PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINICS IN DAR-ES-SALAAM, TANZANIA

Eveta Sabas Masawe, MD

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PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINICS IN DAR-ES-SALAAM, TANZANIA.

By

Dr. Eveta Sabas Masawe, MD

A Dissertation submitted in (Partial) Fulfillment of the Requirements for the Degree of Masters of Medicine (Paediatrics and Child Health) at

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October, 2024

CERTIFICATION

The undersigned certifies that they have read and hereby recommend for examination by Muhimbili University of Health and Allied Sciences the dissertation entitled "***Prevalence of depression and associated factors among adolescents with type one diabetes mellitus attending diabetes clinics in Dar-es-Salaam, Tanzania.***" in fulfilment of the requirements for the degree of Masters of Medicine (paediatrics and child health) of Muhimbili University of Health and Allied Sciences.

_____

Dr. Namala Mkopi

(Supervisor)

Date: _____

_____

Dr. Rahim Karim Damji

(Co-Supervisor)

Date: _____

_____

Dr. Evelyne Assenga

(Co-Supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I, **Eveta Sabas Masawe**, 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…….....

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Finally, special thanks to my mother (Juliana), my sisters, and my brothers for their prayers, sacrifices and encouragement. Your support and love mean a lot to me. May almighty God bless you abundantly.

DEDICATION

To my parents (Juliana Leon and my late father Sabas Masawe)

To my husband (Francisco M. Baraka).

To my Children (Francisca, Agatha and Juan)

Thank you very much for your love for me.

ABSTRACT

Introduction: Children with type one diabetes (T1DM) are surviving to adulthood due to improved care and awareness which in turn increase number of cases of T1DM among adolescents. Compared to individuals without diabetes, those with diabetes are 2 to 3 more likely to develop depression, especially among adolescents. Depressive symptoms during the adolescent period have been associated with suboptimal glycaemic control.

Objectives: To determine the prevalence of depression and associated factors among adolescents with T1DM attending diabetes clinics in Dar-es-Salaam.

Methodology: A hospital-based cross-sectional study was conducted amongst adolescents aged 10-19 years with T1DM attending 4 public diabetes clinics in Dar es Salaam (Muhimbili national hospital (MNH), Mwananyamala Regional Referral Hospital (RRH), Temeke RRH, and Vijibweni District level Hospital) from November 2023 to April 2024. A pre-tested structured questionnaire was used to obtain socio-demographic and clinical information about the participants and the caregivers, while the validated Patient Health Questionnaire (Swahili version) modified for adolescents (PHQ-A) was used to assess depression symptoms.

Results: A total of 186 adolescents with T1DM were recruited in the study. The majority, 144 (77.4%) were aged > 14 years with median age of 15 years, and female predominance (58.1%). Depressive symptoms were detected in 107 (57.5%) adolescents, of whom 50 (26.9%) had clinical depression (moderate, moderately severe, and severe depression). A higher odds of having depression was noted among females (Adjusted Odds Ratio (AOR) = 2.86, 95% CI: 1.32- 6.18, p = 0.008), those aged >14 years, (AOR 3.88, 95% CI: 1.64-9.15, p = 0.002) and those with <5 years duration since being diagnosed with diabetes (AOR 1.16, 95% CI: 1.06-1.26, p =0.001).

However, those with lower average blood glucose levels of ≤7 mmol/L exhibited significantly lower odds of depression compared to their counterparts (p = 0.002).

Conclusion: Depression is prevalent in adolescents with T1DM. Several factors including older age, female sex, and a shorter duration since diagnosis of diabetes were associated with an increased risk of depression. Having average blood glucose of <7mmol/L was found to be protective.

Recommendation: Routine screening for depression and integration of mental health services in diabetes clinics will aid in early diagnosis and management of depression in adolescents with TIDM.

MUHTASARI

Utangulizi: Watoto wenye ugonjwa wa kisukari wanaishi hadi utu uzima kutokana na huduma bora na ufahamu. Ikilinganishwa na watu wasio na ugonjwa wa kisukari, wale walio na ugonjwa wa kisukari wana uwezekano mara 2 hadi 3 zaidi wa kupata ugonjwa wa sonona na h ii ni zaidi kwa vijana. Dalili za sonona wakati wa kipindi cha ujana zimehusishwa na udhibiti hafifu wa ugonjwa wa kisukari.

Lengo la utafiti: Kuchunguza ukubwa na visababishi vya ugonjwa wa sonona miongoni mwa vijana wenye kisukari wanaohudhuria kliniki za ugonjwa wa kisukari Dar-es-salaam**.**

Mbinu: Utafiti ulihusisha vijana wenye umri wa miaka 10-19 wenye ugonjwa wa kisukari waliohudhuria katika kliniki 4 za hospitali za serikali (hospitali ya taifa Muhimbili, hospitali ya rufaa ya mkoa Mwananyamala, hospitali ya rufaa ya mkoa Temeke, na hospitali ya Vijibweni) tokea mwezi wa kumi na moja mwaka 2023 hadi mwezi wa nne mwaka 2024. Dodoso lilitumika kupata habari za kijamii na za ugonjwa dhidi ya mgonjwa na mlezi, wakati dodoso la afya ya mgonjwa -9 (PHQ-9) (toleo la kiwahili) lililorekebishwa kwa vijana PHQ-A) lilitumika kupima dalili za sonona.

Matokeo: Jumla ya vijana 186 walihusishwa katika utafiti huu. Wengi, 144 (asilimia 77.4) walikuwa na umri wa miaka zaidi ya 14, umri wa kati ulikuwa miaka 15 (14-17). Wanawake walikua wengi (asilimia 58.1). Dalili za ugonjwa wa sonona zilionekana kwa vijana 107(asilimia 57.5) wenye kisukari, kati yao 50 (asilimia 26.9) walikua na ugonjwa wa sonona unaohusisha dalili za wastani, wastani-kali na kali. Uwezekano mkubwa ya kupata sonona ulionekana kwa wanawake (AOR = 2.86, 95% CI: 1.32- 6.18, p = 0.008), wale waliokua na umri zaidi ya miaka 14 (AOR 3.88, 95% CI: 1.64-9.15, p = 0.002), na waliokuwa na miaka <5 tangu kugundulika kuwa na ugonjwa wa kisukari (AOR 1.16, 95% CI: 1.06-1.26, p =0.001). Japokua waliokua na wastani mdogo wa sukari ya damu kiwango cha saba au pungufu walikua na uwezo mdogo wakupata sonona ikilinganishwa na wenzao (p=0.002).

Hitimisho: Sonona imeenea kwa vijana wenye kisukari. Sababu zinazohusishwa na ugonjwa wa sonona ni pamoja na umri, jinsia na muda mfupi tangu kugundulika kwa ugonjwa wa kisukari.

Pendekezo: Uchunguzi wa mara kwa mara wa sonona, na ujumuishaji wa huduma za afya ya akili katika kliniki za ugonjwa wa kisukari zitasaidia utambuzi wa mapema pamoja na matibabu kwa vijana wenye ugonjwa wa kisukari.

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
CDC	Center for Disease Control and Prevention
CES-DES	Center for Epidemiological Studies Depression Scale for Children
CGM	Continuous Glucose Monitoring
DALY	Disability-Adjusted Life Years
DM	Diabetes Mellitus
FBG	Fasting Blood Glucose
HbA1c	Glycated haemoglobin A1
IRB	Institutional Review Body
MNH	Muhimbili National Hospital
PHQ-9	Patient Health Questionnaire-9
PHQ-A	Patient Health Questionnaire-9 modified for Adolescents
RBG	Random Blood Glucose
RRH	Regional Referral Hospital
SPSS	Statistical Package for the Social Science
T1DM	Type One Diabetes Mellitus
WHO	World Health Organization
YLD	Years Lived with Disability

DEFINITION OF KEY TERMS

Adolescents: Is the transition age from childhood to adulthood defined by WHO as an age range between 10-19 years.

Depression: Is mental health disorder that presents as a depressed mood (the sad feeling, and emptiness) with a loss of interest in activities.

Diabetes mellitus: Is a disorder that affects carbohydrate metabolism presenting with high blood sugar caused by impaired insulin secretion, its action, or both

Glycated haemoglobin (HbA1c): Is the hemoglobin-glucose combination formed non-enzymatically within the cell which reflects mean blood sugar concentration for the past 2 to 3 months before the test.

Glycaemic control: This is the optimum target of blood glucose level in patients with diabetes mellitus to prevent complications associated with diabetes mellitus. It is objectively measured by HbA1c level with a target value of less than 7.5% in children aged 19 years and below.

Type one Diabetes mellitus: This is a type of diabetes mellitus resulting from absolute insulin deficiency, mostly affecting children, and adolescents.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Depression is among the mental health disorders affecting a person's mood, commonly occurring after stressful and/or unexpected life events. It affects how someone feels, thinks, and conducts daily activities.(1) The WHO report of 2021 estimated that 1 in 7 adolescents (10–19 year-olds) experience mental health conditions including depression.(2) The global prevalence of depressive symptoms among adolescents increased from 24% in 2001-2010 to 37% in 2011-2020, while the pooled one-year prevalence of major depressive disorder was 8%. The Middle East, Africa and Asia reported the highest prevalence of elevated depressive symptoms, with female adolescents showing a higher prevalence than males.(3)

Adolescents are particularly vulnerable to depression due to a combination of biological, psychological, and social factors that distinguish this developmental stage from other populations. During adolescence, the brain undergoes significant structural and functional changes, particularly in areas involved in emotional regulation, decision-making, and stress response, such as the prefrontal cortex and limbic system.(4,5) These neurological developments may lead to heightened emotional sensitivity and impulsivity, making adolescents more prone to mood disorders.(6) Additionally, adolescents face intense social pressures, including the challenges of identity formation, academic expectations, and peer relationships, which can contribute to feelings of stress and inadequacy.(7) Hormonal fluctuations, especially during puberty, further exacerbate emotional instability and susceptibility to depressive symptoms.(8) Moreover, increased engagement with social media and digital communication has been strongly linked to higher rates of depression in adolescents due to factors like cyberbullying, social comparison, and online harassment.(9,10) Together, these factors create a perfect storm for depression in adolescents, making this age group particularly vulnerable compared to children or adults.

Chronic diseases are among potential stressors due to the disease itself, treatment modality, and associated complications. Type 1 diabetes mellitus is among the chronic diseases affecting the endocrine system. It is caused by immune-mediated destruction of beta-

pancreatic cells causing deficiency or absence of insulin in the body, leading to hyperglycemia and associated complications. This form of diabetes most commonly affects children and adolescents. It has a bimodal distribution, with one peak at the age of 6-8 years and a second peak at 10-14 years.(11)

The prevalence of diabetes is on the rise partly due to an increase in incidence but primarily due to increasing survival related to improved care linked to a rise in awareness, availability of insulin, and an increase in the number of pediatric endocrinologists.(12) Care has also improved due to support programs like Changing Diabetes in Children (CDiC) established in 2009, aimed at providing and improving diabetes services in children and adolescents. According to the International Diabetes Federation Atlas, there were 108,300 incident cases of T1DM in children under 15 years old in 2021, and with an extended age range to 20 years old, the number of incident cases increased to 149,500. Children aged 15-19 years report the highest incidence compared to those aged 1-14 years, particularly in sub-Saharan Africa.(12)

In Tanzania, T1DM cases among adolescents have increased from 50 in 2005 to over 1200 in 2014, and they are still on the rise.(13) According to estimates in 2016, type 1 diabetes affects 10.1 to 11.9 out of 100,000 children, with an annual incidence of 1.8–1.9 per 100,000 children. The peak age for diagnosis of TIDM was reported to be peri-adolescent and adolescent children aged 10–14 years.(14)

1.1.1 Depression and diabetes

Among the top ten causes of years lived with disability (YLDs), depression ranks second, while diabetes comes in at seventh place.(15) Researchers report a 2–3 times higher likelihood of depression in people with diabetes compared to those without diabetes. Co-occurrence of these two conditions results in increased morbidity and mortality.(16)

T1DM carries a high level of stress due to the complexity of its management. Survival requires daily multiple doses of insulin injections, which is traumatic, along with repeated self-monitoring of blood glucose. Studies have reported insulin therapy alone to be independently associated with an increased likelihood of depression in patients with diabetes which is the mainstay of treatment in patients with T1DM making this population

more susceptible to depression.(17) The need for regular clinic visits and the cost of treatment both add to the financial strain on the affected family. This may lead to depression which can have a negative impact on glycaemic control denoted by high values of glycated haemoglobin (HbA1c).(18)

Several mechanisms have been proposed on how depression affects glycaemic control such as the negative effect of depression on memory, along with its associated symptoms such as loss of interest in activities, impaired eating habits, difficulty with concentration, and difficulty making decisions. These, in turn, affect adherence and the overall diabetes management.(16,18)

1.1.2 Screening and diagnosis of depression

Diagnosis of a major depressive episode is made when there are 5 or more symptoms for more than 2 weeks of which one symptom should include either loss of interest or pleasure or a depressed mood. This may include changes in sleeping, eating, and activity patterns and suicidal ideation. The most commonly used screening tool is Patient Health Questionnaire -9 (PHQ-9). All populations use this 9-item tool, which undergoes specific modifications and validations based on age (PHQ-A for adolescents), language, and culture. The tool maintains a consistent cut-off point for identifying clinically significant depression. It assists in evaluating symptoms and functional impairment, furnishing details on the severity of depression, and monitoring treatment. Score ranges from 0 to 3 giving a maximum total score of 27. A cut-off of 10 points has a sensitivity of 88% and a specificity of 88% in detecting clinical depression.(19)

1.2 Problem statement

Depression in a patient with diabetes has an adverse impact on glycemic control, resulting in a dual effect on morbidity and mortality associated with these two conditions. The burden is high with a pooled prevalence of depression in adolescents with T1DM from a meta-analysis study done in 2016 was reported to be 30.4% .(15)

Adolescents are vulnerable to mental health disorders, including depression. The physiological, psychosocial, and cognitive changes occurring in adolescents as they transition to adulthood place them at unique risk of depression. The sense of autonomy developing in adolescents has an impact on adherence to treatment and diabetes care, making this group a priority in addressing challenges associated with diabetes treatment, monitoring, and follow-up; including screening of associated comorbid conditions like depression.

The American Diabetes Association (2018) recommended annual screening of adolescents with T1DM for depression. However, in low and middle-income countries these screening opportunities are often missed due to the high patient number to health care provider ratio. Studies have reported that only 25%-50% of diabetic patients with depression are diagnosed and treated despite being a common comorbid condition that negatively impacts glycaemic control.(16)

Studies in Tanzania have shown poor glycemic control in adolescents, but there is a paucity of data on the burden of depression and associated factors in this population, hence the need for this study.

1.3 Conceptual framework

Depression risks and causes are multifactorial, including participants' and caregivers' socio-demographic factors and disease-related factors. The disease-related factors such as the duration of diabetes since diagnosis, frequency of blood glucose monitoring, and glycaemic control may influence the risk of having depression. On the other hand, socio-demographic characteristics of the participants including; age, sex, nutrition status, level of education, and caregivers' socio-economic status, may pose a risk of depression amongst adolescents with TIDM.

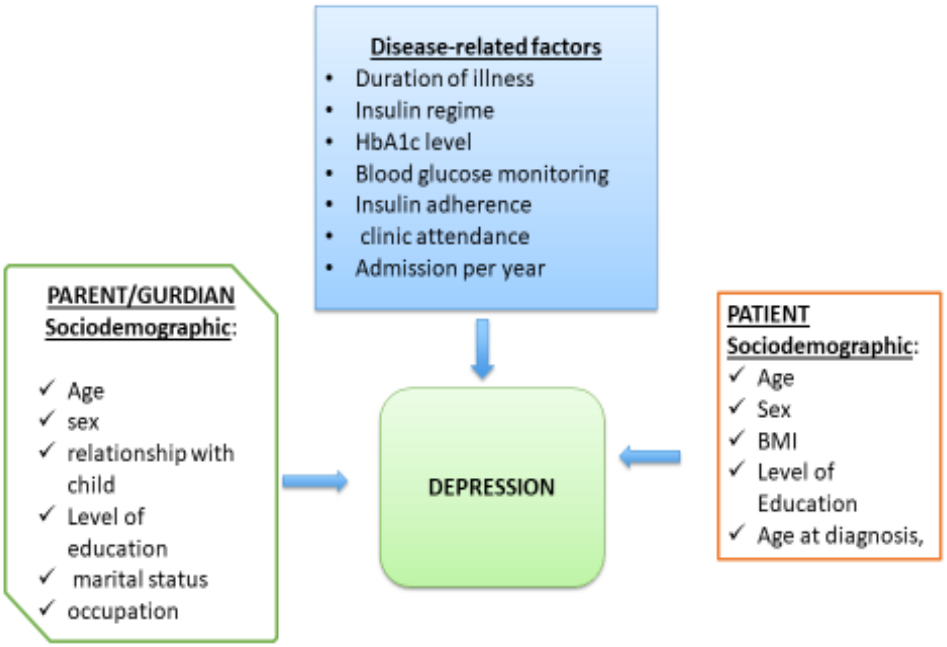


Figure 1: Conceptual framework

1.4 Rationale of the Study

Research indicates a high burden of depression among adolescents with type 1 diabetes mellitus (T1DM), particularly in sub-Saharan Africa. However, data specific to this population remains limited. This study provides local evidence regarding the prevalence of depression among adolescents with T1DM, hence highlighting the need for routine screening of depression and integration of mental health interventions within diabetes care setting. Additionally, by identifying factors associated with depression, the study offers guidance for recognizing those at heightened risk, enabling early detection and appropriate intervention strategies.

1.5 Research Questions

1. What is the prevalence of depression among adolescents with T1DM attending diabetes clinics in Dar-es-Salaam?

2. What are the factors associated with depression among adolescents with T1DM attending diabetes clinics in Dar-es-Salaam?

1.6 Objectives

1.6.1 Broad objective

To determine the prevalence of depression and associated factors among adolescents with type one diabetes mellitus attending the diabetes clinics in Dar-es-Salaam

1.6.2 Specific objectives

1. To determine the prevalence of depression among adolescents with T1DM attending the diabetes clinics in Dar-es-Salaam.
2. To determine the factors associated with depression among adolescents with T1DM attending the diabetes clinics in Dar-es-Salaam.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The magnitude of depression in adolescents with T1DM

Although research on depression in adolescents with T1DM is limited, reports suggest that this population experiences depression at a rate of two to three times higher than the general population.(16) Its magnitude varies across countries due to social attributes, culture, and economy. Study design and the tools used to diagnose depression in a particular study also contribute to the differences in findings. Studies have reported a low prevalence of depression in high-income countries as compared to low and middle-income countries and this may be due to access to care and the presence of supporting groups.(3)

Bernstein *et al*. did a study in USA that involved 150 patients assessing the prevalence of mental health issues and their impact on glycemic control. The study was done among adolescents and young adults aged 11–25 years with T1DM. In this study the prevalence of depression was reported to be 11.3%.(20) In a California multicentre study of 2,672 T1DM patients aged 10-21 years, 22.5% experienced depression, with 14% mild and 8.6% moderate to severe.(21)

A systematic review and meta-analysis which reviewed 14 articles from different countries done in Germany from April 2014 to May 2016 reported a pooled prevalence of depressive symptoms of 30.04%. Studies reviewed had the primary objective of assessing depression symptoms and anxiety in children and adolescents with T1DM.(18) Aqeel *et al*. conducted a cross-sectional study among adolescents with T1DM in Saudi Arabia in 2021, where they found the prevalence of depression to be 27%, with mild cases accounting for 80%, moderate cases for 12.5%, and severe cases accounting for 7.5%.(22)

Single-center studies done in Africa reported a high variability of the prevalence of depression among adolescents with T1DM. Mohamed *et al.* (2021) conducted a study in Cairo, Egypt, which reported an 89% prevalence of depression.(23) In another study done in Congo (2021) assessing psychosocial functioning in T1DM children and adolescents, the prevalence of depression was reported to be 41.9% accounting for mild and moderate

depression cases.(24) On the other hand, a recent study done in Jordan (2023) involving adolescents aged 10-17 years found the prevalence of depression to be 46.3%. The lowest prevalence was reported in a case-control study done in Zambia which reported a prevalence of 19.7% among adolescents with TIDM.(25)

In Tanzania, a study done by Khan *et al.* (2019) which involved both children and adults, with children (< 20 years) accounting for only 12.7 % of the participants, reported the prevalence of depression to be 87%. Minimal depression accounted for 56.7%, 22.1% had mild depression, and 8.2% had moderate depression.(17)

2.2 Factors associated with depression among adolescents with T1DM

Several factors have been linked to the occurrence of depression in adolescents with diabetes, with some consistent reports from multiple studies. These factors include; socio-demographic characteristics of adolescents and caregivers like sex, education level, occupation, obesity, and family structure. Clinical characteristics reported includes duration of diabetes, blood glucose monitoring, and glycemic control

Gender has been consistently reported among adolescents and the prevalence of depression was more observed in females than males. Alassaf *et al.* reported that females were three times more likely to develop depression than males.(26) Several other studies reported similar findings.(22,25) This has been linked to biological makeup and their specific experiences as women in society. Studies have reported that females have unique brain connectivity which provides higher levels of empathy and emotional understanding than men which in turn predisposes them to depression.(27)

Obesity was also reported to be associated with depression among adolescents. Obese adolescents are more likely to develop depression and this was linked to poor glycemic control. They tend to have low self-esteem and are often bullied making it difficult to fit in with their peers, hence, when they have diabetes as a comorbidity, the risk of depression increases.(28)

Family structure and stability have been associated with the occurrence of depression in adolescents, and this was also reported to influence the coping mechanism. In a study done by Wenzhe *et al*. (2021) exploring factors associated with depression in female adolescents found that those from single-parent families were 2 times more likely to develop depression. They also found that those with fathers having low level of education (primary education) were more likely to have depression compared to those with fathers having higher education.(29) Low socio-economic status is among the factors that are consistently linked to an increased likelihood of depression in adolescents with T1DM.(25,28,30)

Looking at the clinical characteristics, studies have shown that the duration of diabetes mellitus is associated with depression. The study done in Jordan in 2023 revealed that adolescents with a long duration of diabetes were more likely to develop depression.(26) A similar finding was reported in a Saudi Arabian study in 2021.(22) Long duration of diabetes is associated with increased chances of developing diabetes-related complications which may partly explain the increased risk of depression in the long run.

Similarly, the frequency of blood glucose monitoring has been associated with depression, and those who have a lower frequency of blood glucose monitoring were reported to be more likely to have depression.(26)

2.3 Effect of depression on HbA1c level among adolescents with T1DM

Studies have linked depression in adolescents to suboptimal glycaemic control, as shown by the high HbA1c percentage. The symptomatology of depression, including loss of interest, poor self-care, poor eating habits, poor concentration, and poor decision-making, partially explains this, as reported in a longitudinal study by Meghan *et al*.(31) Carrie *et al*.'s study revealed that adolescents with depression were twice as likely to have a high HbA1c value as those without depression.(20) Plener *et al.* conducted an observational study to assess depression and metabolic control in youth with T1DM and found that the group with comorbid depression had significantly higher HbA1c compared to their counterparts.(32)

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a hospital-based cross-sectional study

3.2 Study period

The study was conducted over a period of six months from November 2023 to April 2024.

3.3 Study area

The study was conducted in 4 sites, Muhimbili National Hospital (MNH), Temeke Regional Referral Hospital, Mwananyamala Regional Referral Hospital, and Vijibweni Hospital which operates at the level of a district hospital. These sites were purposively selected since they are the only government hospitals in Dar es Salaam with fully functioning diabetes clinics for children and adolescents. They provide both inpatient and outpatient services. The total number of adolescents in these clinics is estimated to be 80 for MNH, 45 for Temeke, 60 for Mwananyamala, and 40 for Vijibweni Hospital, giving a total of 225 adolescents. Adolescents account for about 50% of the cases. The clinics run once every week except at Vijibweni Hospital where they run only twice a month. Services provided during clinic visits include health education on diabetes care, assessing glycaemic control and complications, dose adjustment, and drug refills. In every clinic, there was a point-of-care RBG machine and HbA1c Analyzer. HbA1c measurements are taken every 3 months as a point-of-care service for free.

3.4 Study population

All adolescents aged 10-19 years diagnosed with type one diabetes, on treatment for more than 3 months, and attending clinics at MNH, Mwananyamala RRH, Temeke RRH, and Vijibweni hospitals were eligible for the recruitment.

3.5 Sample size and selection

3.5.1 Sample size

The formula that was used to calculate sample size was Kish Leslie

From

$$n = \frac{Z2\ P(1-P)}{e2}$$

Where;

n = Is the sample size,

Z = Z statistic for a level of confidence,

P = Is the proportion of adolescents with depression=19% from a study done in Zambia by Hapunda *et al*. (22)

e = Desired marginal error, set at 5% (0.05).

n= 165

Considering a 10% non-response rate

N = n x 1/0.9

The sample size was estimated to be 183; however, in the final analysis, 186 participants were included.

3.5.2 Sampling technique

Based on the number of adolescents attending each clinic, we used proportional sampling to determine the number of participants to recruit from each facility: MNH = 65 (80/225 x 183), Temeke = 37, Mwananyamala = 49 and Vijibweni Hospital = 33. We then used consecutive sampling to recruit study participants from each clinic. At the end, we included all adolescents who attended each clinic during the study period to increase the power of the study and the sample size in the final analysis was 186 participants.

3.5.3 Inclusion criteria

All adolescents aged 10-19 years with T1DM attending the diabetes clinics and on medication for more than 3 months

3.5.4 Exclusion criteria

Adolescents whose caregivers declined consent

3.5.5 Independent variables

1. Caregivers' characteristics: age, whether parents living together, level of education, occupation
2. Participants' characteristics: Age, sex, BMI, level of education, insurance status
3. Disease-related factors; duration since diagnosis of diabetes, number of diabetes related admissions per year, insulin regime, insulin storage, clinic adherence, frequency of blood glucose monitoring, HbA1c level

3.5.6 Dependent variable

The presence or absence of clinical depression

3.6 Data collection

The principal investigator and three research assistants (two doctors and one nursing officer), who had a one-day training on the study's purpose and the data collection process, collected the data.

3.6.1 Data collection tools

We developed and translated structured English questionnaire into the local language, Kiswahili, to collect data on the clinical characteristics of the participants and the socio-demographic characteristics of both caregivers and the participants. Pre-testing of the

questionnaire was done before the commencement of data collection. We also used the Swahili version of the Patient Health Questionnaire-9 modified for adolescents (PHQ-A) to assess for symptoms of depression.

3.6.2 Data Measurement

3.6.2.1 Socio-demographic and clinical characteristics assessment

Nutrition status: BMI represented participants' nutrition status which was calculated and expressed as a percentile and was then categorized based on the CDC growth chart for children and adolescents (2-20years) into:

- Underweight: < 5^{th} percentile
- Normal weight: 5^{th} - < 85^{th} percentile
- Overweight:85^{th} - < 95^{th} percentile
- Obesity: ≥95^{th} percentile

Diabetes mellitus control: Was assessed using the most recent HbA1c (within 3 months) which was categorized based on the American Association of Diabetes cutoff point of HbA1c level for adolescents.(33,34)

≥ 7.5% uncontrolled diabetes

<7.5 controlled diabetes

Blood glucose monitoring: This was assessed based on the frequency of RBG measurements per week by reviewing participants' blood glucose monitoring log books, and was categorized as follows

- Always: daily
- Mostly: 4-6 days per week
- Rarely: <4 days per week
- Never: none.

This categorization was adopted from a study done by Alassaf *et al*. in 2023.(26)

Average blood glucose: A 2-week average blood glucose correlating with the duration of depression symptoms assessment was obtained by summing up the RBG obtained from the participant's blood glucose monitoring log books and dividing by the total number of RBG readings.

3.6.2.2 Depression assessment

A Swahili version of the PHQ-9 modified for adolescents (PHQ-A) tool was used. It contains nine questions with a total score of 27. The scores were given based on the frequency of occurrence of depressive symptoms in the past two weeks. We scored as follows; 0 = Not at all, 1=several days, 2= more than half of the days, and 3= nearly every day.(19)

The severity of depression was classified based on the total score as follows:

- 0-4 none-minimal depression,
- 5-9 mild depression,
- 10-14 moderate depression,
- 15-19 moderately severe depression and
- 20-27 severe depression

Clinical depression which was used as an outcome variable was defined as a score of 10 and above

3.6.3 Data analysis and management

Data entry, cleaning, and processing were done using SPSS version 23. Data were categorized, coded and analyzed. Continuous data were summarized as median (IQR) and Mean (±SD). Categorical data was summarized as frequencies and proportions. Chi-square and Fisher's exact tests were used where applicable to test for the significant difference between the independent variables' proportions and the presence of depression. Univariate and multivariate logistic regression was done to find the association between socio-demographic characteristics and clinical characteristics with depression. Variable with a p-value of <0.2 on univariate analysis were entered into a multivariate model for analysis to control for other factors. P-value <0.05 was considered statistically significant at a 95% confidence interval

3.6.4 Ethical considerations

Ethical clearance was obtained from the Muhimbili University of Health and Allied Science Institutional Review Board (IRB) and was approved by publication and research committee meeting on October 23, 2023, [See Appendix 9]. Permission letters for data collection were obtained from each health facility (MNH, Mwananyamala RRH, Temeke RRH and Vijibweni Hospital), [See Appendices 10-13].

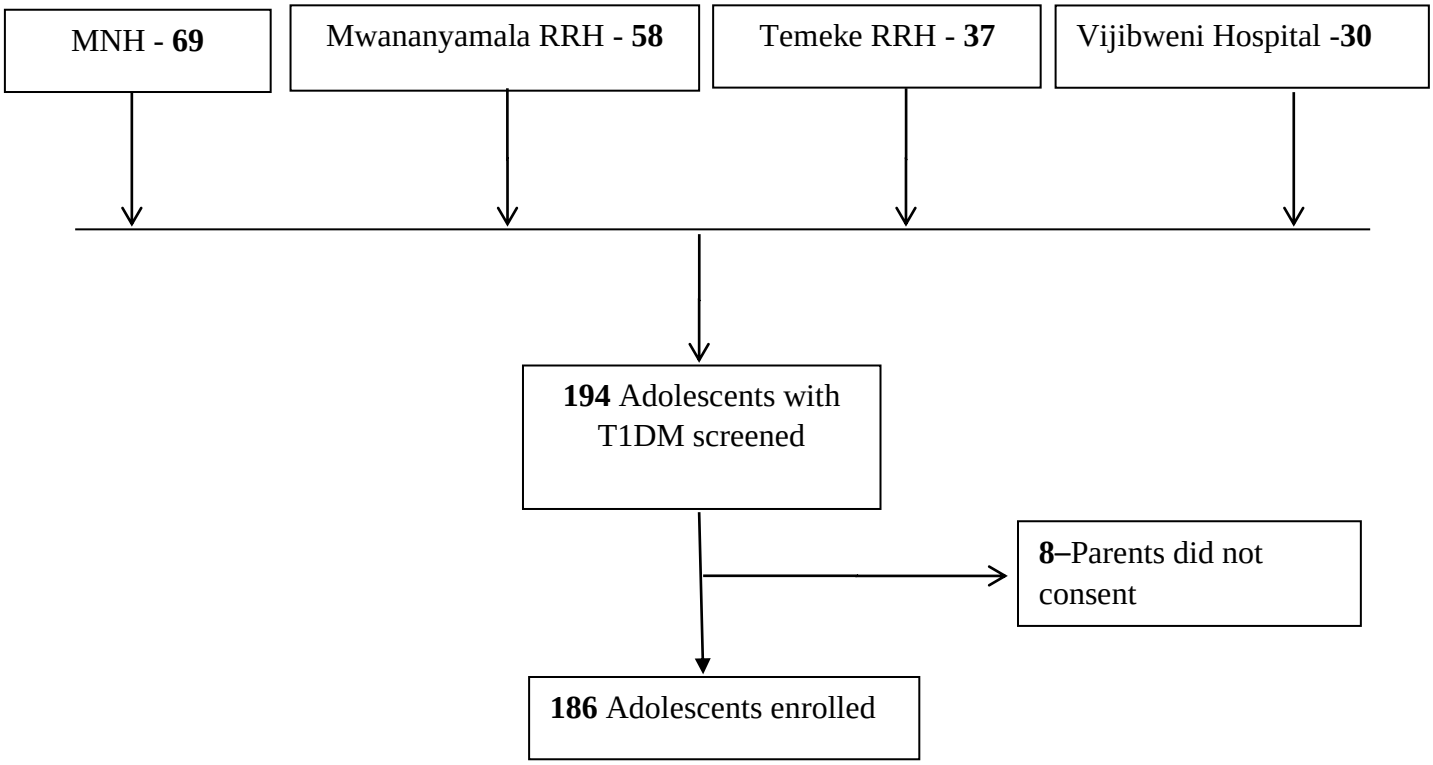
Informed consent was obtained from adolescents >18 years and caregivers of adolescents below 18 years. Simultaneously, assent was also obtained from participants <18 years before enrollment. Unique study identification numbers were used in place of participants' hospital registration details to ensure confidentiality. The data collection process did not interfere with routine service delivery and participants were free to withdraw from the study at any point during data collection. Patient documents including answered questionnaires were kept in a secured cabinet.

For participants who were diagnosed with moderate to severe depression or had a yes answer to suicidal ideation, a consultation was written and the participants were linked to a clinical psychologist at MNH psychiatric department for further evaluation and management.

CHAPTER FOUR

4:0 RESULTS

We screened a total of 194 adolescents for eligibility; 8 of them declined to participate, leading to the recruitment of 186 participants in the study. The flow chart in Figure 2 below illustrates the number of eligible adolescents screened from each facility, as well as the final enrollment of study participants.



MNH; Muhimbili National Hospital, RRH; Regional Referral Hospital, T1DM; Type one Diabetes Mellitus

Figure 2: Flow diagram showing how the participants were recruited into the study

4.1 Socio-demographic characteristics of adolescents with T1DM

The majority, 144 (77.4%) of participants were aged more than 14 years, with a median age of 15 (IQR:14-17) years. There was a female preponderance (58.1%) whilst most of the participants (63.4%) had normal weight and secondary level of education (68.3%). Table 1 summarises the socio-demographic characteristics of adolescents with T1DM.

Table 1: Socio-demographic characteristics of adolescents with T1DM (N=186)

Variables	Frequency (n)	Percent (%)
Age (Years)		
≤14	42	22.6
>14	144	77.4
Median (IQR)	**15 (14-17)**	
Sex		
Male	78	41.9
Female	108	58.1
Nutrition status		
Underweight	**49**	**26.3**
Normal weight	**118**	**63.4**
Overweight	**10**	**5.5**
Obesity	**9**	**4.8**
Education level		
No formal education	10	5.4
Primary education	49	26.3
Secondary education	127	68.3
Insurance status		
Yes	78	41.9
No	108	58.1
Name of diabetes clinic		
Muhimbili National Hospital	63	33.9
Mwananyamala RRH	58	31.2
Temeke RRH	35	18.8
Vijibweni Hospital	30	16.1

IQR; Interquartile range, RRH; Regional Referral Hospital

4.2 Socio-demographic characteristics of the caregivers

Out of 186, 171(91.9%) primary caregivers were biological parents of whom 83.9% both parents were alive; and most of them (66.1 %) were living together. Education level varied, with only 4.3% of caregivers having no formal education but most of them (54.5%) were self-employed as shown in Table 2.

Table 2: Socio-demographic characteristics of the caregivers (N=186)

Variables	Frequency (n)	Percent (%)
Primary caregivers		
Parent(s)	171	91.9
Guardian	15	8.1
Parent survival status		
Both are alive	156	83.9
Single parent	25	13.4
Both died	5	2.7
Parent living together		
Yes	123	66.1
No	63	33.9
Caregiver education		
No formal education	8	4.3
Primary	68	36.6
Secondary	70	37.6
College or university	40	21.5
Caregiver occupation		
Formal employment	58	31.2
Self-employed	120	64.5
Unemployed	8	4.3

4.3 Clinical characteristics of adolescents with T1DM

More than half (57.0%) of study participants had been diagnosed with T1DM for less than 5 years before the study, with a mean duration of 4.5 (SD: ±3.17) years since diagnosis. The majority, (98.9%) were self-injecting insulin, and 83.3% were always monitoring blood glucose. Also majority (79.0%) had average blood glucose ranging between 7.1 and 11 mmol/L. Almost all (96.2%) of participants had poor diabetes control with HbA1C ≥7.5%, as shown in Table 3.

Table 3: Clinical characteristics of adolescents with T1DM (N=186)

Variables	Frequency (n)	Percent (%)
Duration of DM diagnosis		
<5 years	106	57.0
≥5years	80	43.0
Mean(SD)	**4.5 (±3.17)**	
Mode of insulin injection		
Self-injection	184	98.9
Caregiver	2	1.1
Insulin Regimen		
Twice daily injection	75	40.3
Multiple daily injection (≥3)	111	59.7
Number of admissions in the past 1 year		
None	122	65.6
Once	61	32.8
≥2	3	1.6
Blood glucose monitoring		
Always	155	83.3
Mostly	24	12.9
Rarely	7	3.8
Average blood glucose(mmol/L)		
≤7	10	5.4
7.1-11	147	79.0
≥11.1	29	15.6
DM control (HbA1c Levels %)		
Controlled(<7.5)	7	3.8
Uncontrolled (≥7.5)	179	96.2

DM; Diabetes Mellitus, HbA1c; Glycated haemoglobin A1c, SD; Standard Deviation

4.4 Prevalence of Depression

Depressive symptoms were detected in 107 (57.5 %) adolescents with T1DM. Among the depressed adolescents, 57 (30.6%) had mild depression while 50 (26.9%) had clinical depression. Clinical depression comprises moderate depression (14%) moderately severe depression (11.8%) and severe depression 2 (1.1%). Figure 3 summarizes the proportion of depression by severity.

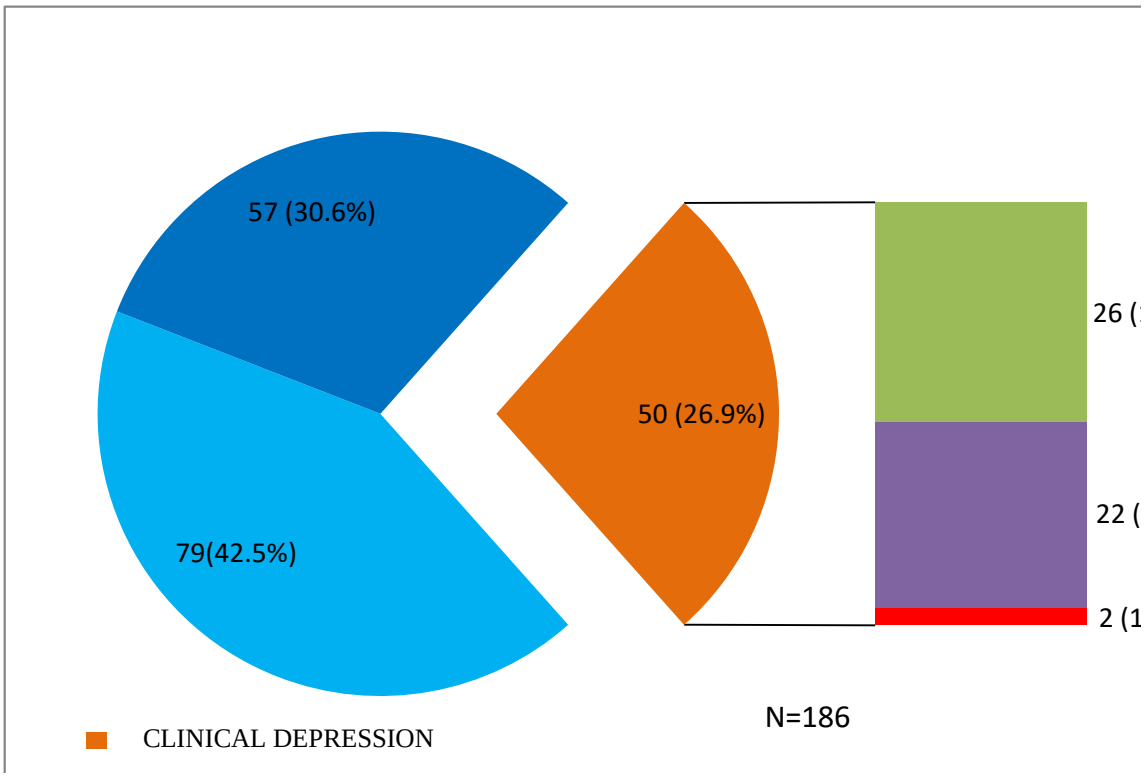


Figure 3: Prevalence of depression by severity among adolescents with T1DM

4.5 Association between socio-demographic characteristics of adolescents with T1DM and clinical depression

Depression amongst adolescents with diabetes was found to be significantly higher in females 35(32.4%) as compare to male 19.2(19.2%), (p=0.045) and those aged >14 years (p=0.003). However, having depression was neither associated with nutrition status, level of education nor insurance status as shown in Table 4.

Table 4: Association between socio-demographic characteristics of adolescents with T1DM and clinical depression

Variables	Depression		P-value
	Depressed n= 50	Not depressed n= 136	
Age (Years)			
≤14	9(13.8)	56(86.2)	**0.003**
>14	41(33.9)	80(66.1)	
Sex			
Male	15 (19.2)	63 (80.8)	**0.045**
Female	35 (32.4)	73 (67.6)	
Nutrition status			
Underweight	9 (18.4)	40 (81.6)	
Normal weight	36 (30.5)	82 (69.5)	0.433*
Overweight	3 (30.0)	7 (70.0)	
Obesity	2 (22.2)	7 (77.8)	
Education level			
No Formal Education	1 (10.0)	9 (90.0)	
Primary Education	13 (26.5)	36 (73.5)	0.350
Secondary Education	36 (29.3)	91 (71.7)	
Insurance status			
Yes	23 (29.5)	55 (70.5)	0.496
No	27 (25.0)	81 (75.0)	
Diabetes clinic			
MNH	21 (33.3)	42 (66.7)	
Mwananyamala RRH	11 (19.0)	47 (81.0)	0.291
Temeke RRH	11 (31.4)	24 (68.6)	
Vijibweni Hospital	7 (23.3)	23 (76.7)	

MNH; Muhimbili National Hospital, RRH; Regional Referral Hospital

****Fischer exact test used. P<0.05-statistically significant***

4.6 Association between socio-demographic characteristics of the caregivers and clinical depression

Depression was significantly associated with the caregiver's marital status, whereby participants whose parents were separated, 38.1% had depression as compared to 21.1% in those whose parents were living together (P=0.014) as summarized in Table 5.

Table 5: Association between caregiver socio-demographic characteristics and clinical depression

Variables	Depression		P-value
	Depressed n= 50	Not depressed n= 136	
Primary caregiver			
Parent(s)	45(26.3)	126(73.7)	0.552
Guardian	5(33.3)	10 (66.7)	
Parent survival status			
Both are alive	39(25.0)	117(75.0)	0.431*
Single parent	9 (36.0)	16 (64.0)	
Both died	2(40)	3(60)	
Parent living together			
Yes	26 (21.1)	97 (78.9)	**0.014**
No	24 (38.1)	39 (61.9)	
Caregivers' Education Level			
No formal education	**3(37.5)**	**5(62.5)**	
Primary	**18(26.5)**	**50(73.5)**	
Secondary	**20(28.6)**	**50(71.4)**	**0.812**
College or university	**9 (22.5)**	**31(77.5)**	
Caregiver s' occupation			
Formal employment	19(32.8)	39(67.2)	
Self-employed	27(22.5)	93 (77.5)	0.113*
Unemployed	4 (50.0)	4 (50.0)	

Fischer exact test used. P<0.05-statistically significant

4.7 Association between clinical characteristics of adolescents with T1DM and clinical depression

A shorter duration (<5 years) since the diagnosis of diabetes and a higher 2-week average blood glucose level (>11.0mmol/L) were significantly associated with depression ($p < 0.001$). However, depression was not associated with diabetes mellitus control (HbA1c level), insulin regimen, or frequency of blood glucose monitoring as shown in Table 6

Table 6: Association between clinical characteristics of adolescents with T1DM and clinical depression.

Variables	Depression		P-value
	Depressed n= 50	Not depressed n= 136	
Duration DM diagnosis			
<5 years	41 (38.7)	65 (61.3)	**<0.001**
≥5 years	9 (11.2)	71 (88.8)	
Mode of insulin injection			
Self-injection	50 (27.2)	134 (72.8)	0.389*
Parent or Guardian	0 (0.0)	2 (100.0)	
Insulin regimen			
Twice daily injection	18 (24.0)	57 (76.0)	0.466
Multiple daily injection	32 (28.8)	79 (71.2)	
Number of admissions			
None	32 (26.2)	90 (73.8)	
Once	17 (27.9)	44 (72.1)	0.942*
≥2	1 (33.3)	2 (66.7)	
Blood glucose monitoring			
Always	45 (29.0)	110 (71.0)	
Mostly	2 (8.3)	22 (91.7)	0.065*
Rarely	3 (42.9)	4 (57)	
Average blood glucose			
≤7	1 (10.0)	9 (90.0)	**<0.001**
7.1-11	31 (21.1)	116 (78.9)	
≥11.1	18 (62.1)	11 (37.9)	
DM control (HbA1c level %)			
Controlled (<7.5)	1 (14.3)	6(85.7)	
uncontrolled (≥7.5)	49(27.4)	130 (72.6)	0.44

**Fischer exact test used. P <0.05-statistically significant, DM; Diabetes Mellitus*

4.8 Logistic regression analysis of factors associated with clinical depression in adolescents with T1DM

It was shown that older age (>14 years) was associated with 3.8 times the odds of having depression (p=0.002) as compared to those aged ≤14. Female adolescents were 2.86 times more likely to have depression compared to males (AOR = 2.86, 95% CI: 1.32-6.18, p = 0.008). Also, a short duration of diabetes mellitus diagnosis (<5 years) was associated with higher odds of depression (AOR = 1.16, 95% CI: 1.06-1.26, p = 0.001). On the other hand, depression was less likely to occur if parents were living together (p = 0.014), if caregivers had formal education (p=0.029), and those with average blood glucose levels of ≤11.1 mmol/L (p = 0.001). Table 7 summarizes the univariate and multivariate analysis of factors associated with clinical depression among adolescents with T1DM.

Table 7: Logistic regression analysis of factors associated with clinical depression in adolescents with T1DM.

Factors	Univariate analysis COR (95% CI)	P-value	Multivariate analysis AOR (95% CI)	P-value
Age (Years)				
≤14	Ref			
>14	3.18(1.44-7.08)	0.004	3.88(1.64-9.15)	**0.002**
Sex				
Male	Ref			
Female	2.01(1.01-4.02)	0.048	2.86(1.32-6.18)	**0.008**
Parent living together				
Yes	0.44 (0.22-0.85)	0.015	0.36(0.16-0. 81)	**0.014**
No	Ref			
Caregiver occupation				
Formal employment	0.487 (0.11-2.16)	0.344	0.41(0.183-0.91)	**0.029**
Self-employed	0.29(0.07-1.23)	0.095	1.02(0.19-5.4)	0.986
Unemployed	Ref			
Duration (DM) diagnosis				
<5 years	4.98 (2.25-11.03)	<0.001	1.16 (1.06-1.26)	**0.001**
≥5 years	Ref			
Blood Glucose Monitoring				
Always	Ref			
Mostly	0.90 (0.69-1.17)	0.447	0.94 (0.76-1.16)	0.558
Rarely	0.76 (0.58-1.01)	0.160	0.77 (0.61-1.12)	0.168
Average blood glucose				
≤7	0.07 (0.01-0.61)	0.016	0.76 (0.63-0.91)	**0.002**
7.1-11	0.16 (0.07-0.38)	<0.001	0.83 (0.75-0.93)	**0.001**
≥11.1	Ref			
DM Control (HbA1c level)				
Controlled(<7.5)	Ref			
Uncontrolled(≥7.5)	2.26(0.2-19.26)	0.455	1.47(0.08-26.96)	0.794

COR: crude Odds Ratio, AOR: Adjusted Odds Ratio, Ref: reference group, DM; Diabetes Mellitus, HbA1c; Glycated haemoglobin A1c, p <0.05 statistically significant.

CHAPTER FIVE

5:0 DISCUSSION

Depression is a common mental health disorder affecting adolescents with T1DM. In this study, we found that more than half of the participants (57.5%) had mild to severe depression. and over one quarter (26.9%) had clinical depression (moderate to severe depression). Older age, female sex, duration of diabetes of less than 5 years, parent separation, and caregivers' occupation were independently associated with depression.

The high prevalence of depression was in keeping with studies done in Africa and Middle East countries where the prevalence of depression in these countries ranged from 41.5% in Congo in 2021,(24) 46.3% in Jordan in 2023,(26) and as high as 89.0% in Egypt in 2020.(23) The similarity observed in the study done by Afify *et al*. in Egypt may be attributed to the fact that a similar screening tool was used (PHQ-A), which takes into account the milder form of the disease. However, the lower prevalence in the former two studies may be attributed to the differences in age groups included and the screening tools used. In the Congolese study, they included participants aged 8-25 years and used the Beck's Depression scale, while in the Jordanian study, they used the CES –DC tool. The wide age range in the Congolese study, which encompassed preadolescents, could potentially explain the slightly lower prevalence of depression in this study due to underreporting.(24) On the other hand, this study had a higher prevalence of depression when compared to a study done in the USA in 2013 where only 11.3 % had depression. This may be due to differences in the levels of care in high-income countries and the availability of counselling services and support groups integrated into routine care which may reduce the incidence of depression.(20)

The severity of depression has implications in terms of outcome and management. More than a quarter (26.9%) of adolescents with T1DM had clinical depression which indicates clinically significant depression requiring further evaluation and prompt management. This finding was in keeping with a study done in Saudi Arabia in 2021 where they reported the prevalence of depression to be 27%.(22) On the other hand, a lower prevalence of clinical

depression (16.6%) was reported in a study done by Almeida *et al.* (2018) in Brazil. The difference observed may be attributed to the study design used (case-control study).(35)

Older adolescents > 14 years have an increased risk of depression. Our study also found that those in middle and late adolescence were about four times more likely to have depression compared to those in the early adolescent period (≤14 years). This finding was similar to the study done by Vassili *et al*. (2020) in Congo.(24) The increase in the likelihood of depression in older adolescents has been linked to unique physical and psychological changes occurring at different phases of adolescence in conjunction to the differences in level of maturity and autonomy.(36)

Females had a 2.8-fold increase in odds of depression compared to males which was in keeping with other studies.(22,25,26) Researchers have linked this to the difference in the female brain structure, making them susceptible to mental health conditions,(27) the hormonal milieu, and their unique experiences as women in society. Women also constantly face societal expectations and gender discrimination, which negatively impacts their mental health, particularly during the adolescent period.

Family stability has long been known to be associated with mental health disorders including depression. This particularly affects adolescents who are relatively cognitively developed. In our study, we found that those whose parents were living together were less likely to be depressed, that is they were 64% protected from having depression compared to their counterparts. This was similar to the study done by Sun *et al.* (2021) that explored psycho-social factors associated with depression in female adolescents where they found that those in single-parent families were 2 times more likely to have depression.(29) Events accompanying the separation and decline in family support structure following parental separation may be the culprit for the psychological distress and hence the increased likelihood of depression.

The economic status of a family can affect the psychological well-being of the family members hence causing mental health disorders. Adolescents whose caregivers had formal employment were less likely to have depression compared to those with an unemployed caregiver. Steve *et al.* (2020) reported a similar finding.(24) Stable formal employment

indirectly reflects the family's socio-economic status which may alleviate the strain of chronic medical care and indirectly lower the risk of depression.(28)

Clinical depression was found to be more prevalent among adolescents with a shorter duration (< 5 years) since diagnosis of T1DM, indicating that most of the participants had adolescent-onset T1DM. The fact that most cases of T1DM are diagnosed during adolescent period is supported by the study done in Tanzania by Jasem *et al*. (2016) where they reported the peak age for TIDM diagnosis to be 10-14 years,(14) corresponding to the second peak of 10-14 years reported by Klitz *et al.* (2005).(11) Our findings were in line with the study that examined depression in children with T1DM, natural history, and collates, where they found two peaks in depression: one peak in less than 5 years like in our study, and another peak more than 10 years after diagnosis of diabetes.(37) Similarly, a 10-year longitudinal study by Kovacs *et al*. conducted among children aged 8 to 13 years, the cumulative probability of major depressive disorder was 27.5% after 10 years from diagnosis, and a high incidence was observed during the 1st year of diabetes diagnosis.(38) Acceptance of the disease and coping mechanisms, which typically develop over time, may contribute to the increased risk of depression early after the diabetes diagnosis. Maladaptive and slow coping mechanisms may occur in adolescents, especially with the adolescent onset of the disease, because adolescents concurrently have the developmental task of adapting to puberty.(39,40)

On the contrary, some studies have reported depression to be associated with a longer duration since the diagnosis of diabetes.(25,28,30) Abeer *et al*. (2020) showed a mean duration of diabetes of 5.4 ± 3.2 years to be associated with the risk of having depression. This is probably related to the potential of developing diabetes-related complications following the long duration of the disease which adds on the already existing stress of having diabetes mellitus.

Good glycaemic control has been associated with a lower risk of depression.(24,32) However, in this study, there was no statistically significant difference between those with poor diabetes control versus those with good control. This may be attributed to the fact that more than 95% of participants had uncontrolled diabetes. Furthermore, this high proportion of suboptimal glycemic control has been linked to the adolescent period itself among other

factors as reported in different studies that looked at glycemic control in children and adolescents with T1DM.(41,42) The growth spurt observed in adolescents and the increase in insulin demand during this period may lead to insulin insufficiency if not well addressed resulting in poor glycemic control. The sense of independence developing in adolescents when coupled with lack of parental supervision also may affect diabetes care and hence suboptimal glycemic control observed in this population.

Despite the fact that DM control did not significantly influence the occurrence of depression in this study, those with a 2-week average blood glucose in the lower range (<7 mmol/l) had lesser odds of depression than those with a higher range (≥11.1mmol/L). A 2-week period does not adequately measure DM control; however, a high level indicates more episodes of high blood sugar, which may reflect the longer-term glycemic control. Given that this was obtained during the period of depressive symptoms a high range of blood glucose may support the hypothesis of the negative effect of depressive symptoms such as loss of interest in activities, impaired eating habits, trouble in concentration, and making decisions on diabetes care.(16,18,20) This highlights the need for routine screening and management of depression in adolescents with T1DM to reduce long-term dual morbidity associated with these two conditions.

Inability to frequently monitor one's blood glucose levels has been previously associated with depression, as shown by Alassaf *et al*. (2020) in Jordan.(26) Although a larger proportion of those with depression in our study rarely measured their blood glucose, most of the participants were measuring blood glucose regularly hence the frequency of blood glucose monitoring did not significantly influence depression which was comparable to the study done by Jurgen *et al*. (2020) in USA.(43)

5.1 Strength and Limitations of the study

Our study was conducted in both secondary and tertiary level health facilities hence involving participants receiving different levels of healthcare services which increase the generalizability of the results.

The major limitations of this study were the possibility of recall and social desirability bias from the self-reported information from the participants which may underestimate the prevalence of depression. We mitigated this by inquiring on information within a short recall period whilst ensuring confidentiality to the participants. The cross-sectional study design also limited the establishment of a causal relationship.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Depression is prevalent among adolescents with T1DM particularly in females, those aged >14 years, and those within 5 years since the diagnosis of diabetes; whilst adequate glycaemia control was found to be protective. Single parenthood and lack of formal parental employment increased the risk of depression amongst TIDM adolescents. Notably, majority of adolescents with T1DM had uncontrolled diabetes.

6.2 Recommendation

Routine screening for depression amongst adolescents with T1DM should be integrated into the diabetes clinic services to ensure early detection and management. Further studies should be done to determine factors contributing to the high prevalence of poor diabetes control among this adolescent population.

REFFERENCES

1. del Barrio V. Diagnostic and Statistical Manual of Mental Disorders. In: Encyclopedia of Applied Psychology, Three-Volume Set. 2004. p. 607–14.

2. Mental health of adolescents [Internet]. [cited 2024 May 29]. Available from: https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health

3. Shorey S, Ng ED, Wong CHJ. Global prevalence of depression and elevated depressive symptoms among adolescents: A systematic review and meta-analysis. Br J Clin Psychol. 2023 Jun 4];61(2):287–305.

4. Blakemore SJ. Development of the social brain during adolescence. Q J Exp Psychol. 2008;61(1):40–9.

5. Crone EA, Dahl RE. Understanding adolescence as a period of social-affective engagement and goal flexibility. Nat Rev Neurosci 2012;13(9):636–50.

6. Somerville LH, Jones RM, Casey BJ. A time of change: Behavioral and neural correlates of adolescent sensitivity to appetitive and aversive environmental cues. Brain Cogn 2010;72(1):124–33.

7. Platt JM, Bates L, Jager J, McLaughlin KA, Keyes KM. Is the US Gender Gap in Depression Changing over Time? A Meta-Regression. Am J Epidemiol. 2021;190(7):1190–206.

8. Naninck EFG, Lucassen PJ, Bakker J. Sex Differences in Adolescent Depression: Do Sex Hormones Determine Vulnerability? J Neuroendocrinol. 2011;23(5):383–92.

9. Frison E, Eggermont S. Toward an Integrated and Differential Approach to the Relationships Between Loneliness, Different Types of Facebook Use, and Adolescents' Depressed Mood. Communic Res. 2020;47(5):701–28.

10. Nesi J, Prinstein MJ. Using Social Media for Social Comparison and Feedback-Seeking: Gender and Popularity Moderate Associations with Depressive Symptoms. J Abnorm Child Psychol. 2015;43(8):1427–38.

11. Ei F, Klitz W, Ham M, Am L, Stastny P, Dupont B, et al. Felner2005. 2005;213–20.

12. Ogle GD, James S, Dabelea D, Pihoker C, Svennson J, Maniam J, et al. Global estimates of incidence of type 1 diabetes in children and adolescents: Results from the International Diabetes Federation Atlas, 10th edition. Diabetes Res Clin Pract 2022;183:109083.

13. Muze KC, Majaliwa ES. Brief Communication Type 1 diabetes care updates : Tanzania. 2015;19:12–4.

14. Jasem D, Majaliwa ES, Ramaiya K, Najem S, Swai ABM, Ludvigsson J. Incidence, prevalence and clinical manifestations at onset of juvenile diabetes in Tanzania. Diabetes Res Clin Pract 2019;156:107817.

15. Bill F, Foundation MG. Global , regional , and national incidence , prevalence , and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries , 1990 – 2013 : a systematic analysis for the Global Burden of Disease Study 2013. Lancet [Internet]. 2015;6736(15):1990–2013.

16. Centers for Disease Control and Prevention (CDC). Diabetes and Mental Health [Internet]. [cited 2023 Jun 4]. Available from: https://www.cdc.gov/diabetes/managing/mental-health.html

17. Khan ZD, Moledina SM. Prevalence of Depression and Associated Factors among Diabetic Patients in an Outpatient Diabetes Clinic. 2019;2019.

18. Buchberger B, Huppertz H, Krabbe L, Lux B, Mattivi JT, Siafarikas A. Symptoms of depression and anxiety in youth with type 1 diabetes: A systematic review and meta-analysis. Psychoneuroendocrinology.2016;70:70–84.

19. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. 46202:606–13.

20. Bernstein CM., Stockwell MS, Gallagher MP, Rosenthal SL, Soren K. Mental health issues in adolescents and young adults with type 1 diabetes: Prevalence and impact on glycemic control. Clin Pediatr (Phila). 2013;52(1):10–5.

21. Lawrence JM, Standiford DA, Loots B, Klingensmith GJ, Williams DE, Ruggiero A, et al. Prevalence and Correlates of Depressed Mood Among Youth With Diabetes : The SEARCH for Diabetes in.

22. Alaqeel A, Almijmaj M, Almushaigeh A, Aldakheel Y, Almesned R. High Rate of Depression among Saudi Children with Type 1 Diabetes. 2021;

23. Afify1 MAEME, Thabet1 RA, Elrasas2 HH, Alaaeldeen, Elazab1 NM. Screening for Depression in Adolescents with Type 1 Diabetes Mellitus. 2021;114:2021.

24. Vassili S, Mandilou M, Ollandzobo LCA ibara, Lesnée F, Kitemo G, Robert J, et al. Psychosocial functioning and health related quality of life in children , adolescents and young adults with type 1 diabetes mellitus in Congo. 2021;(December 2020):675–82.

25. Hapunda G, Abubakar A, Pouwer F, van de Vijver F. Diabetes mellitus and comorbid depression in Zambia. Diabet Med. 2015;32(6):814–8.

26. Alassaf A, Gharaibeh L, Zurikat RO, Farkouh A, Ibrahim S, Zayed AA, et al. Prevalence of Depression in Patients with Type 1 Diabetes between 10 and 17 Years of Age in Jordan. J Diabetes Res. 2023;2023.

27. Ingalhalikar M, Smith A, Parker D, Satterthwaite TD, Elliott MA, Ruparel K, et al. Sex differences in the structural connectome of the human brain. 2013;1–6.

28. Silverstein J, Cheng P, Ruedy KJ, Kollman C, Beck RW, Klingensmith GJ, et al. Depressive symptoms in youth with type 1 or type 2 diabetes: Results of the pediatric diabetes consortium screening assessment of depression in diabetes study. Diabetes Care. 2015;38(12):2341–3.

29. Sun W, Mei J, Wang Y, Zhao X, Zhu Z, Zhang C, et al. Psycho-social factors associated with high depressive symptomatology in female adolescents and gender difference in adolescent depression : an epidemiological survey in China ' s Hubei Province. 2021;1–12.

30. N B, Praveen K, Rashmi N. Prevalence and Factors Influencing Depression among Adolescents with Type-1 Diabetes – A Cross-Sectional Study. Int J Med Public Heal. 2017;7(3):162–5.

31. Meghan E. McGrady1 2 and Korey K. Hood2. Associations with Longitudinal Outcomes. 2011;88(3):1–6.

32. Plener PL, Molz E, Berger G, Schober E, Mönkemöller K, Denzer C, et al. Depression, metabolic control, and antidepressant medication in young patients with type 1 diabetes. Pediatr Diabetes. 2015;16(1):58–66.

33. Nathan DM, Balkau B, Bonora E, Borch-Johnsen K, Buse JB, Colagiuri S, et al. International expert committee report on the role of the A1C assay in the diagnosis of diabetes. Diabetes Care. 2009;32(7):1327–34.

34. Rewers M, Pihoker C, Donaghue K, Hanas R, Swift P, Klingensmith GJ. Assessment and monitoring of glycemic control in children and adolescents with diabetes. Pediatr Diabetes. 2009;10(SUPPL. 12):71–81.

35. Almeida MC, Claudino DA, Grigolon RB, Fleitlich-bilyk B. Psychiatric disorders in adolescents with type 1 diabetes : a case-control study. 2018;284–9.

36. Brix N, Ernst A, Lykke L, Lauridsen B, Parner E, Støvring H, et al. Timing of puberty in boys and girls : A population- - based study. 2018;(August):1–9.

37. Grey M, Whittemore R, Tamborlane W. Depression in Type 1 diabetes in children Natural history and correlates. 2002;53:907–11.

38. Inventory BD, Rat- HA, Hamilton T, Rating D, Area EC. Psychiatric Disorders in Youths With IDDM: Rates and Risk Factors. 1997;20(1).

39. Wadsworth ME. Development of Maladaptive Coping : A Functional Adaptation to Chronic , Uncontrollable Stress. 2015;0(0):1–5.

40. Zimmer-gembeck MJ, Skinner E. Adolescents coping with stress : Development and diversity. 2014;(May).

41. McLarty RP, Alloyce JP, Chitema GG, Msuya LJ. Glycemic control, associated factors, acute complications of Type 1 Diabetes Mellitus in children, adolescents and young adults in Tanzania. Endocrinol Diabetes Metab. 2021;4(2):1–8.

42. Noorani M, Ramaiya K, Manji K. Glycaemic control in type 1 diabetes mellitus among children and adolescents in a resource limited setting in Dar es Salaam. BMC Endocr Disord. 2016;1–8.

43. Jurgen B, Baker CN, Kamps JL, Hempe JM, Chalew SA. Associations Between Depressive Symptoms , Fear of Hypoglycemia , Adherence to Management Behaviors and Metabolic Control in Children and Adolescents with Type 1 Diabetes. J Clin Psychol Med Settings. 2020;27(2):385–95.

APPENDICES

Appendix 1: Questionnaire (English version)

QUESTIONNAIRE FOR STUDY ON "PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINIC IN DAR-ES-SALAAM"

Interview date……

ID number…….

Put the symbol √ and/ or fill the space in front of the item provided

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTIC

1.0 Patient socio-demographic characteristics		
1.1 Age (years)		
1.2 Sex	1. Male	
	2. Female	
1.3 Address		
1.4 Health insurance	1. Yes	
	2. No	
1.5 Education level	1. None	
	2. Primary	
	3. Secondary	
	4. Higher	
1.6 Anthropometry	1. Weight (kg)	
	2. Height (cm)	
	3. BM1	
1.7 Diabetes Clinic	1. MNH	
	2. Mwananyamala RRH	
	3. Temeke RRH	
	4. Vijibweni Hospital	

2.0 Primary caregiver socio-demographic characteristic		
1.1 Primary caregiver	1. Both parents	
	2. Biological mother	
	3. Biological father	
	4. Relative	
	5. Other, specify	
1.2 Age the father (years)		
1.3 Age the father (years)		
2.4 Age of the guardian (years) if not fathe or mother		
2.5 Parents' survival status	1. Both alive	
	2. Father only	
	3. Mother only	
	4. Both are dead	
2.6 Parents living together	1. Yes	
	2. No	
	3 N/A(if one/both are dead)	
2.7 Guardian marital status (if primary caregiver is not parent)	1. Married	
	2. Single	
	3. Separated/divorced	
2.8 Father's level of education	1. No formal education	
	2. Primary	
	3. Secondary	
	4. University /college	
	5. NA(if not alive)	
2.9 Mother's level of education	1. No formal education	
	2. Primary	
	3. Secondary	

	4. University /college	
	5. NA(if not alive)	
2.10 Guardian's level of education	1. No formal education	
	2. Primary	
	3. Secondary	
	4. University /college	
	5. NA(if not alive)	
2.11 Father's occupation	1. Formal employment	
	2. Self-employed	
	3. None	
	4. N/A(if not alive)	
2.12 Mother's occupation	1. Formal employment	
	2. Self-employed	
	3. None	
	4. N/A(if dead)	
2.13 Guardian's occupation	1. Formal employment	
	2. Self-employed	
	3. None	
	4. N/A (if dead)	

SECTION B: DISEASE-RELATED FACTORS

3.1 Duration of diabetes (Years)		
3.2 Mode of insulin injection	1. Self-injection	
	2. Caregiver	
3.3 Number of insulin injections per day	1. Once daily	
	2. Twice daily	
	3. Thrice daily	
	4. Other, specify	
3.4 Number of missed doses per week	1. No missed dose	
	2. Missed 1-3 doses	
	3. Missed >3 doses	
3.5 Insulin storage	1. Refrigerator	
	2. Cold pot	
	3. Room temperature	
3.6. Missed clinic visits in past 3 months	1. None	
	2. 1-2	
	3. More than 2	
3.7. Number of diabetes-related admissions in the past 1 year	1. None	
	2. Once	
	3. Twice	
	4. Thrice or more	
3.8. Blood sugar monitoring in the past 1 week	1. Daily	
	2. More than 4 days	
	3. Less than 4 days	
	4. None	
3.9 Average blood sugar for the past 1 week (mmol/l)	1. 0-3	
	2. 3.1-7	
	3. 7.1-11	

	4. more than 11	
3.10 When did you measure your HbA1c level	1. Within the past 3 months	
	2. More than 3 months	
	3. The day of the interview	
3.11 HbA1c level %		
3.12 Episodes of symptomatic hypoglycaemia in past 2 weeks	1. None	
	2. Daily	
	3. Few days	
	4. More than half of the days	
3.13 Symptoms of hypoglycaemia necessitating intervention (use of sugary foods or admission) in the past 2 weeks (select all that apply)	1. None	
	2. Tiredness	
	3. Sweating	
	4. Dizziness	
	5. Tremor	
	6. Awareness of heartbeats	
	7. Other, specify	

Kiambatanisho Namba 2: Dodoso (Kwa kiswahili)

DODOSO KUHUSU TAFITI YA KUANGALIA "UKUBWA NA VISABABISHI VYA SONONA KWENYE KUDHIBITI KISUKARI KWA VIJANA RIKA WANAOHUDHURIA KLINIKI YA KISUKA DAR-ES-SALAAM"

Tarehe yakuhojiwa……

Namba ya utambulisho…….

Weka alama √ pia/au jaza sehemu iliyowazi mbele ya swali lililoulizwa

SEHEMU A: TAARIFA ZA KIJAMII

1.0 Taarifa mbalimbali za mgonjwa		
1.1 Umri (miaka)		
1.2 Jinsia	1. Me	
	2. Ke	
1.3 Sehemu unapoishi		
1.4 Una bima ya Afya	1. Ndio	
	2. Hapana	
1.5 Kiwango cha Elimu	1. Sijasoma	
	2. Msingi	
	3. Sekondari	
	4. Chuo	
1.6 Vipimo	1. Uzito(kg)	
	2. Urefu (cm)	
	3. Uwiano wa uzito kwa urefu (Uzito/urefu$^{2)}$	
1.7 Kliniki ya kisukari unayohudhuria	1. Muhimbili	
	2. Mwananyamala	
	3. Temeke	
	4. Vijibweni	

2.0 Taarifa mbalimbali za mtu wakaribu anayekuhudumia		
2.1 Mtu wa karibu anayekuhudumia	1. Baba na mama	
	2. Mama tu	
	3. Baba tu	
	4. Ndugu	
	5. Wengine(fafanua)	
2.2 Umri wa baba (miaka)		
2.3 Umri wa mama		
2.4 Umri wa mlezi kama sio baba au mama		
2.5 Wazazi wote wapo hai?	1. Wote wapo hai 2. Baba tu 3. Mama tu 4. Wote wamefariki	
2.6 Wazazi wanaishi pamoja?	1. Ndio 2. Hapana 3. Haihusiki(kama amefariki)	
2.7 Hali ya ndoa ya mlezi(kama haulelewi na mzazi/wazazi	1. Ameolewa/Ameoa	
	2. Hajaolewa/Hajaoa	
	3. Wameachana	
	4. Mjane/Mgane	
	5. Nyingine, fafanua	
2,8. Kiwango cha elimu cha baba	1. Hajasoma	
	2. Msingi	
	3. Sekondari	
	4. Chuo 5. Haihusiki(kama amefariki)	
2.9 Kiwango cha elimu cha mama	1. Hajasoma	
	2. Msingi	
	3. Sekondari	

	4. Chuo 5. Haihusiki (kama amefariki)	
2.10 Kiwango cha elimu cha mlezi	1 .Hajasoma 2 . Msingi 3. Sekondari 4. Chuo	
2.11 Kazi ya baba	1. Ajira maalumu	
	2. Amejiajiri	
	3. Hafanyi kazi yoyote	
	4. Haihusiki (kamaamefariki)	
2.12 Kazi ya mama	1. Ajira maalumu	
	2. Amejiajiri	
	3. Hafanyi kazi yoyote	
	4. Haihusiki (kamaamefariki)	
2.13 Kazi ya mlezi	1. Ajira maalumu	
	2. Amejiajiri	
	3. Hafanyi kazi yoyte	
	4. Haihusiki (kama amefariki)	

SEHEMU B: TAARIFA ZA UGONJWA

3.1 Muda wa kuugua kisukari (miaka)		
3.2 Namna ya kuchoma insulini	1. Mwenyewe	
	2. Mzazi/mlezi	
3.3 Idadi yakuchoma insulin kwa siku	1. Mara moja	
	2. Mara mbili	
	3. Mara tatu	
	4. Nyingine, fafanua	
3.4 Idadi ya dose ulizokosa kwa wiki moja iliyopita	1. Hamna	
	2. 1-2	
	3. Zaidi ya 3	
3.5 Utunzaji wa insulini	1. Jokofu	
	2. Maji ya baridi	
	3. Hali ya kawaida	
3.6 Vipindi ulivyokosa kuhudhuria kliniki ndani ya kipindi cha miezi mitatu iliyopita	1. Hamna	
	2. 1-2	
	3. Zaidi ya mbili	
3.7 Idadi ya kulazwa kwa sababu tatizo la sukari kwa kipindi cha mwaka mmoja uliopita	1. Hamna	
	2. Moja	
	3. Mbili	
	4. Tatu au zaidi	
3.8 Kujipima sukari kwa kipindi cha wiki moja iliyopita	1. Kila siku	
	2. Zaidi ya siku nne	
	3. Chini ya siku nne	
	4. Hamna	
3.9 Wastani wa kiwango cha sukari kwa kipindi cha wiki mbili zilizopita	1. 0-3	
	2. 3.1-7	
	3. 7.1-11	
	4. Zaidi ya 11	

3.10 Kiwango cha HbA1c (%) kimepimwa lini	1. Ndani ya miezi mitatu	
	2. Zaidi ya miezi mitatu	
	3. Leo	
3.11 Kiwango cha HbA1c (%)		
3.12 Kuna wakati Sukari imeshuka hadi kuhitaji matibabu kama kutumia kitu chenye sukari nyingi au kulazwa ndani ya kipindi cha wiki mbili zilizopita	1. Hamna	
	2. Siku chache	
	3. Zaidi ya nusu ya siku	
	4. Kila siku	
3.13. Dalili za sukari kushuka ndani ya wiki mbili zilizopita(waweza kuchagua zaidi ya moja	1. Hamna	
	2. Kuchoka	
	3. kutoka jasho	
	4. Kizunguzungu	
	5. Kutetemeka	
	6. Mapigo ya moyo kwenda mbio	
	7. Nyingine,fafanua	

Appendix 3: Depression Screening, PHQ-A Tool (English version)

Instructions: How often have you been bothered by each of the following symptoms during the past **two weeks**? For each symptom put an "√" in the box beneath the answer that best describes how you have been feeling.

	(0) Not at all	**(1) Several Days**	**(2) More than Half the Days**	**(3) Nearly Every day**
4.1 Feeling down, depressed, irritable, or hopeless?				
4.2 Little interest or pleasure in doing things?				
4.3 Trouble falling asleep, staying asleep, or sleeping too much?				
4.4 Poor appetite, weight loss, or overeating?				
4.5 Feeling tired, or having little energy?				
4.6 Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?				
4.7 Trouble concentrating on things like school work, reading, or watching TV?				
4.8 Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?				
4.9 Thoughts that you would be better off				

dead, or of hurting yourself in some way?				
4.10 In the past year have you felt depressed or sad most days, even if you felt okay sometimes?	(1) Yes (2) No			
4.11 If you are experiencing any of the problems on this form, how difficult have these problems made it for you to do your work, take care of things at home or get along with other people?	0	Not difficult at all		
	1	Somewhat difficult		
	2	Very difficult		
	3	Extremely difficult		
4.12 Has there been a time in the past month when you have had serious thoughts about ending your life?	(1) Yes (2) No			
4.13 Have you EVER, in your WHOLE LIFE, tried to kill yourself or made a suicide attempt?	(1) Yes (2) No			
4.14 Do you have intention of self harm right now	(1) Yes (2) No			
4.15 If you feel bad,do you have any one you can ask help	(1) Yes (2) No			
4.16 If qn 13 is yes, who? (Can be more than one)	(1) Father/Mother (2) Brother/Sister (3) Relative (ankle, aunt) (4) Grandparents (4) Guardian (6) Friend (7) Other ……			

Kiambatisho Namba 4; Kipimo Cha Kiwango Cha Sonona (PHQ-A)

Maagizo: Mara ngapi umekuwa ukisumbuliwa na kila dalili zifuatazo ndani ya **wiki mbili** zilizopita? Kwa kila dalili weka alama ya √ kwenye kisanduku chini ya jibu ambalo linaelezea vizuri jinsi ambavyo umekuwa unajisikia.				
	(0) Sijisiki hivi kabisa	**(1) Kwa Siku Chache**	**(2) Zaidi ya nusu ya siku kwa ujumla**	**(3) Karibia siku zote**
4.1. Unajihisi upweke kusononeka, kuwa na kihasira au kuto kuwa na matumaini?				
4.2 Kutokuwa na hamu wala raha ya kufanya vitu?				
4.3 Kupata shida kusinzia, au kulala sana?				
4.4 Kukosa hamu ya kula chakula, kupungua uzito au kula sana?				
4.5 Kujisikia kuchoka, au kuwa na nguvu kidogo?				
4.6 Kujisikia vibaya juu yako mwenyewe – au kujihisi wewe ni mshindwa na umejiangusha wewe mwenyewe na familia yako?				
4.7 Kupata shida ya kuwa makini na vitu kama kazi kazi za shule, kusoma au kuangalia luninga?				
4.8 Kutembea na kuongea pole pole kiasi ambacho watu wangeweza kugundua? Au mbadala yake – Kutokuweza kutulia na kuhangaika hangaika sana kuliko kawaida yako?				

4.9 Mawazo kwamba ingekuwa afadhali ungekuwa umekufa au mawazo ya kujiumiza kwa kutumia njia tofauti?				

4.10 . Mwaka huu umewahi kujisikia kusononeka au kuwa na huzuni kwa muda wa siku nyingi, hata kama siku zingine unajisikia kuwa kawaida?	(1) Ndio (2) Hapana	
4.11 Ikiwa unakabiliana na shida zozote katika fomu hii, kwa kiwango gani cha **ugumu**, shida hizi zime kukwaza kufanya kazi zako, utunzaji wa nyumbani kwako au kuelewana na watu wengine?	0	Sio ngumu kabisa
	1	Ngumu kiasi
	2	Ngumu
	3	Ngumu kabisa
4.12 Kulikuwa na wakati ndani ya mwezi huu umekuwa na mawazo ya kusitisha maisha yako?	1) Ndio 2) Hapana	
4.13 Katika MAISHA YAKO YOTE, umeshawahi kujaribu kujiua au kusitisha maisha yako?	1) Ndio 2) Hapana	
4.14 Je, kwa wakati huu,unampango wowote wakujiumiza kwa kudhamiria	1) Ndio 2) Hapana	
4.15 Kama unajihisi vibaya au huzuni je,kuna mtu katika maisha yako ungemwendea kwa msaada	1) Ndio 2) (Hapana	
4.16 Kama swali 13 ni ndio, Ni nani? (Anaweza kuwa zaidi ya mmoja)	(1) Baba au mama Mzazi (2) Kaka au dada (3) Ndugu wengine(mf mjomba) (4) Bibi au babu (5) Mlezi(kama sio ndugu) (6) Rafiki (7) Mtu mwingine fafanua ……	

Appendix 5: Consent Form

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF MEDICINE

CONSENT FOR PARTICIPATING IN A STUDY ON "PREVALENCE, OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINICS IN DAR-ES-SALAAM"

Greetings. I'm EVETA SABAS MASAWE, a postgraduate student, pursuing a Master's degree in Paediatrics and Child Health at Muhimbili University of Health and Allied Science. I am conducting research on the **prevalence of depression and associated factors among adolescents with type one diabetes attending diabetes clinics in Dar-es-salaam, Tanzania.**

Purpose of the Study

The purpose of the study is to determine the prevalence, factors associated with depression, and its effect on glycaemic control among adolescents with type one diabetes mellitus.

How to participate: If you accept to participate in the study, you will sign this consent form and your child will sign an assent form to approve your willingness. You will be asked some questions about your background and information on disease-related factors and your child will be asked questions on symptoms of depression

Possible benefit: Your participation in this study will help in knowing the burden of depression and assisting in planning for health care improvement aiding in reducing the burden of depression, early diagnosis, and treatment of depression among adolescents with type one diabetes l.

If you are diagnosed to have depression appropriate care and linkage to a psychiatric clinic will be done.

Possible Risks: There will be minimal risks associated with the study.

Financial benefit: There is no financial benefit that you will receive and you are not required to pay fees for participating in the study.

Confidentiality: Your information will be kept confidential. The information will be collected anonymously and a special identification number will be used on each questionnaire so that no information can be traced back to you. Your information will remain confidential during and after study work. Unauthorized personnel will not be able to access the information you provide from the questionnaires.

Participant's Right for Voluntary Participation: Your participation is voluntary and you have the right to withdraw from the study. If you decide not to participate in the study, your decision will be respected and you continue to receive all the healthcare services you need.

Who to contact for any questions about the study: Please contact the principal investigator Dr. Eveta Sabas Masawe. Phone number 0769593550, P. O. Box 65001 MUHAS, Dar es Salaam.

If you have any questions about your rights as a participant, you may contact, the Chairperson of the Research and Publications Committee, MUHAS. P.O. Box 65001, Dar es Salaam-Tanzania, Tel +2552150302-6

Participation Agreement

I…….... have read/ or have had the contents of this form explained to me and I have clearly understood. My questions have been adequately answered. I agree to participate in this study.

Signature of participant…… Date…….

Signature of researcher …… Date……

Kiambatanisho Namba 6. Fomu Ya Ridhaa

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI

SHULE YA UTABIBU

FOMU YA RIDHAA KUSHIRIKI KATIKA UTAFITI WA KUANGALIA "UKUBWA NA VISABABISHI VYA SONONA KWA VIJANA RIKA WENYE KISUKARI WANAOHUDHURIA KLINIKI ZA KISUKARI, DAR ES SALAAM."

Habari, mimi ni Eveta Sabas Masawe, daktari. Ninasomea shahada ya uzamili ya Udaktari wa watoto katika Chuo Kikuu cha Afya na Sayansi cha Muhimbili (MUHAS). ninafanya utafiti juu ya ukubwa na visababishi vya ugonjwa wa sonona miongoni mwa vijana rika wenye kisukari na matokeo ya ugonjwa wa sonona kwenye kudhibiti kisukari kwa vijana wanahudhuria kliniki ya kisukari Dar es Salaam.

Kusudi la Tafiti: Tafiti hii inalengo la kugundua ukubwa wa tatizo la sonona kwa vijana rika wenye kisukari, visababishi na matokeo yake kwenye udhibiti wa kisukari

Jinsi yakushiriki: Ukikubali kushiriki katika tafiti hii atasaini fomu hii ya makubaliano kama ushahidi wa ukubali wako.Utaulizwa maswali katika dodoso juu ya taarifa zako binafsi, na maswali yanayohusu ugonjwa wako na dodoso la dalili za ugonjwa sonona

Faida: Kushiriki kwako katika tafiti hii itasaidia kufanya maamuzi na kusaidia kupanga namna ya kuongeza uwazi juu ya ugonjwa wa sonona katika vijana rika wenye ugonjwa wa kisukari. Itasaidia ugonjwa kugundulika mapema na kupata tiba mapema.

Ukikutwa na tatizo utaratibu wa matibabu utafanyika ikiwa ni pamoja na kuunganishwa na mwanasaikologia katika idara ya magonjwa ya akili Muhimbili

Athari: Hakuna athari utakayopata kwa kushiriki katika tafiti hii.

Faida kifedha Hakuna faida yoyote ya kifedha utakayoipata,na hamna ada utakayotakiwa kulipa kwa ajili ya kushiriki katika tafiti hii.

Usiri: Taarifa zote zitakazokusanywa katika utafiti huu zitatunzwa kwa usiri mkubwa. Taarifa hizi hazitawekwa wazi, namba maalumu zitatumika kuhifadhi taarifa hizo.jina lako halitatumika . Taarifa zote utakazotoa zitahifadhiwa kwa usiri mkubwa.Mtu ambaye hausiki hataweza kupata taarifa zako binafsi utakazotoa katika utafiti huu

Utayari Wakushiriki au Kujitoa: Kushiriki kwako ni hiyari na unaweza kujitoa kwenye Usajili wakati wowote. Usipokua tayari kushiriki maamuzi yako yataheshimiwa na haitaadhiri matibabu yako.

Mawasiliano Kama una swali lolote kuhusu utafiti huu, tafadhali wasiliana na mtafiti mkuu, Eveta Sabas Masawe, sanduku la posta 65001 MUHAS, Dar es salaam, nambari ya simu 0769644226.

Ikiwa una swali lolote kuhusu haki yako kama mshiriki unaweza kuwasiliana na Mwenyekiti wa Kamati ya Utafiti na Machapisho, MUHAS. S.L.P 65001, Dar es Salaam-Tanzania, Simu + 2552150302-6.

Ridhaa kushiriki katika utafiti

Mimi …… Nimesoma/ Nimeelezwa yaliyomo katika fomu hii na nimeelewa maana yake. Nakubali kushiriki katika utafiti huu.

Saini ya mshiriki……..…… Tarehe…….....

Saini ya mtafiti ……..... Tarehe……

Appendix 7: Assent Form

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

SCHOOL OF MEDICINE

ASSENT FORM FOR THE STUDY: "PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINICS IN DAR-ES-SALAAM."

Greetings. I'm EVETA SABAS MASAWE, a postgraduate student, pursuing a Master's degree in Paediatrics and Child health at Muhimbili University of Health and Allied Science. I am researching to determine the prevalence of depression and associated factors among adolescents with type one diabetes among adolescents attending diabetes clinics in Dar-es-salaam.

Am doing research to learn about your health, and if you decide you want to be a part of this study, you and/or your caregiver will be asked a few questions. You may be asked some questions on social information, information about your disease and symptoms of depression. The information which you will provide will be confidentially handled and protected in such a way that people who are not part of the study will not be able to access your information,

If you don't want to be in this research study, you will continue to receive the treatment and care you need. It is not compulsory to be in this study. You can stop at any point if you wish to. If you agree to participate, please sign your name

I, …… agree to be in this research…….

Sign your name here	Date
.....	.....
Researcher's signature	Date

Kiambatanisho Namba 8: fomu ya ridhaa kwa mtoto

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI

SHULE YA UTABIBU

FOMU YA RIDHA KUSHIRIKI KATIKA UTAFITI WA KUANGALIA "UKUBWA NA VISABABISHI VYA SONONA KWA VIJANA RIKA WENYE KISUKARI WANAOHUDHURIA KLINIKI ZA KISUKARI, DAR ES SALAAM."

Habari, mimi ni Eveta Sabas Masawe, daktari. Nasomea shahada ya uzamili ya Udaktari wa watoto katika Chuo Kikuu cha Afya na Sayansi cha Muhimbili (MUHAS). ninafanya utafiti juu ya ukubwa na visababishi vya ugonjwa wa sonona miongoni mwa vijana rika wenye kisukari na matokeo ya ugonjwa wa sonona kwenye kudhibiti kisukari kwa vijana wanahudhuria kliniki ya kisukari Dar es Salaam

Nafanya utafiti ili kujifunza juu ya afya yako na ikiwa utakua tayari kuwa sehemu ya utafiti huu wewe /au mlezi wako ataulizwa maswali juu ya taarifa zako binafsi, na maswali yanayohusu ugonjwa wako na dodoso la dalili za ugonjwa sonona. Tutaangalia pia afya yako ya ujumla na kukushauri kuhusu matibabu yako Taarifa utakazotoa zitatunzwa kwa usiri na yatalindwa na hamna mtu ambaye sio sehemu ya utafitiatakayeweza kupata taarifa zako.

Kushiriki kwako ni kwa hiari na sio lazima. Kama hutakua tayari kushiriki tutaheshimu maamuzi yako nahaitaadhiri matibabu yako kwa njia yoyote ile

Ikiwa utaamua kuwa katika utafiti huu tafadhali Saini jina lako.

Mimi,…….nakubali kuwa katika utafiti huu

…… ……

Andika Saini yako hapa

Appendix 9: Ethical Clearance

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/1954 Date: 23/10/2023

MUHAS-REC-10-2023-1954
EVETA SABAS MASAWE
COLLEGE OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINIC IN DAR-ES-SALAAM

Reference is made to the above heading,

I am pleased to inform you that the Chairperson 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 subjects research.

APPROVAL DATE: 23/10/2023
EXPIRATION DATE OF APPROVAL: 23/10/2024

STUDY DESCRIPTION:
Purpose:

The purpose of this cross-sectional study is to determine the prevalence of depression among adolescents with T1DM attending a diabetes clinic in Dar-es-Salaam.

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-%2014801.pdf and in the MUHAS archives.

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. Kasusu Nyamuryekung'e

Ag. Chairperson, MUHAS Research and Ethics Committee



Appendix 10: Permission Letter; MNH

THE UNITED REPUBLIC OF TANZANI

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote;

Ref. No.: MNH/CRTCU/Perm/2023/559 Date: 10th November, 2023

Head of Department
Paediatrics and Child Health Noted, Approved. 17.11.2023
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of Student	**Eveta Sabas Masawe**
Title	**"Prevalence of Depression and Associated Factors Among Adolescent with type One Diabetes Attending Diabetes Clinic in Dar es Salaam".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisor	Dr. Rahim Damji (MUHAS)
Co-supervisor	Dr. Namala Mkopi MNH)
Period	10th November, 2023 to 30 April, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Dr. Namala Mkopi** (MNH) supervisor.

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Deus Buma
For: Head of Clinical Research, Training and Consultancy Unit

c.c DMS
c.c Namala Mkopi
c.c **Eveta Sabas Masawe**

Upanga West, Kalenga Street, Plot No. 10480/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

Appendix 11: Permission Letter; Temeke RRH

9959707079 15

JAMHURI YA MUUNGANO WA TANZANIA
WIZARA YA AFYA.
HOSPITAL YA RUFAA YA MKOA YA TEMEKE
Baruapepe:temekerh@afya.go.tz,S.L.P 45232 Dar es Salaam,Simu 0222856007

Kumb. Na. TRRH/RSC/9/9/02/49 **Tarehe: 30/11/2023**

Ndg. Eveta Sabas Masawe
Muhimbili University of Health and Allied Sciences
S.L.P 65001,
DAR ES SALAAM.

YAH: OMBI LA KUFANYA UTAFITI KUHUSU "PREVALENCE OF DEPRESSION AND AASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETIES CLINIC IN DAR ES SALAAM" (RESEARCH)

Tafadhali husika na somo tajwa hapo juu.

2. Nimepokea barua yako ya tarehe 07 Novemba, 2023 kuhusu ombi lako la kufanya Utafiti (Research) katika Taasisi yetu, kuhusu **"Prevalence of depression and aassociated factors among adolescents with type one Diabeties clinic in Dar es Salaam".**

3. Ombi lako limekubaliwa, utatakiwa kulipa ada kiasi cha **Tshs.100,000/=**. Hivyo wasiliana na mhasibu wa mapato wa Hospitali **Ndg. Lusajo Nsajigwa** kwa namba **0717 959495** ili akupatie control Number kwa ajili ya malipo ya ada hii ili uweze kuruhusiwa kufanya utafiti.

4. Asante kwa ushirikiano.

Dkt. Husna Msangi
Kny: MKURUGENZI
HOSPITALI YA RUFAA YA MKOA YA TEMEKE

Nakala: CSCO - ***Tafadhali hakikisha taarifa ya utafiti inabaki hospitalini***

Appendix 12: Permission Letter; Vijibweni Hospital

JAMHURI YA MUUNGANO WA TANZANIA
OFISI YA RAIS
TAWALA ZA MIKOA NA SERIKALI ZA MITAA
HALMASHAURI YA MANISPAA KIGAMBONI

[Barua zote zipelekwe kwa Mkurugenzi wa Manispaa Kigamboni]

Simu: +255 22-2928468
Fax: +255 22-2928469
Baruapepe: info@kigamboni.go.tz
Tovuti: www.kigamboni.go.tz

S.L.P. 36009,
KIGAMBONI,
DAR ES SALAAM,
TANZANIA.

Unapo jibu tafadhali taja:

Kumb. Na. AC.24/283/01C/94

14/12/2023

MGANGA MFAWIDHI,
HOSPITALI YA VIJIBWENI.

YAH : KIBALI CHA KUFANYA UTAFITI WA NDG. EVETA SABAS MASAWE.

Tafadhali husika na somo tajwa hapo juu.

2. Ofisi ya Mkurugenzi wa Manispaa ya Kigamboni imepokea barua yenye **kumb. Na. HD/MUH/T.197/2021** ya tarehe **07 Novemba, 2023** kutoka **Chuo kikuu cha Tiba na Sayansi Shirikishi Muhimbili (MUHAS)** inayomtambulisha **BI. EVETA SABAS MASAWE** kufanya utafiti "**PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINIC IN DAR ES SALAAM".**

3. Kwa barua hii, Ofisi ya Mganga Mkuu wa Manispaa ya Kigamboni inamtambulisha mtafiti tajwa hapo juu, Utafiti huu ni kwa muda wa mwezi Mmoja kuanzia tarehe ya barua hii.

4 Mpokee na kuwapa ushirikiano.

MGANGA MKUU WA MANISPAA
KIGAMBONI

Dkt. L. D. Ngamtwa
MGANGA MKUU WA MANISPAA KIGAMBONI

Nakala : Mkurugenzi wa Manispaa ya Kigamboni - *Aione kwenye Jalada*

Appendix 13: Permission Letter; Mwananyamala RRH

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

Telephone Address:

Telephone: 022-2760500

Mwananyamala Regional
Referral Hospital,
P.O.Box 61665
Dar es Salaam.

RE: NO.: MA. 59/240/341/01/96

DATE: 14th December, 2023

Director,
Muhimbili University of Health and Allied Science,
P.O.BOX 65001,
DAR ES SALAAM.

RE: EVATA SABAS MASAWE, TO CONDUCT HIS RESEARCH IN MWANANYAMALA REGIONAL REFERRAL HOSPITAL

The captioned subject refers

2. May you be informed that your prescribed request for your bonafide student **Evata Sabas Masawe,** to conduct his Research in our Institution through your letter referred **No. HD/MUH/T.197/2021, dated 20th November,2023 to 20TH December,2023**, ***Tilled "PREVALENCE OF DEPRESSION AND ASSOCIATED FACTORS AMONG ADOLESCENTS WITH TYPE ONE DIABETES ATTENDING DIABETES CLINIC IN DAR ES SALAAM" form 14 March,2023 to April14,2023*** is asserted.

3. The Institution charges **50,000/=**, as a Research fee. The payments are to be made upon reporting.

4. May he report to the Administration and HR department head for further instruction.

Thanks.

Dr. Mkiwa Akida
RESEARCH COORDINATOR
FOR: MEDICAL OFFICER INCHARGE
MWANANYAMALA REGIONAL REFERRAL HOSPITAL

COPY:
Head of Internal Medicine Department - **MWANANYAMALA REGIONAL REFERRAL HOSPITAL**

Student - **Eveta Sabas Masawe**