been given by the university.

Kindly request your necessary assistance and coorperation to our student.

Yours Sincerely.

Mr. Sebe Mohamed Yusuf
For: DIRECTOR, POSTGRADUATE STUDIES

Cc: Emmanuel Absalom Mwakasumi

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.604/2019

21st April, 2023

Medical Officer Incharge,
Amana Regional Referral Hospital,
P. O. Box 25411, Ilala
DAR ES SALAAM

RE: INTRODUCTION LETTER OF EMMANUEL ABSALOM MWAKASUMI

We would like to inform you that the bearer of this letter is Emmanuel Absalom Mwakasumi with Reg. No. HD/MUH/T.604/2019 is a student at School of Public Health and Social Sciences in the Muhimbili University of Health and Allied Sciences (MUHAS) " pursuing Master of Public Health (MPH).

As part of his studies, he will be doing an elective research titled: "***Gestation Diabetic Mellitus: Magnitude, Association to Antiretroviral Therapy Usage and Other Risk Factors Among Pregnant Women Living with HIV in Dar es Salaam Region, Tanzania.***" He is being supervised by Prof. Bruno Sunguya (main supervisor) from School of Public Health and Social Sciences – MUHAS and Dr. Elias Bukundi (Co-Supervisor) from School of Public Health and Social Sciences - MUHAS

The Ethical Clearance for doing the said research has been given by the university.

Kindly request your necessary assistance and coorperation to our student.

Yours Sincerely,

Mr. Sebe Mohamed Yusuf
For: DIRECTOR, POSTGRADUATE STUDIES

Cc: Emmanuel Absalom Mwakasumi

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.604/2019

21st April, 2023

Medical Officer Incharge,
Mwananyamala Regional Referral Hospital,
P. O. Box 61665
DAR ES SALAAM

RE: INTRODUCTION LETTER OF EMMANUEL ABSALOM MWAKASUMI

We would like to inform you that the bearer of this letter is Emmanuel Absalom Mwakasumi with Reg. No. HD/MUH/T.604/2019 is a student at School of Public Health and Social Sciences in the Muhimbili University of Health and Allied Sciences (MUHAS) " pursuing Master of Public Health (MPH).

As part of his studies, he will be doing an elective research titled: "***Gestation Diabetic Mellitus: Magnitude, Association to Antiretroviral Therapy Usage and Other Risk Factors Among Pregnant Women Living with HIV in Dar es Salaam Region, Tanzania.***" He is being supervised by Prof. Bruno Sunguya (main supervisor) from School of Public Health and Social Sciences – MUHAS and Dr. Elias Bukundi (Co-Supervisor) from School of Public Health and Social Sciences - MUHAS

The Ethical Clearance for doing the said research has been given by the university.

Kindly request your necessary assistance and coorperation to our student.

Yours Sincerely,

Mr. Sebe Mohamed Yusuf
For: DIRECTOR, POSTGRADUATE STUDIES

Cc: Emmanuel Absalom Mwakasumi

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015;
Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.604/2019

21st April, 2023

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

RE: INTRODUCTION LETTER OF EMMANUEL ABSALOM MWAKASUMI

We would like to inform you that the bearer of this letter is Emmanuel Absalom Mwakasumi with Reg. No. HD/MUH/T.604/2019 is a student at School of Public Health and Social Sciences in the Muhimbili University of Health and Allied Sciences (MUHAS) " pursuing Master of Public Health (MPH).

As part of his studies, he will be doing an elective research titled: "***Gestation Diabetic Mellitus: Magnitude, Association to Antiretroviral Therapy Usage and Other Risk Factors Among Pregnant Women Living with HIV in Dar es Salaam Region, Tanzania.***" He is being supervised by Prof. Bruno Sunguya (main supervisor) from School of Public Health and Social Sciences – MUHAS, Dr. Elias Bukundi (Co-Supervisor) from School of Public Health and Social Sciences – MUHAS and Dr. Hellen Mrina from Department of Obstetrics and Gynecology MNH.

The Ethical Clearance for doing the said research has been given by the university.

Kindly request your necessary assistance and coorperation to our student.

Yours Sincerely.

Mr. Sebe Mohamed Yusuf
For: DIRECTOR, POSTGRADUATE STUDIES

Cc: Emmanuel Absalom Mwakasumi

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz