FACTORS ASSOCIATED WITH DEPRESSION AMONG POSTGRADUATE STUDENTS IN DAR-ES-SALAAM, TANZANIA: A CASE STUDY OF MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

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School of Public Health and Social Sciences

FACTORS ASSOCIATED WITH DEPRESSION AMONG POSTGRADUATE STUDENTS IN DAR-ES-SALAAM, TANZANIA: A CASE STUDY OF MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES.

By

Salma Karim Mohamed

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

Muhimbili University of Health and Allied Sciences

October, 2024

CERTIFICATION

The undersigned certifies that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled: **"Factors associated with depression among postgraduate students in Dar-es-Salaam, Tanzania: A case study of Muhimbili University of Health and Allied Sciences"** in (partial) fulfilment of the requirements for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.

Prof Anna Tengia-Kessy

(Supervisor)

Date----------

……

Mr Elias Bukundi

(co-supervisor)

Date ----------

DECLARATION AND COPYRIGHT

I, Salma Karim Mohamed, declare that this dissertation is my original work and 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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Last but not least my sincere thank you goes to all respondents, the postgraduate students of Muhimbili University of Health and Allied Sciences for providing valuable research information.

DEDICATION

This dissertation is dedicated to my family and friends, for their support and encouragement.

ABSTRACT

Background: Depression is a rising health problem in the world. It is a disorder affecting mental health which involves symptoms like feelings of hopelessness, suicidal thoughts, sleep disruption, poor concentration, low self-esteem or guilty feelings, appetite changes, fatigue, diminished interest or pleasure, and in most severe cases, depression can result in suicide. University students consist of distinct demography and go through different life and academic stressful events as a result, they are at risk of depression, especially postgraduate students who have to balance between work, academic, family and financial responsibilities.

Objective: This study aimed to determine factors associated with depression among postgraduate students at the Muhimbili University of Health and Allied Sciences (MUHAS).

Methodology: A **c**ross-sectional study design with a quantitative approach was utilised in this study, involving 377 students enrolled in postgraduate studies at MUHAS. Students were initially stratified according to the schools they are enrolled in, and then study participants were randomly selected from each school**.** Self-administered questionnaires containing the PHQ-9 score for depression and a scale that measures social support were used to collect data. Stata version 17 was used to analyse each objective whereas logistic regression analysis was performed to determine how the independent factors are related to depression.

Results: A total of 377 postgraduate students participated in the study and their median age was 32 years, ranging from 25 to 55 years. Among the respondents, 90 (23.9%) had probable depression and factors which independently had an association with depression included physical activity (p-value 0.003), alcohol use (0.007), financial challenge (p-value 0.001) and social support (<0.001). Having higher social support was found to be a protective factor against depression.

Conclusion and Recommendation: The study found that nearly one in four postgraduate students had probable depression whereas alcohol use, financial challenges, physical activity and social support had a significant association with depression. It is therefore recommended that postgraduate students engage in regular physical activities like joining sports clubs and limit alcohol intake. Additionally, qualitative research should be conducted to explore more about the factors associated with depression among the target population.

TABLE OF CONTENT

CERTIFICATION i
DECLARATION AND COPYRIGHT ii
ACKNOWLEDGEMENT iii
DEDICATION iv
ABSTRACT v
LIST OF TABLES ix
LIST OF FIGURES x
LIST OF ABBREVIATIONS xi
DEFINITIONS OF TERMS xii
CHAPTER ONE 1
1.0: INTRODUCTION 1
1.1. Background 1
1.2. Problem Statement 3
1.3 Conceptual Framework 4
1.3.1. Description of the Conceptual Framework 4
1.3.2 Conceptual Framework 5
1.4. Rationale 6
1.5. Research questions 6
1.5.1 Main research question 6
1.5.2 Specific research question 6
1.6. Research Objective 7
1.6.1 Broad objective 7
1.6.2 Specific objectives 7
CHAPTER TWO 8
2.0 LITERATURE REVIEW 8
2.1 Prevalence of depression among Postgraduate Students 8
2.2 Individual factors associated with depression 8
2.2.1 Age 8
2.2.2 Sex 9
2.2.3 Marital status 9

2.2.4 Substance use 10
2.2.5 Prior history of mental illness 10
2.2.6 Physical activities 11
2.2.7 Having children. 11
2.2.8 Health status 11
2.3 Social economic factors associated with depression 12
2.3.1 Financial problems/challenges 12
2.3.2 Social support 12
2.3.3 Employment 12
2.4 Postgraduate training -related factors associated with depression 13
2.4.1 School registered 13
2.4.2 Year of study 13
CHAPTER THREE 14
3.0 MATERIALS AND METHODS 14
3.1 Study design 14
3.2 Study area 14
3.3 The study population 14
3.4 Sample size estimation 14
3.5 Sampling Procedure 15
3.6 The Inclusion and Exclusion Criteria 16
3.6.1 Inclusion criteria 16
3.6.2 Exclusion criteria 16
3.7 Study variables 16
3.7.1Dependent 16
3.7.2 Independent variables 17
3.8 Recruitment and training of research assistants 19
3.9 Pre-test of the tools 19
3.10 Data collection 20
3.11 Validity and reliability 20
3.12 Data Management and Analysis 20
3.12.1 Data management 20

3.12.2 Data Analysis Plan 21
3.13 Ethical consideration 21
CHAPTER FOUR 22
4.0 RESULTS 22
4.1 Social Demographic Characteristics 22
4.2 Prevalence of depression among MUHAS Postgraduate Students 24
4.2.1 Depression severity according to PHQ 9 score results 24
4.3 Prevalence of depression across social-demographic characteristics 25
4.4 Association between individual factors and depression among postgraduate students 27
4.5 Social-economic factors associated with depression among postgraduate students 29
4.6 Postgraduate training- related factors associated with depression 30
CHAPTER FIVE 31
5.0 DISCUSSION 31
5.1 Prevalence of depression 31
5.2 Individual factors associated with depression among postgraduate students 32
5.3 Social-economic factors associated with depression among postgraduate students 33
5.4 Postgraduate training- related factors associated with depression 34
5.5 Study Strengths and Limitations 35
5.5.1 strength of the study 35
5.5.2 Study limitations and their mitigations 35
CHAPTER SIX 36
6.0 CONCLUSION AND RECCOMENDATION 36
6.1 Conclusion 36
6.2 Recommendations 36
REFERENCES 37
APPENDICES 42
Appendix 1: English version of the questionnaire 42
Appendix II: Swahili version of the questionnaire 47
Appendix III: English version of consent form 52
Appendix IV: Swahili Version of Consent form 53
Appendix V: Ethical Clearance 54
Appendix VI: Introduction Letter 56

LIST OF TABLES

Table 1: Number of students sampled in each school.....16

Table 2: Independent variables measurement.....17

Table 3 : Social Demographic Characteristics of Participants.....22

Table 4: Prevalence of depression across the sociodemographic characteristics 26

Table 5: Bivariate and multivariable analysis of individual factors associated with depression 28

Table 6: Bivariate and multivariable of Social economic factors associated with depression among postgraduate students.....29

Table 7: Bivariate and multivariable analysis of Postgraduate training-related factors associated with depression.....30

LIST OF FIGURES

Figure 1: The Conceptual framework about factors associated with depression among postgraduate students. 5

Figure 2: Prevalence of depression among postgraduate student 24

Figure 3: Depression severity among postgraduate students at MUHAS 25

LIST OF ABBREVIATIONS

CDC	Centre of Diseases Control and Prevention
IRB	Institutional Review Board
MSPSS	Multidimensional Scale of Perceived Social Support (MSPSS)
MUHAS	Muhimbili University of Health and Allied Sciences
PG	Postgraduate student
PHQ 9	Patient Health Questionnaire (containing nine questions)
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

DEFINITIONS OF TERMS

Depression is defined by WHO as a mental health condition that involves symptoms like diminished mood and interest loss in once enjoyable actions lasting at least two weeks**(**WHO, 2017).

The Patient Health Questionnaire (PHQ-9) is a scale used to measure and self-report the symptoms of depression (Kroenke and Sptizer, 2002).

A postgraduate student is an individual who has completed an undergraduate degree and is undertaking an advanced degree in a specified university (Cambridge, 2007).

The Multidimensional Scale of Perceived Social Support (MSPSS) is a scale that measures how an individual perceives his or her social support system including the support from friends, family and his or her spouse (Zimet et al., 1988).

CHAPTER ONE

1.0: INTRODUCTION

1.1. Background

Depression is among a rising health problem in the world. It is a disorder affecting mental health marked by the presence of a sense of despair, suicidal thoughts, sleep disruption, poor concentration., low self-esteem or guilty feelings, appetite changes, fatigue, diminished interest or pleasure in once enjoyable activities, and, in most severe cases it can result in suicide(WHO, 2019). Depression can manifest in varying degrees of severity ranging from, mild, moderate, and severe depending on how it affects the individual's daily functions (WHO, 2017, 2019). Globally approximately 280 million people suffer from depression, with an increase in its trends over the years where in Africa, 29.9 million people are affected while in Tanzania the prevalence of depression is 4.1 %(WHO, 2017). Furthermore, depression impacts university students at a higher rate in comparison to the overall population with a prevalence of 24.4%globally(Akhtar *et al.*, 2020).

University students consist of distinct demography that go through different life and academic stressful events which increase the risk of depression which in turn has a detrimental effect on their academic performance and life in general. Specifically, postgraduate students have to balance work, family responsibilities, and academics, which is demanding compared to undergraduate students. In a systematic review conducted in American and Asian countries, the proportion of postgraduate students with depression ranges from 6.2 % to 84.7% with a pooled prevalence of 34% whereas low-middle-income countries had a higher prevalence (Guo *et al.*, 2021). In similar studies conducted in Europe and Saudi Arabia, the prevalence of depression among postgraduate students ranged between 39.6 to 49.6% and the studies further reported that the prevalence of depression among postgraduate students is underestimated, unrecognized, and poorly addressed(Zaman *et al.*, 2014; Alrasheedi and Rabbani, 2022; Milicev *et al.*, 2023). Studies in Nigeria, 10% of the postgraduate students had depression(Okoli *et al.*, 2019)

The impacts of depression are significant as it ranked as a primary factor contributing to disability whereby in a lifetime a person loses 7.5 years living with disability (WHO, 2017). Additionally, depression increases the risk of committing suicide, diabetes, cardiovascular

diseases, and cancer moreover it impacts productivity in academics, and relationships with family and friends as depression leads to social withdrawal(WHO, 2019). For university students, depression is associated with failing their modules or poor academic performance (Muhammad, Terna and Saanyol, 2018). This can significantly affect their academic journey, leading to challenges in progressing academically and achieving their goals.

For undergraduate students, in a systematic review study conducted in the UK, the pulled prevalence of depression is 25%(Sheldon *et al.*, 2021).whereas in similar systematic review studies conducted in Saudi Arabia which involved both postgraduate and undergraduate students the prevalence of depression for undergraduate students ranged from 28% to 67.4% while for postgraduate students, the prevalence of depression ranged from 30.2% to 70.6 % indicating a variation between the undergraduate and postgraduate students(Dabbagh *et al.*, 2023). Furthermore, studies conducted in West and South Africa the prevalence of depression among undergraduate students ranges from 32 to 48% whereas in Tanzania depression among undergraduate students is 21.3%(Lugata *et al.*, 2020; Isara, Nwokoye and Odaman, 2022; Croock *et al.*, 2023). Postgraduate students have more family, financial, employment, and academic commitments than undergraduate students, indicating a higher risk of depression. (Barton and Bulmer, 2017; Dabbagh *et al.*, 2023).

Despite the medical treatment of depression is known but still, there are a lot of challenges hindering the provision of mental health services globally, including insufficient funding allocated to mental health services, shortage of adequately trained healthcare professionals, and perceived stigma surrounding mental health, further increasing difficulty for the depressive disorder patients to access the required care(WHO, 2019).

From a perspective of the theoretical model of depression proposed by Beck and Bredeimeier 2016, Depression is suggested as a complex condition that results from an interplay of more than one factor including social, behavioural, emotional, cognitive, and neurobiological factors; and environmental factors such as trauma can further exacerbate the condition (Beck and Bredemeier, 2016). Furthermore, the model provides a holistic understanding of depression occurrence and emphasizes that depression treatment should be personalised and involve multiple methods like lifestyle changes, social support interventions, and medication.

1.2. Problem Statement

In recent years depression among postgraduate students has become a significant challenge signalling a concern that demands attention(Barton and Bulmer, 2017). Previous studies which were conducted in Kenya and Nigeria reported the prevalence of depression among postgraduate students ranging between 17.3% to 29% (Gu *et al.*, 2015; Shah *et al.*, 2021). Though these studies were conducted in some African countries which could be similar to Tanzania, they did not account for the diversity of academic programs as they focused on one program like medicine and these countries have different social, cultural, and environmental factors that could influence the mental health of postgraduate students.

Depression among postgraduate students can significantly impair their cognitive function, and concentration and make it difficult to focus on their studies consequently decreasing academic performance and heightening the likelihood of suicidal behaviour (Abreu *et al.*, 2021; Ahorsu *et al.*, 2021; Deng *et al.*, 2022). Several studies have highlighted some of the risk factors of depression among postgraduate students including, being female, financial problems, being older in age, marriage, and having children but it is still inconclusive as other studies have shown that some of these risk factors can also be protective factors (Dave *et al.*, 2018; Shah *et al.*, 2021; Allen *et al.*, 2022; Milicev *et al.*, 2023)

In recognition of the importance of students' well-being universities in Tanzania have campus counselling and guidance services, which focus on the student's problems including mental health but are not equipped to recognise and address mental health disorders like depression among students including postgraduate students.

Depression in Tanzanian postgraduates is understudied despite unique challenges like self-directed learning and increased family and financial responsibilities as compared to undergraduate students. Most studies have focused on undergraduate students (Lugata *et al.*, 2020). This study aimed to assess factors which are associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences (MUHAS) to address their mental health needs and improve their well-being.

1.3 Conceptual Framework

1.3.1. Description of the Conceptual Framework

This conceptual framework was self-constructed and built based on the knowledge generated from the literature on depression among postgraduate students and university students in general and some of the studies include (Simić-Vukomanović *et al.*, 2016; Ashraful Islam *et al.*, 2018; Dave *et al.*, 2018; Hosseinpur, Parsa and Kabir, 2023)

Depression can occur due to the interplay of many individual factors including age-related trends, sex, marital status, substance use, physical inactivity, prior history of mental health and health status such as chronic illnesses.

Socioeconomic factors, such as financial problems can directly correlate with depression by increasing the depression risk. Employment status can either be a risk factor or a protective factor and the more social support a person has, depression risk decreases.

Factors related to postgraduate training, including the year of study and the type of faculty, can influence depression risk, with varying trends observed across years of study. Some faculties have an increased risk of depression compared to others.

1.3.2 Conceptual Framework

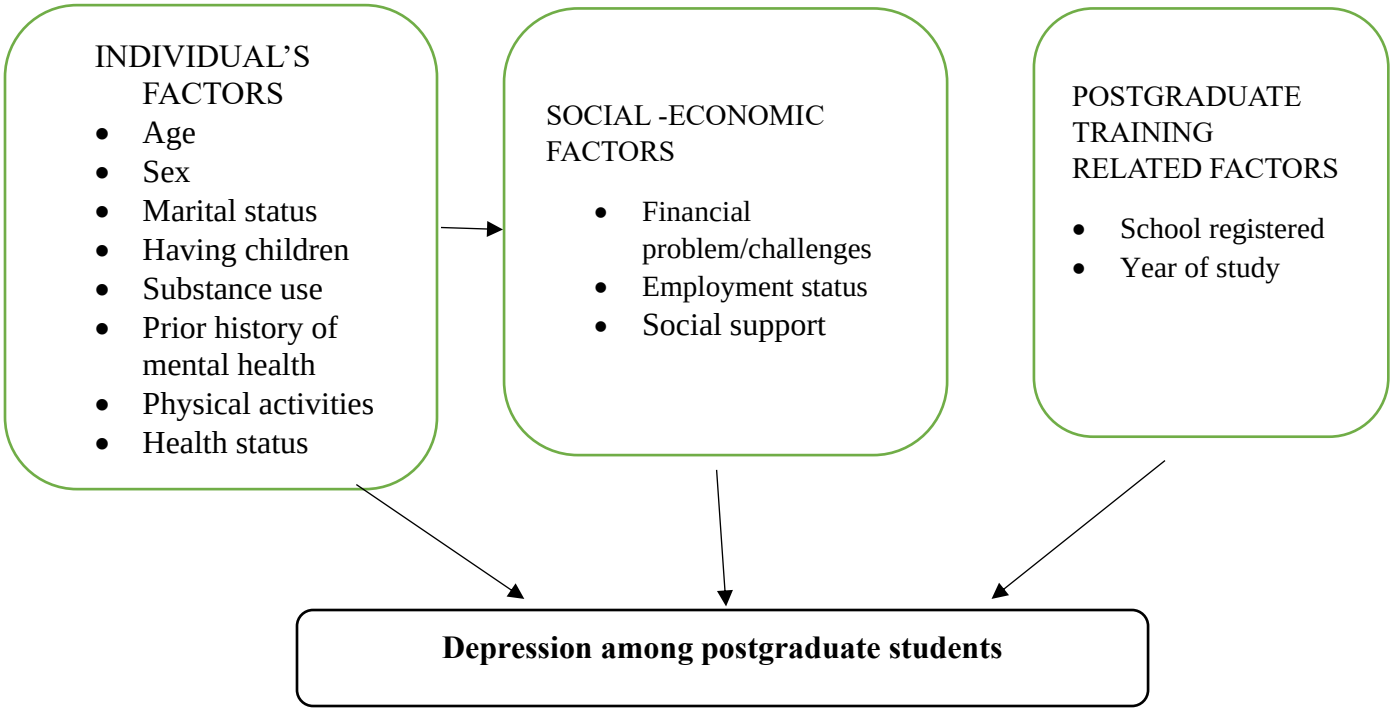


Figure 1: The Conceptual framework about factors associated with depression among postgraduate students.

1.4. Rationale

The generated findings from this study will give the postgraduate students an insight into the factors associated with depression and therefore establish appropriate coping mechanisms to deal with it. At the university level, this study will help to plan for appropriate interventions directed towards postgraduate students' mental health. Moreover, it can help in the enhancement of the existing university guidance and counselling services. Lastly, the results will help in the advancement of knowledge about depression and inspire further investigation of the problem.

1.5. Research questions

1.5.1 Main research question

What are the factors associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences?

1.5.2 Specific research question

1. What is the prevalence of depression among postgraduate students at Muhimbili University of Health and Allied Sciences?
2. What is the association between individual factors and depression among postgraduate students at Muhimbili University of Health and Allied Sciences?
3. What is the association between socioeconomic factors and depression among postgraduate students at Muhimbili University of Health and Allied Sciences?
4. What is the association between postgraduate training-related factors and depression among postgraduate students at Muhimbili University of Health and Allied Sciences?

1.6. Research Objective

1.6.1 Broad objective

To determine the factors associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences.

1.6.2 Specific objectives

1. To determine the prevalence of depression among postgraduate students at Muhimbili University of Health and Allied Sciences.
2. To determine the individual factors associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences.
3. To identify the socioeconomic factors associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences.
4. To examine the postgraduate-related training factors associated with depression among postgraduate students at Muhimbili University of Health and Allied Sciences.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Prevalence of depression among Postgraduate Students

Studies conducted throughout the globe focusing on depression among students enrolled in postgraduate studies show that it is a problem of concern, with the trends increasing especially after the covid 19 pandemic. Studies conducted in the USA show the prevalence of depression among students enrolled in postgraduate studies ranges from 13% to 14 %(Barton and Bulmer, 2017; Allen *et al.*, 2022).In Asia, the prevalence of depression among postgraduate students ranges from 11.2 % to 49.6% with the variation seen significantly across regions and cultures, with some countries experiencing higher prevalence than others(Rai *et al.*, 2016; Alles, Amarakoon and Rohanachandra, 2023). In the United Kingdom, 40.5% of postgraduate students have depression which is highly linked to workaholism, resilience and perfectionism(Milicev *et al.*, 2023).

In South Africa, 17.5% of the postgraduate students have severe depression while 42.4 % of the postgraduate students have mild to moderate and 10% of the study participants were subjected to psychiatric treatment during the study(Janse van Vuuren, Bodenstein and Oberholzer, 2021). Like any part of the world East Africa has a burden of depression among postgraduate students even though few studies have been conducted. In Kenya, 29.6 % of postgraduate students have depression and have an increased risk of substance abuse which can further exacerbate depression (Shah *et al.*, 2021). In Tanzania, there is little understanding of depression among postgraduate students making it an area of concern, most studies have focused on specific population groups other than postgraduate students.

2.2 Individual factors associated with depression

2.2.1 Age

The relationship between postgraduate students' age and depression is inconclusive as some studies show with an increase in age depression increases while others show an increase in age depression decreases. Studies conducted in India and Bangladesh argued that postgraduate students older than 30 years are a risk of depression compared to the younger and can be so due

to increased family responsibilities, career pressure and financial burden(Dave *et al.*, 2018; Kılıç and Karahan, 2023). Similar studies in the USA showed students aged 26 and more were depressed (Allen *et al.*, 2022). In contrast, another study in Turkey argued that depression decreases with age, where students below 30 years of age are more depressed (Kılıç and Karahan, 2023). Moreover, some studies in Bangladesh and New York contended that age is not significantly associated with depression (Zaman *et al.*, 2014; Barton and Bulmer, 2017; Vasugi and Hassan, 2019). However, in Tanzania, the link between age and depression among postgraduate students is less known.

2.2.2 Sex

Depression affects more females than males and its manifestation can also differ between them(WHO, 2019). Previous studies conducted in Asia and America show that female postgraduate students have a higher likelihood of getting depression in comparison to male students which is related to child care, hormones and marriage (Guo *et al.*, 2021; Allen *et al.*, 2022; Alles, Amarakoon and Rohanachandra, 2023; Dabbagh *et al.*, 2023; Milicev *et al.*, 2023). A similar study in East Africa, Kenya shows female postgraduate students are at higher risk of depression compared to male postgraduate students (Shah *et al.*, 2021). Conversely, a similar study argued male postgraduate students are more depressed than females which is related to financial burden and family responsibility as the man of the house (Zaman *et al.*, 2014). However additional researchers found there is no difference in depression risk between female and male postgraduate students as both are faced with similar difficulties as students (Barton and Bulmer, 2017; Dave *et al.*, 2018; Kumar and Tilak Kumar, 2019; Guo *et al.*, 2021). Hence it is still inconclusive and in Tanzania there is little knowledge on the relationship of sex and depression among the postgraduate students.

2.2.3 Marital status

Marriage can be both a protective factor and a negative factor predisposing to depression among postgraduate students. Previous studies conducted in America and Turkey speculated that being married is a protective factor for depression as it is associated with moral support and stability while being single, divorced or widowed increases the risk of depression (Barton and Bulmer, 2017; Kılıç and Karahan, 2023). In other studies conducted in Asia, marriage increases the risk

of depression among postgraduate students due to a combination of academic demands, marriage and family responsibility (Zaman *et al.*, 2014). Furthermore, a study in Malaysia showed that marriage has no significant relationship with depression among postgraduate students (Vasugi and Hassan, 2019). In Africa, there is little understanding of how marriage is correlated to depression among postgraduate students. Therefore, the connection between marriage and depression is still indecisive and needs more investigation.

2.2.4 Substance use

The connection between depression and substance use can be bidirectional in the sense that substance use can elevate the likelihood of experiencing depression while nonetheless, depression can influence substance abuse including alcoholism, smoking, and the use of illicit drugs or prescription drugs. Previous studies conducted in the USA and Bangladesh showed that postgraduate students who engage in substance use have an increased risk of getting depression in comparison to those who do not use it (Garcia-Williams, Moffitt and Kaslow, 2014; Zaman *et al.*, 2014). A similar study conducted in East Africa Kenya also showed a significant association between substance abuse and depression among postgraduate students (Shah *et al.*, 2021). In contrast, similar studies in India found the association between substance use and depression among postgraduate students is not significant (Dave *et al.*, 2018). Though all these studies show the relationship between postgraduate depression and substance use in Tanzania there is little knowledge about the association.

2.2.5 Prior history of mental illness

A pre-existing history of mental illness can predispose an individual to recurrent occurrence of depression. A study conducted in Sri Lanka, Kenya and Ethiopia suggested that postgraduate students who have a prior history of mental illness have more risk of having depression compared to those who do not (Ahmed *et al.*, 2020; Shah *et al.*, 2021; Alles, Amarakoon and Rohanachandra, 2023). Conversely, a study in India argued that there is no meaningful correlation between having a prior history of mental illness and depression, all postgraduate students are at equal risk (Dave *et al.*, 2018). Therefore, this suggests that further research is warranted to investigate the connection between depression and pre-existing mental illness.

2.2.6 Physical activities

Physical activity is recognised as a potential factor which protects against depression in various populations. Several researchers have investigated whether physical exercise is connected to depression. Studies conducted in Europe, Australia and America suggested that physical activities had a positive impact on depression, students who had regular physical exercise had a reduced risk for depression (Schofield *et al.*, 2016; Hoying *et al.*, 2020; Volken *et al.*, 2021). Similar studies in East Africa Kenya showed lack of physical activity increases the risk of depression and physical activity is a protective factor and a coping mechanism for stress and depression (Shah *et al.*, 2021). On the other hand, a study in Norway suggested that there is no significant correlation between physical exercise and depression among postgraduate students (Grotan, Sund and Bjerkeset, 2019). In Africa, there is limited information regarding the correlation between depression and physical exercise. Hence emphasising the importance of further research to unravel the underlying mechanisms that drive this connection within this particular demographic.

2.2.7 Having children.

Earlier research has indicated that having children relates to a higher likelihood of depression, where individuals who are parents show a higher likelihood of experiencing depression compared to those without children, this is due to difficulty finding childcare during their busy school schedules (Allen *et al.*, 2022). On the other hand studies in Serbian universities assert that students with children are found to have similar levels of depression as those without children (Simić-Vukomanović *et al.*, 2016). Hence it is still inconclusive.

2.2.8 Health status

Studies in the USA emphasised that postgraduate students who have pre-existing physical health conditions may be more susceptible to depression due to the added burden of managing their health alongside academic responsibilities (Hoying *et al.*, 2020). Another study in Kenya claimed having a pre-existing physical health condition is associated with increased depression (Shah *et al.*, 2021). Hardly any study shows how depression relates to the health status of students enrolled in postgraduate studies hence there is little knowledge about it.

2.3 Social economic factors associated with depression

2.3.1 Financial problems/challenges

Financial situation can play an important role in influencing the occurrence of depression among postgraduate students. Previous studies conducted in America, Australia and Asia argued that financial problems increased the risk of depression among postgraduate students, the increase in financial problems is exacerbated by student loans, limited funding and the high cost of living where the universities are located which is in urban areas.(Farrer *et al.*, 2016; Barton and Bulmer, 2017; Charles, Karnaze and Leslie, 2022; Alles, Amarakoon and Rohanachandra, 2023). Studies in the UK show that students who have to fund their education expenses like tuition fees and other university expenses are at high risk of depression compared to those who are funded. (Hosseinpur, Parsa and Kabir, 2023) A similar study in East Africa Kenya also showed that financial problems or concerns were linked to depression. (Shah *et al.*, 2021). However, in Tanzania, there is little knowledge of the association between the financial situation of postgraduate students and depression.

2.3.2 Social support

Social support provides emotional reassurance and gives a sense of purpose and hence can influence depression among postgraduate students. Previous studies on depression among postgraduate students in the UK, France and the USA argue that social support is a protective factor from depression, having social support lowers the likelihood of depression (Barton and Bulmer, 2017; Janse van Vuuren, Bodenstein and Oberholzer, 2021; Charles, Karnaze and Leslie, 2022; Milicev *et al.*, 2023). A similar study in East Africa Kenya shows having lower social support elevates the chances of suffering from depression (Shah *et al.*, 2021). In Tanzania, there is low knowledge of the level of social support among postgraduate students and how it influences depression.

2.3.3 Employment

The relationship between employment status among postgraduate students and depression is a complex matter as employment can be both a negative and a positive factor. In South America studies about depression among postgraduate students speculated that having employment

together with studies increased the risk of depression (de Oliveira Souza *et al.*, 2023). On the contrary, another study in Turkey shows there is no relationship between being employed or unemployed and depression among postgraduate students (Kılıç and Karahan, 2023). Though some postgraduate students work and study at the same time few studies have addressed the connection between employed students and the risk of depression.

2.4 Postgraduate training -related factors associated with depression

2.4.1 School registered

Schools, where the postgraduates are registered, vary in terms of the rigour and demands of their programs. Previous studies in Asia and Europe have indicated that belonging to certain academic faculty poses a higher risk factor for depression compared to others, for instance, being enrolled in clinical departments is associated with an elevated risk of depression when compared to non-clinical departments (Simić-Vukomanović *et al.*, 2016; Alrasheedi and Rabbani, 2022; Alles, Amarakoon and Rohanachandra, 2023). Another study conducted in Kenya also suggested that there is a difference in depression risk across different academic departments (Shah *et al.*, 2021). In Tanzania, there is insufficient information regarding the relationship between depression and faculty where the student is registered, underscoring the need for research in this area.

2.4.2 Year of study

Some studies suggest that the level of depression may vary across different years of postgraduate study. Research conducted in India suggests that postgraduate students in their second year experience higher levels of depression compared to those in other years of study (Dave *et al.*, 2018). On the contrary, a study conducted at a Serbian university indicated that first-year students exhibit higher levels of depression in comparison to students in other years of study (Simić-Vukomanović *et al.*, 2016). However other studies found no association between year of study and depression among postgraduate students (Alrasheedi and Rabbani, 2022; Dabbagh *et al.*, 2023). Hence still inconclusive.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study design

This study was a cross-sectional study with a quantitative approach. This type of study design was chosen because it is quick and cost-effective.

3.2 Study area

MUHAS is a government university founded in Tanzania, Dar-es-Salaam. The institution is committed to health science education, research and service provision. MUHAS offers a wide range of undergraduate and graduate programs focusing on health-related disciplines. The university and its postgraduate programs cover a range of fields, like medicine, nursing, public health, pharmacy, dentistry and other health sciences. These master's and doctoral programs aim to provide students with advanced knowledge and skills, preparing them for leadership positions, research projects and improving health care.

3.3 The study population

The study participants were postgraduate students enrolled at MUHAS in different master's programs**.** MUHAS was purposely selected for this study because it is one of the largest public universities in Tanzania which enrols a variety of health and health-related students who provide health services in the community and hence their mental health status can interfere in the provision of care.

3.4 Sample size estimation

The study sample size was calculated according to the formula for cross-sectional study design (Charan and Biswas, 2013) which is:

$$N=\frac{Z^2 P(1-P)}{E^2}$$

N= Estimated sample size

Z is the standard normal deviation of 1.96 in confidence interval of 95%

E is the margin of error which is 5% or 0.05

P is the prevalence where 29.6 % will be used as obtained from a study conducted in Kenya(Shah *et al.*, 2021)

$$N = \frac{1.96^2 (0.296) (1-0.296)}{0.05^2}$$

N=320

To assume a 10% non-response rate

N= (10/100* N) +N

N=352 (minimal sample size)

3.5 Sampling Procedure

A stratified sampling procedure was used to divide the study participants according to the schools available at MUHAS. There were four schools including, Nursing, Dentistry, Pharmacy, Public Health and Social Sciences, and for research purposes, the College of Medicine and the Institute of Traditional Medicine were regarded as schools making a total of six schools.

The proportionate-to-size method was used to obtain the number of participants in each school according to the overall count or number of students.

The number of participants selected in each school was arrived at as follows:

$$\frac{\textit{Total number of students in a school } x^{*}\textit{sample size required for the study}}{\textit{Total number of all the students in all schools}}$$

Table 1: Number of students sampled in each school

Schools /institute /college	No. of postgraduate students in the school	No participants are to be sampled from each School
Medicine	763	202
Nursing	131	35
Dentistry	34	9
Pharmacy	27	7
Public Health and Social Sciences	370	98
Traditional Medicine	4	1
Total	**1329**	**352 (minimum sample size)**

After obtaining the proportion of students to be sampled from each school, a sampling frame was formulated using the list of the number of postgraduate students obtained from the respective school. Study respondents were then selected randomly as representatives within each school.

3.6 The Inclusion and Exclusion Criteria

3.6.1 Inclusion criteria

The study included postgraduate students enrolled at MUHAS in master's programmes

3.6.2 Exclusion criteria

The postgraduate students enrolled in distance learning programmes because of their accessibility and the difference in learning environment.

3.7 Study variables

3.7.1Dependent

Depression was the dependent variable in this study, which was measured by utilizing a PHQ 9 score developed in 1999 by Dr Robert Pitzer intended for screening, diagnosis, and measuring the severity of depression. The score uses nine questions representing symptoms each question has four categories to choose from 0 to 3, with each option signifying how often an individual

has symptoms- 0 is not at all, 1 is several days, 2 is more than half the days of the week? and 3 being nearly every day. The score ranges from 1-4 which is minimal depression or asymptomatic 5-9 mild depression, 10-14 moderate depression,15-19 moderate severe depression and 20-27 severe depression. However, a score of 10 and above was regarded as probable depression as it has been documented to have 88% sensitivity and 88% specificity for depressive disorder (Kroenke, Spitzer and Williams, 2001).

3.7.2 Independent variables

Table 2: Independent variables measurement

Variable	**Operational definition**	**Measurement**
Age	Number of years a person has lived	This was reported by the participants in years and then categorised into two groups above or equal to 30 and below 30
Sex	Biological identification of a person as either male or female	Was recorded as either male or female
Marital status	A relationship with a significant example married or single	Was categorised as single, married, cohabiting, divorced or widowed
Having children	The state of possessing children	Whether having biological or adopted children was responded to as Yes or No and if the answer was yes, the number of children was also reported

Prior history of mental health	Having any mental illness in the past	Individuals' experience with mental issues was reported as Yes or No
Physical exercise	Anybody activity a person performs to stay fit	Any bodily activities an individual performs were reported in terms of how many times the activities are performed in a week, never, rarely (once or twice a week), regularly (more than twice)
Health status	Having any permanent medical condition	Having any chronic condition which requires regular treatment was reported by participants as yes or no
Substance use	The use of alcohol or tobacco	Within this study, the alcohol or tobacco use was reported by participants as Yes or No
Financial problems	Any financial challenge a person encounter	Financial challenges individual encounters were reported by participants as Yes or No
Employment status	Having a paid job or any activities	Being in a paid work or activities which was reported by participants as Yes or No
Social support	Having support from, family, friends or partners	Measured as how an individual perceives social support, scores are categorised as mean scores which cover scores between 1 -2.9 showing that support is low, 3 - 5 support is moderate and 5.1- 7 support is high. Social support was measured using a specific scale, a 12-item multidimensional scale of perceived social support (MSPSS) developed by Gregory Zimet in 1988 which

		measures social support in three classes: friends, family and significant other(Zimet *et al.*, 1988).
School registered	A department a student is categorised in	A school an individual was enrolled in, including, Medicine, Nursing, Pharmacy, Dentistry, Public Health and Social Sciences; and Traditional Medicine which is an institute but for this study, it was regarded as a school
Year of Study	The level of a student whether first, second or third year	The year in which the respondent was at the time of study either, the first, second or third year

3.8 Recruitment and training of research assistants

This study involved the principal researcher and two research assistants. The research assistants were trained for three days and the training involved familiarizing them with the research, including the topic, objectives, and the questionnaire for data collection. The training also included the roles and responsibilities of the research assistant and research ethics. The training employed lecturing and interactive discussion in the provision of the necessary skills required for research.

3.9 Pre-test of the tools

The research assistants were involved in the pretesting of the tools. 37 students from the same population were involved in pretesting and to ensure that the students were not again randomly selected special identifiers or codes were used to exclude them from participating in the main study and they were also removed from the list of students from which the sampling frame was formed. The reason for pretesting was to ascertain the tool's capability to collect the required information and the suitability of the tool to the targeted population.

3.10 Data collection

Data were collected over four weeks by the use of a self-administered questionnaire which included two adopted tools, the PHQ 9 score developed by Dr Robert Ptizer and the multidimensional scale of perceived social support developed by Dr Gregory Zimet. The tool was used to gather information about symptoms of depression by using a PHQ-9 score and information about individual factors, Postgraduate training-related factors and socioeconomic factors. The participants were located in classes and clinical areas where the researchers explained to them about the research study, its purposes, importance and the benefit of their participation. The students who agreed to participate signed informed consent and were guided on how to use the self-administered questionnaires including proper filling of the questionnaires. The questionaries were distributed in classes with the help of the class representative, while for those who had internet access a link to a Google form was shared. Then the filled questionnaires were collected by the researchers.

3.11 Validity and Reliability

PHQ 9 scale and the MSPSS tools are validated and highly reliable tools(Zimet *et al.*, 1988)(kroenke and Sptizer, 2002). The PHQ 9 scale when used on university students in Bangladesh showed higher validity and reliability with a reliability coefficient of 0.824 which is greater than the recommended of 0.8 showing high reliability (Rahman *et al.*, 2022).In Tanzania, the PHQ 9 is used in hospitals for patients above 18 years of age. MSPSS tools when used for university students in the USA and South Africa showed a reliability coefficient ranging between 0.85 and 9.1 respectively, indicating high reliability(Zimet *et al.*, 1988; Janse van Vuuren, Bodenstein and Oberholzer, 2021). The tools were pretested to check if they provided the required information by administering it to the same individuals on different occasions to check for consistency and reliability.

3.12 Data Management and Analysis

3.12.1 Data management

The filled questionnaires were collected daily from the research assistant and specific tracking forms were used to keep a record of all the collected tools. All the collected tools were sent to

the principal investigator. The raw data collected in the questionnaires was entered and coded in Microsoft Excel computer software. Data were then imported to Stata version 17 software for data cleaning, which included renaming variables for clarity, removing duplicates, identifying and replacing missing variables, filtering the data to retain relevant information and converting data into Stata-friendly format and analysis.

3.12.2 Data Analysis Plan

Stata version 17 was used to analyse each specific objective. A descriptive analysis of the data was performed to show the distribution of participants in the study. Numerical variables like age were summarised in the form of median and range because it was not normally distributed whereas categorical variables were summarised in the form of frequencies and proportions.

The prevalence of depression was estimated by dividing the total number of postgraduate students with a PHQ-9 score of 10 and above and the total number of postgraduate students. Logistic regression was utilized to establish the association between depression and individual, socioeconomic and postgraduate-training-related factors.

Bivariate logistic regression analysis was utilised to estimate the odds ratio (OR) whereas variables whose p-values are below 0.2 were considered for multivariable analysis for the establishment of an independent association. Odds ratios and 95% confidence intervals were reported and the variables having a p-value below 0.05 were deemed statistically significant.

3.13 Ethical consideration

The ethical approval for the study was attained from the Institutional Review Board (IRB) of MUHAS and permission was sought from the relevant authority in MUHAS before data collection. Before enrolling, participants received comprehensive information about the study and its objectives, expected procedures and potential benefits, which ensured clarity and transparency and helped them make an informed decision and sign consent. Study participants were guaranteed that they were free to quit the study at any phase. It was expressly stated that the involvement in the research study was completely optional and privacy was respected. To protect confidentiality; instead of the names of participants numerical codes were used.

CHAPTER FOUR

4.0 RESULTS

4.1 Social Demographic Characteristics

A total of 377 postgraduate students participated in the study and their median age was 32 years, ranging from 25 to 55 years. Slightly over half of the students were male (n=210; 55.7%), and about half (n=193; 51.2%) were in their first year of study. The largest proportion of the respondents (n=220; 58.4%) reported being married, while nearly half of the students stated they had more than one child (n=163; 43.2%). (Table 1).

Table 3 : Social Demographic Characteristics of Participants (N =377)

Variable	Frequency	Percentage (%)
Age (in years)		
≥ 30	309	82
< 30	68	18
Sex		
Female	167	44.3
Male	210	55.7
Marital Status		
Single	133	35.3
Married/ Cohabiting	236	62.6
Divorced/ Widowed	8	2.1
No of Children		
None	134	35.5
One child	80	21.2
More than one	163	43.2
Year of Study		
First	193	51.2
Second	137	36.3
Third	47	12.5
Schools		
Public Health	103	27.3
*Medicine	205	54.4
Pharmacy	11	2.9
Nursing	47	12.5
Dentist	9	2.4
**Traditional Med	2	0.53

No of Children		
None	134	35.5
One child	80	21.2
More than one	163	43.2
Employment Status		
Employed	299	79.3
Not employed	78	20.7
Physical Activity		
Never	80	21.2
Rarely	176	46.7
Regular	121	32.1
Financial Challenge		
Yes	197	52.3
No	180	47.8
Social Support		
Low	57	15.1
Medium	109	28.9
High	211	56.0

*College

**Institute

4.2 Prevalence of depression among MUHAS Postgraduate Students

Overall, 90 (23.9%) of the 377 MUHAS postgraduate students who participated in this study were depressed at the time of the survey (Figure 2)

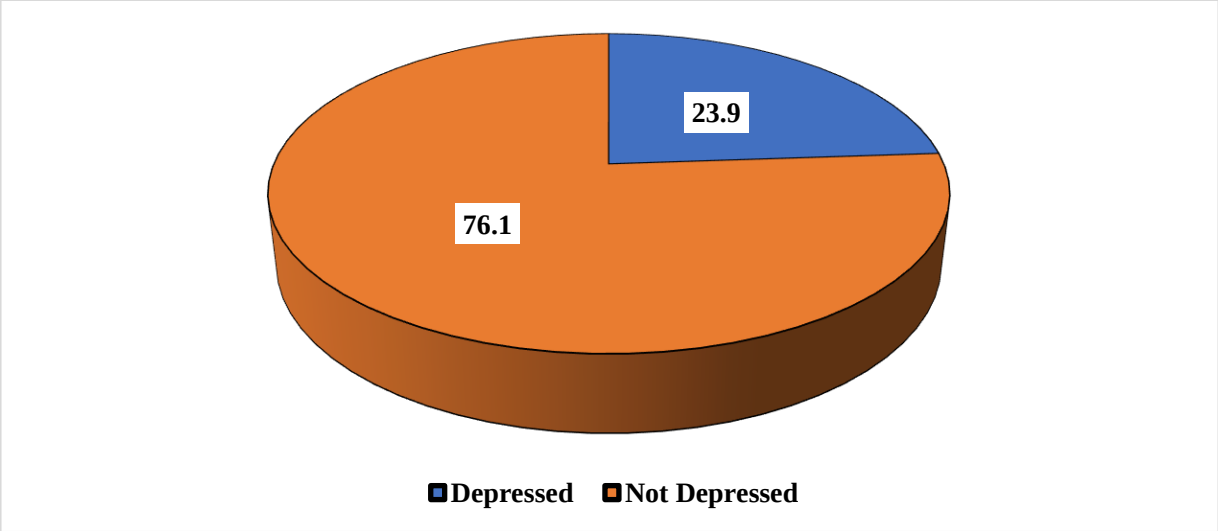


Figure 2: Prevalence of depression among postgraduate student

4.2.1 Depression severity according to PHQ 9 score results

At MUHAS 15.3% of postgraduate students had a PHQ 9 score of 0 indicating that they had no depression, over a third of the respondents 145 (38.5%) had minimal depression, 85 (22.5%) had mild depression, furthermore 58 (15.4%) had moderate depression, 24(6.4%) and 8 (2.1%) had moderate-severe depression and severe depression respectively (figure 3). However, a score of 10 and above which is from moderate to severe depression was regarded as probable depression.

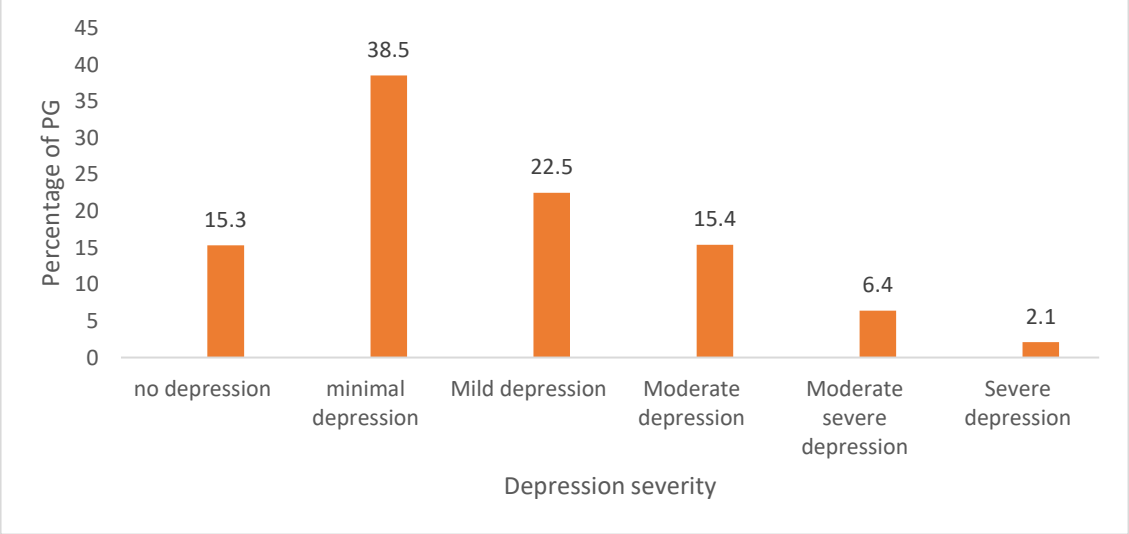


Figure 3: Depression severity among postgraduate students at MUHAS

4.3 Prevalence of depression across social-demographic characteristics

In the prevalence of depression across the social-demographic characteristics there were some variables which were observed to have a significant difference in depression. Whereas in alcohol consumption, the alcohol users had a higher prevalence of depression (n=47; 32.4%) as compared to non-alcohol users (n=43; 18.5%, ($p = 0.002$) indicating that they were more likely to develop depression. Likewise, in tobacco use, the users had a higher prevalence of depression compared to the non-users, (46.7% vs. 21.9%, $p = 0.002$), showing a significant difference in depression prevalence. Moreover, those who had a history of mental problems had a higher prevalence as compared to those who had none (55.0% vs. 22.1%, $p = 0.001$), students who reported having chronic illness, those who had chronic illness had a higher prevalence in depression compared to those who had none (48.4% vs. 21.7%, $p = 0.001$). Likewise, students who had financial challenges had a higher prevalence of depression compared to those who had none (36.0% vs. 10.6%, $p < 0.001$), whereas those with low social support had a higher prevalence of depression compared to those who had higher social support (52.6% vs. 9.5%, $p < 0.001$). Other variables like age, sex, having children, employment, year of study, and School enrolled had no significant difference in depression prevalence as indicated in Table 2 below.

Table 4: Prevalence of depression across the sociodemographic characteristics (N=377)

Variable	Depression status		P-value
	Depressed (n=90) (n, %)	Not depressed (n=287) (n, %)	
Age group (in years)			
≥ 30	70 (22.7)	239 (77.3)	0.324
< 30	20 (29.4)	48 (70.6)	
Sex			
Female	46 (27.5)	121 (72.5)	0.136
Male	44 (20.9)	166 (79.1)	
Marital status			
Single	33(24.8)	100 (75.2)	
Married/ Cohabiting	53(22.4)	183 (77.)	0.234
Divorced/ Widowed	4 (50)	4 (50)	
No of children			
None	30 (22.4)	104 (77.6)	
One child	15 (18.7)	65 (81.3)	0.277
More than one	45 (27.6)	118 (72.4)	
Year of Study			
First	51 (26.4)	142 (73.6)	
Second	32 (23.4)	105 (76.6)	0.247
Third	7 (14.9)	40 (85.1)	
Schools			
Public Health	32 (31.1)	71 (68.9)	
Medicine	38 (18.5)	167 (81.5)	
Pharmacy	3 (27.3)	8 (72.7)	0.067
Nursing	16 (34.0)	31 (65.9)	
Dentist	1(11.1)	8 (88.9)	
Traditional Medicine	0(0)	2(100)	
Employment status			
Employed	72 (24.1)	227(75.9)	0.853
Not employed	18 (23.1)	60 (76.9)	
Physical activity			
Never	33 (41.3)	47 (58.8)	
Rarely	40 (22.7)	136 (77.3)	<0.001*
Regular	17 (14.1)	104 (85.9)	
Alcohol consumption			
Yes	47 (32.4)	98 (67.6)	0.002*
No	43 (18.5)	189 (81.5)	

Tobacco use			
Yes	14(46.7)	16 (53.3)	0.002*
No	76 (21.9)	271 (78.1)	
History of mental illness			
Yes	11 (55.0)	9 (45.0)	0.001*
No	79 (22.1)	278 (77.9)	
Presence chronic Illness			
Yes	15 (48.4)	16 (51.6)	0.001*
No	75 (21.7)	271 (78.3)	
Financial challenge			
Yes	71 (36.0)	126 (63.9)	< 0.001*
No	19 (10.6)	161 (89.4)	
Social support			
Low	30 (52.6)	27 (47.4)	
Medium	40 (36.7)	69 (63.3)	<0.001*
High	20 (9.5)	191 (90.5)	

4.4 Association between individual factors and depression among postgraduate students

During the bivariate logistic regression analysis, the results indicated that sex, alcohol, tobacco use, physical exercise, history of mental illness, and chronic diseases had an association with depression. However, during multivariable analysis, only alcohol use and physical exercise remained statistically significantly associated with depression. Specifically, postgraduate students who used alcohol were twice as likely to have depression compared to those who did not use alcohol [adjusted Odd Ratio (aOR)=2.13, 95% Confidence interval CI (0.91 - 3.46)]. Additionally, those who had never engaged in physical exercise were three times more likely to have depression compared to those who engaged in regular physical exercise [aOR=3.09, 95%CI (1.48 - 6.49)]. As shown in Table 3 below

Table 5: Bivariate and multivariable analysis of individual factors associated with depression

Variables		Bivariable Analysis		Multivariable analysis	
	N	crude OR (95% CI)	P-value	aOR (95% CI)	P-value
Age(in years)					
≥ 30years	309	*Reference*			
<30 years	68	1.42(0.79-2.56)	0.238		
Sex					
Female	167	1.43 (0.89 - 2.31)	0.137	1.27(0.74 - 2.18)	0.394
Male	210	*Reference*		*Reference*	
Marital status					
Single	133	2.31 (0.69 - 1.88)	0.284		
Married/Cohabiting	236	*Reference*			
Divorced/ Widowed	8	3.45(0.84 - 14.27)	0.087		
No of children					
More than one	163	1.32 (0 .77 - 2.25)	0.304		
One child	80	0 .8 (0.40 -1.59)	0.528		
None	134	*Reference*			
Alcohol consumption					
Yes	145	2.11 (1.30 - 3.41)	0.002	2.13 (0.91 - 3.46)	0.007*
No	232	*Reference*		*Reference*	
Tobacco use					
Yes	30	3.12 (1.46 - 6.68)	0.003	2.13 (0.91 - 4.97)	0.081
No	247	*Reference*		*Reference*	
Physical activity					
Never	80	4.29 (2.18 - 8.47)	<0.001	3.09 (1.48 - 6.49)	0.003*
Rarely	176	*1.79 (0.97 - 3.35)*	0.06	1.48 (0.77 - 2.85)	0.234
Regular	126	*Reference*		*Reference*	
History of mental illness					
Yes	20	4.3 (1.72 - 10.75)	0.002	2.28 (0.85 - 6.22)	0.103
No	357	*Reference*		*Reference*	
Presence chronic illness					
Yes	31	3.39 (1.60 - 7.17)	0.001	2.17 (0.95 - 4.95)	0.060
No	146	*Reference*		*Reference*	

aOR(adjusted odds ratio) ,N(Number of students) ,CL(confidence interval)

4.5 Social-economic factors associated with depression among postgraduate students

In bivariate analysis, results indicated that financial challenge and social support had an association with depression. Likewise in multivariable analysis, financial challenge and social support remained statistically significantly associated with depression, postgraduate students who had financial challenges had twice the odds of having depression compared to those who didn't have financial challenges [adjusted Odd Ratio (aOR)=2.86, 95% Confidence interval CI (1.57 - 5.22)]. Additionally, those with low social support were seven times more likely to have depression compared to those with high social support [aOR=7.55, 95%CI (3.64 - 15.69)] as well as those with medium social support had four times the likelihood of developing depression compared to those with high social support [aOR=4.35, 95%CI (2.32 - 8.15)]. (Table 6)

Table 6: Bivariate and multivariable of Social economic factors associated with depression among postgraduate students

		Bivariable Analysis		Multivariable analysis	
Variables	**N**	**crude OR (95% CI)**	**P-value**	**aOR (95% CI)**	**P-value**
Financial challenge					
Yes	197	4.77 (2.73 - 8.34)	< 0.001	2.86 (1.57 - 5.22)	0.001
No	180	*Reference*		*Reference*	
Employment status					
Employed	299	*Reference*			
Not employed	78	0.95(0.53-1.71)	0.850		
Social support					
Low	57	10.61 (5.29 - 21.25)	< 0.001	7.55 (3.64 - 15.69)	< 0.001
Medium	109	5.54 (3.03 - 10.12)	< 0.001	4.35 (2.32 - 8.15)	< 0.001
High	211	*Reference*		*Reference*	

aOR (adjusted odds ratio), N (Number of students), CL (confidence interval)

4.6 Postgraduate training- related factors associated with depression

The postgraduate training-related factors did not have any statistically significant association with depression. However, students in the school of nursing had twice the likelihood of developing depression but it was not statistically significant as shown in table 5 below

Table 7: Bivariate and multivariable analysis of Postgraduate training-related factors associated with depression

	N	Bivariable Analysis		Multivariable analysis	
Variables		**crude OR (95% CI)**	**P-value**	**aOR (95% CI)**	**P-value**
School					
Public Health	103	1.98 (0.14 - 3.41)	0.24		
Medicine	205	*Reference*			
Pharmacy	11	1.64(0.41 - 6.50)	0.476		
Nursing	47	2.27 (0.12 - 3.56)	0.236		
Dentist	9	0.54(0.66-4.54)	0.578		
Year of Study					
Third	47	0.49 (0.20 - 1.15)	0.53		
Second	137	0.85 (0.51 - 1.41)	0.1		
First	193	*Reference*			

aOR (adjusted odds ratio), N (Number of students), CL (confidence interval)

CHAPTER FIVE

5.0 DISCUSSION

This chapter delves into this study's main findings, including the prevalence of probable depression and its associated factors. Hence aiming to provide a comprehensive understanding of the mental health challenges of Tanzanian postgraduate students by examining the individual, socioeconomic and postgraduate training-related factors that are associated with depression.

5.1 Prevalence of depression

In this study, it was found that nearly one out of four postgraduate students had probable depression signalling a concern. In comparison to other countries, this study is consistent with the result found in a systematic review study conducted in low-, middle- and high-income countries where the prevalence of depression among postgraduate students ranged from 6.2 % to 84.7%(Guo *et al.*, 2021). Hence the prevalence of this study is within this range. However related studies conducted in Nigeria, China, and the USA showed a lower prevalence as compared to this current study(Gu *et al.*, 2015; Barton and Bulmer, 2017; Fang *et al.*, 2019) .Nevertheless, studies conducted in Kenya, South Africa, and Saudi Arabia showed a higher prevalence as compared to this current study(Janse van Vuuren, Bodenstein and Oberholzer, 2021; Shah *et al.*, 2021; Alrasheedi and Rabbani, 2022) .The difference in depression prevalence could potentially be due to differences in methodology, study setting, and tools used to measure the outcome which is depression(Shah *et al.*, 2021; Alrasheedi and Rabbani, 2022).Additionally, in this current study the difference in depression prevalence with other studies could also be attributed to the fact that the PHQ 9 scale which was used to measure depression is a self-reporting tool and hence can result in underreporting or overreporting of the depression symptoms leading to a higher or low prevalence found. Thus, these findings show that depression among postgraduate students is a problem of concern in Tanzania suggesting the need for targeted mental health interventions to address the mental well-being of this population. Henceforth, further research that will employ various assessment tools and methodologies is essential for a more comprehensive understanding of the mental health challenges facing Tanzanian postgraduate students.

Regarding depression severity, this study found that the postgraduate students at MUHAS have varying degrees of depression severity ranging from mild, to moderate to severe depression. This is consistent with studies conducted in South Africa and India where a notable percentage of students suffer from mild, moderate to severe depression(Dave *et al.*, 2018; Janse van Vuuren, Bodenstein and Oberholzer, 2021).

5.2 Individual factors associated with depression among postgraduate students

In this study factors like age, sex, marital status, prior history of mental health and health status showed no significant association with depression among postgraduate students. The absence of this association might be due to the homogeneity of the sample in a way that all postgraduate students face the same academic challenges regardless of the demographic characteristics rendering these characteristics less influential. Similar findings were reported in other studies in Serbia, UK, Malaysia and India (Simić-Vukomanović *et al.*, 2016; Barton and Bulmer, 2017; Dave *et al.*, 2018; Vasugi and Hassan, 2019). However, findings in this study show that physically inactive students have an increased likelihood of getting depression (p=0.003), compared to postgraduate students who engage in regular physical activities, these findings are consistent with the conclusions of the studies in the USA and Kenya where the authors further suggested that regular physical activities is a protective factor against depression (Hoying *et al.*, 2020; Shah *et al.*, 2021). Furthermore, physical activity programs are among the preventive programs encouraged in depression prevention as they reduce depression risk by enhancing mood, reducing anxiety and improving sleep quality(WHO, 2019). The findings in this study also showed that there is a significant association between alcohol use and depression, where students who use alcohol had an increased risk of depression in comparison to non-users(p=0.007). These findings align with previous studies from Kenya and the USA which also suggested that there is an increased likelihood of depression among alcohol users(Garcia-Williams, Moffitt and Kaslow, 2014; Shah *et al.*, 2021). Additionally, the WHO suggested that there is a causal relationship between alcohol use and mental health disorders including depression(WHO, 2015). In comparison studies conducted among Indian postgraduate students implied that there is no significant correlation between the use of substances like alcohol and depression which could be due to strict cultural and social norms in India (Dave *et al.*, 2018). The difference seen in this study could stem from several reasons including variations in

lifestyles and cultural attitudes between countries which could play a significant role in influencing a person to engage in alcohol use. Likewise, this difference could be attributed to different tools used to measure alcohol use.

5.3 Social-economic factors associated with depression among postgraduate students

An important variable that appeared to have a significant association was social support, where more than half of the students with low social support had an increased odds of developing depression ($p<0.001$) compared to those with high social support. Also, those with medium social support appeared to have increased odds of developing depression($p<0.001$) compared to the students with higher support, and hence in comparison to low and medium social support, those having higher social support suggest that having a higher social support is a protective factor against depression. A similar association was found in studies conducted in Kenya and South Africa(Janse van Vuuren, Bodenstein and Oberholzer, 2021; Shah *et al.*, 2021), as did studies conducted in the USA(Barton and Bulmer, 2017), and the UK (Milicev *et al.*, 2023). Another study further suggested that social support being a positive factor can help mitigate the risk associated with the negative factors of depression(Charles, Karnaze and Leslie, 2022).Among others WHO also indicated that having social support including friends and family who you can interact with including sharing personal feelings and solving problems can help to reduce the risk of developing depression or even help in the treatment of those who are already depressed(WHO, 2019).

In this study, depression was also found to have a significant association with financial problems or challenges where the students who reported having financial problems had an increased likelihood of developing depression($p=0.001$) compared to those who had none. This appears to be similar to the study conducted in the USA where students with financial problems had increased odds of depression(Charles, Karnaze and Leslie, 2022). Moreover, studies conducted in Australia and Kenya further added that depression is linked with financial problems among postgraduate students which is due to the high cost of living where the universities are located, student loans which aggravate it, and limited funding as not all students get sponsorship(Farrer *et al.*, 2016; Shah *et al.*, 2021). In contrast, studies conducted in India suggested that there is no significant association between financial challenges and depression among postgraduate

students, furthermore, the study also suggested that this could be so because these students receive the same financial allowance which helps to level their economic status(Dave *et al.*, 2018). For Tanzanian postgraduates it is different as most of these students have already started families and hence, they have increased financial responsibility regardless of the allowance they receive from the government or any other sponsors, and some still do not receive the allowances hence increasing the likelihood of facing financial challenges. However, the findings of this study also showed that there is no association between employment and depression and therefore corresponds with another study conducted on postgraduate students in Turkey by (Kılıç and Karahan, 2023)

5.4 Postgraduate training- related factors associated with depression

In this study, the year of study had no significant association with depression, whereas students in all years of study seemed to be at risk of developing depression. Similarly, a systematic review study conducted in Saudi Arabia concluded that there is no association between depression and the year of study(Dabbagh *et al.*, 2023). On the contrary, a study conducted in Serbian showed that students in the second year of study were more depressed (Simić-Vukomanović *et al.*, 2016). The finding from this current study could be explained by the fact that all students almost face the same academic challenges regardless of the year of study. Regarding the association between the school in which the student is registered and depression, this study's findings did not find any significant association. This finding aligns with the study conducted in the UK which suggested that all students are at risk of depression regardless of the school, and department they are enrolled in(Milicev *et al.*, 2023).In contrast, another study conducted in Kenya suggested that there is a difference in the risk of depression between different courses in postgraduate studies(Shah *et al.*, 2021). The findings in this current study could be explained by the fact that although there are different schools or courses within the university, students still encounter many of the same academic pressures including, assessments, deadlines and the need to maintain high academic performance. Therefore, this shared experience creates a collective stressful environment that impacts the students similarly. Additionally, factors like limited access to mental health resources and the competitive nature of postgraduate studies could exacerbate feelings of depression regardless of course or year of study.

5.5 Study Strengths and Limitations

5.5.1 strength of the study

This study has the following strengths

The study used more than one postgraduate program like nursing, medicine, traditional medicine, public health and social science, radiology and pharmacy and therefore allows us to understand how different curricula or academic environments can influence depression.

Moreover, this study could serve as a foundation for future studies exploring the mental well-being of postgraduate students.

5.5.2 Study limitations and their mitigations

The study findings have several limitations as follows: Firstly, The Patient Health Questionnaire (PHQ-9) is a provisional diagnosis tool and not a gold standard for depression diagnosis. Secondly, the reliance on self-reported information may have introduced biases as students might overreport or underreport the symptoms of depression. Additionally, the study only focused on depression leaving out other mental health conditions which go hand in hand with depression-like stress and anxiety

Mitigation of the study limitations

In reporting the study results, we considered the provisional nature of the PHQ -9 and hence the findings were reported as the prevalence of probable depression. Before collecting data, the respondents were emphasised the importance of reporting true information about their depressive symptoms.

CHAPTER SIX

6.0 CONCLUSION AND RECCOMENDATION

6.1 Conclusion

According to this study, nearly one in four of the postgraduate students had probable depression underscoring a significant mental health concern. Physical activity and the use of alcohol were identified as individual factors which have a significant association with depression. Likewise having financial challenges appeared to have a significant link with having depression Additionally, social support emerged as a protective factor, whereby having a high level of social support correlated with a low depression rate.

6.2 Recommendations

1. Postgraduate students should engage in regular physical activities like joining sports clubs and should limit alcohol intake.
2. Policies made for combating mental health challenges should also target academic institutions
3. MUHAS should introduce comprehensive mental health programs that will include mental health workshops and mental health screening to support the student's mental health.
4. A study qualitative study should be conducted, to further explore the factors associated with depression among postgraduate students.

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APPENDICES

Appendix 1: English version of the questionnaire

QUESTIONNAIRE FOR DEPRESSION SURVEY

QUESTIONARE NUMBER……

INSTRUCTIONS

Use a tick or circle the correct answer

INDIVIDUAL FACTORS

1.	1. Age	……
2.	Sex	a. Male b. Female
3.	What is your current status in terms of marriage?	a. Single b. Married c. Cohabiting d. Divorced e. Widowed
4.	Do you have children? If yes how many?	a. Yes b. No ……
5.	Have you at any point used alcohol?	a. Yes b. No
6.	Have you at any point used tobacco?	a. Yes b. No
8.	How many times in a week do you perform physical exercises (walking, jogging, swimming or any other spot)	a. Never b. Rarely (once or twice a week) c. Regularly (more than two times a week)
9.	Have you previously experienced or gotten treatment related to disorders of mental health including depression?	a. Yes b. No
10	Do you currently undergo any medical treatment for a chronic disease?	a. Yes b. No

PATIENT HEALTH QUESTIONNAIRE(PHQ-9)

Over the last two weeks, how often have you been bothered by any of the following problems?

(Use a Tick to indicate the answer)

		Not at all	Several days	More than half the days	Nearly every day
1.	Little interest or pleasure in doing things	0	1	2	3
2.	Feeling down, depressed, or hopeless	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4.	Feeling tired or having little energy	0	1	2	3
5.	Poor appetite or overeating	0	1	2	3
6.	Feeling bad about yourself or that you are a failure or have let yourself or your family down	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed. Or the opposite being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9.	Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

For office coding 0 …… +…… + …… + …….

Total ……

10.If you checked off any of the problems, 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

Not difficult at all……

Somewhat difficult ……...

Very difficult …….

Extreme difficult……

	SOCIAL -ECONOMIC FACTORS	
1.	Are you currently facing any financial challenges?	a. Yes b. No
2.	Are you employed?	a. Yes b. No

12. Social support

Multidimensional Scale of Perceived Social Support (MSPSS)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

If you **VERY STRONGLY DISAGREE**- Circle No. 1

If you **STRONGLY DISAGREE**- Circle No 2

If you **MILDLY DISAGREE**- Circle No 3

If you are **NEUTRAL**- Circle No 4

If you **MILDLY AGREE**- Circle No. 5

If you **STRONGLY AGREE**- Circle No 6

If you **VERY STRONGLY AGREE**- Circle No 7

	very strongly disagree	**strongly disagree**	**mildly disagree**	**neutral**	**mildly agree**	**strongly agree**	**very strongly agree**
1. There is a special person who is around when I am in need	1	2	3	4	5	6	7
2. There is a special person with whom I can share joys and sorrows	1	2	3	4	5	6	7

	very strongly disagree	**strongly disagree**	**mildly disagree**	**neutral**	**mildly agree**	**strongly agree**	**very strongly agree**
3. My family really tries to help me	1	2	3	4	5	6	7
4. I get the emotional help & support I need from my family	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me	1	2	3	4	5	6	7
7.I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8.I can talk about my problems with my family	1	2	3	4	5	6	7
9.I have friends with whom I can share my joys and sorrows	1	2	3	4	5	6	7
10.There is a special person in my life who cares about my feelings	1	2	3	4	5	6	7
11.My family is willing to help me make decisions.	1	2	3	4	5	6	7
12.I can talk about my problems with my friends.	1	2	3	4	5	6	7

	POSTGRADUATE TRAINING RELATED FACTORS	
1	Year of study	a. First b. Second c. Third
2	Faculty registered (medicine, nursing, dentistry, pharmacy, public health and social sciences and traditional medicine.	…….

Appendix II: Swahili version of the questionnaire
DODOSO LA UTAFITI KUHUSU SONONA

DODOSO NAMBA…….

TAARIFA BINAFSI zungushia kwenye jibu ambalo sahihi

1.	Umri	…….
2.	jinsia	a) Me b) Ke
3.	Hali ya ndoa	a) Hujao/Hujaolewa b) Umeoa /kuolewa c) Kuishi Pamoja bila ndoa d) Kutalikiwa e) Mjane/Mgane
4	Jee una watoto? Kama ndio ni wangapi	a) Ndio b) Hapana …….
5.	Unatumia pombe?	a) Ndio b) Hapana
6	Unavuta sigara?	a) Ndio b) Hapana
8.	Unafanya mazoezi mara ngapi kwa wiki kama vile (kutembea, kukimbia , kuogelea au mchezo wowote?	a) Kamwe b) Mara chache (moja au mbili kwa wiki) c) Mara kwa mara(Zaidi ya mara mbili kwa wiki)
9.	Ushawai kutambuliwa au kutibiwa ugonjwa wowote wa akili ikiwemo sonona?	a) Ndio b) Hapana
10	Je unatibiwa ugonjwa wowote wa kudumu?	a) Ndio b) Hapana

KIDODOSI JUU YA AFYA YA MGONJWA -9 (PHQ – 9) Katika kipindi cha wiki mbili zilizopita, ni mara ngapi umesumbuliwa na matatizo yafuatayo? Tumia "√" ili kuashiria jibu lako

		Haijatokezea kabisa	Siku kadhaa	Zaidi ya Nusu ya siku hizo	Takribani kila siku
1.	Kutokua na hamu au raha ya kufanya mambo	0	1	2	3
2.	Kuvunjika moyo , kuhuzunika au kukata tamaa	0	1	2	3
3.	Matatizo ya kutopata usingizi au kulalamfululizo au kulala sana	0	1	2	3
4.	Kujiskia kuchoka choka au kutokua na nguvu	0	1	2	3
5.	Kutokua na hamu ya kula au kula sana	0	1	2	3
6.	Kujiskia vibaya nafsi yako, kujiona umeshindwa kutimiza malengo yako ya Maisha au kuhisi umejidunisha wewe au familia yako.	0	1	2	3
7.	Matatizo ya kumakinika katika mambo Fulani kwa mfano unaposoma gazeti au kuangalia runinga	0	1	2	3
8.	Kuenda au kuongea taratibu sana mpaka watu wakawa wameona tofauti au kinyume chake kwamba hutulizani na unahangaika sana kulikoilivyo kawaida	0	1	2	3
9.	Kuwaza kuwa ni afadhali Zaidi ufeau ujidhuru kwa namna fulani	0	1	2	3

For office coding 0 …… +…… + …… + …….

10.Ikiwa umetia alama kwa matatizo yoyote , ni kwa kiwango kipi matatizo haya yamekupa ugumu kufanya kazi ,yako kushuhulikia vitu nyumbani au kutangamana na watu.

Sio ngumu ata kidogo……
Ngumu kiasi……..
Ngumu sana ……
Ngumu zaidi …….

Total ……..

	MAMBO YA KIJAMII -KIUCHUMI		
1.	Je kwa sasa unakabiliwa na changamoto zozote za kifedha?	a. c.	Ndio Hapana
2.	10.Jee unaufadhili wowote au msaada wa ada yako ya shule?	a. c.	Ndio Hapana

11. MSAADA WA KIJAMII

Multidimensional Scale of Perceived Social Support (MSPSS)

Maagizo:Tunania na unavyohisi kuhusu kauli zinazofuata,tafadhali soma kila taarifa kwa umakini , onyesha jinsi unavyojihisi kuhusu kila kauli.

Kama Haukubaliani sana- zungushia namba 1

Kama Haukubaliani - zungushia namba 2

Kutokubaliana kidogo - zungushia namba 3

Kama wewe ni neutral- zungushia namba 4

Kama Unakubaliana kidogo- zungushia namba 5

Kama Unakubaliana- zungushia namba 6

Kama Unakubaliana sana- zungushia namba 7

	Haukubaliani sana	**Haukubaliani**	**Kutokubaliana kidogo**	**Ni neutral**	**Unakubaliana kidogo**	**Unakubaliana**	**Unakubaliana sana**
1. Kuna mtu maalumu ambaye yupo kalibu ninapo hitaji.	1	2	3	4	5	6	7
2. Kuna mtu maalumu ambaye ninaweza kushirikiana naye furaha na uzuni.	1	2	3	4	5	6	7
3. Familia yangu inajalibu kunisaidia.	1	2	3	4	5	6	7

	Haukubaliani sana	**Haukubaliani**	**Kutokubaliana kidogo**	**Ni neutral**	**Unakubaliana kidogo**	**Unakubaliana**	**Unakubaliana sana**
4. Napata usaidizi wa kihisia na usaidizi ninaohitaji kwa familia yangu.	1	2	3	4	5	6	7
5. Nina mtu wa pekee ambaye ni chanzo cha kweli cha faraja yangu.	1	2	3	4	5	6	7
6.Rafiki zangu wanajalibu kunisaidai	1	2	3	4	5	6	7
7.ninaweza kuwategemea marafiki zangu mambo yangu yanapoenda kwa ubaya	1	2	3	4	5	6	7
8.Ninaweza kuzungumza juu ya shida zangu na familia yangu.	1	2	3	4	5	6	7
9.Nina marafiki ambao ninaweza kushiriki nao furaha na huzunu.	1	2	3	4	5	6	7
10.Kuna mtu maalumu katika Maisha yangu ambae anajali hisia nilizonazo	1	2	3	4	5	6	7
11.Familia yangu ipo tayari kunisaidia kufanya maamuzi	1	2	3	4	5	6	7
12.ninaweza kuzungumza juu ya shida zangu na marafiki zangu	1	2	3	4	5	6	7

TAARIFA KUHUSU MAFUNZO YA UZAMILI	
1.. Mwaka wa masomo	a. kwanza b. pili c. Tatu
2.Kitivo (udaktari,uuguzi,udaktari wa meno phamacia,afya ya jamii,na tiba asili Afya)	…….

Appendix III: English version of consent form

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCE (MUHAS)

DIRECTORATE OF RESEARCH AND PUBLICATION

I am Salma Karim, an investigator from the Muhimbili University of Health and Allied Sciences. I am researching the factors influencing depression among postgraduate students. The study seeks to determine the extent problem and the factors associated. The findings of this research study will aid in giving insight into depression among postgraduate students to establish appropriate interventions.

Participation entails Provided that you accept to be involved in the study, you are requested to fill in the questionnaire and provide information about, individual, postgraduate related information, social, and economic information and scale for depression and social support measurement.

Confidentiality Every information you provide will abide by confidentiality and will only be put to use for research only.

Risks No risk or harm is anticipated to occur due to your involvement in the investigation. You have the right to choose to either engage or not to engage in this study. And once you decide to be involved you are unrestricted from withdrawing your participation at any point.

Benefits of participating If you agree to be involved in the study, your involvement will aid detection of the factors that associates with depression among postgraduate students.

Whom do you contact? For any inquiries concerning the study call the principal investigator Salma Karim through the number 0758878327. If you have any questions about the right to participate contact Muhimbili University Box 65000, Dar-es-Salaam.

If you agree to be involved in this study, please provide your signature below. I……. I have read and comprehended the form's contents above. All my questions have been responded to. I am agreeing to participate.

Signature of the participant…….

Signature of the researcher……

Appendix IV: Swahili Version of Consent form

Naitwa Salma Karim, mtafiti kutoka chou cha Afya na Sayansi Shirikishi Muhimbili. Nina fanya utafiti Kuhusu sababu zinazohusishwa na sonona kwa wanafunzi wa shahada ya pili Dar-es-salaam. Utafiti huu utasaidia kujua ukubwa wa tatizo hili miongoni mwa wanafunzi wa shahada ya uzamili ili kuanzisha atua zinazofaa.

Ushiriki unahusu nini. Ukikubali kushiriki katika utafiti huu, utaombwa kujaza dodoso na kutoa taarifa kuhusu, habari za mtu binafsi, za uzamili, habari za jamii na kiuchumi na kipimo kwa ajili ya kipimo cha sonona au unyogofu na usaidizi wa kijamii.

Usiri Kila taarifa utakayotoa itasalia kuwa siri na itatumiaka kwa madhumuni ya utafiti pekee.

Hatari Hakuna hatari au madhara yanayotarajiwa kutokea kutokana na kushiriki katika utafiti.Una haki ya kuamua kushiriki au kutoshiriki kaabisa kwenye huu utafiti..

Faida za Kushiriki kushiriki kwako katika huu utafiti utasaidia katika kupata sababu zinazohusiana yanayohusiana na sonona au unyogofu miongoni mwa wanafunzi wa uzamili.

Wa kuwasiliana naye?

Uwapo na swali lolote lihusulo utafiti piga simu kwa mpelelezi mkuu Salma Karim kupitia nambari 0758878327 . Ikiwa una maswali yoyote kuhusu haki ya kushiriki wasiliana na chou kikuu cha Muhimbili box 65000, Dar-es-salaam. ikiwa unakubaliana kushiriki katika utafiti huu,tafadhari saini fomu hii hapa

Jina langu……Nimeshasoma na nimeelewa yote yaliyomo ndani yah ii fomu . Maswali niliyokua nayo yote yamejibiwa. Hivyo nakubali kushiriki .

Saini ya Mshiriki……..

Saini ya Mtafiti……..

Appendix V: 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 INNOVATIONS

Ref. No.DA.282/298/01.C/2232 Date: 08/05/2024

MUHAS-REC-05-2024-2232
SALMA KARIM MOHAMED
SHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: FACTORS ASSOCIATED WITH DEPRESSION AMONG POSTGRADUATE STUDENTS IN DAR-ES-SALAAM. A CASE STUDY OF MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES.

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: 08/05/2024
EXPIRATION DATE OF APPROVAL: 08/05/2025

STUDY DESCRIPTION:
Purpose:
The purpose of this cross-sectional observation study is to determine factors associated with depression among postgraduate students 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-%2015611.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. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. 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)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. 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,
Chairperson, MUHAS Research and Ethics Committee

Appendix VI: Introduction Letter

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.644/2023 15th May, 2024

The DVC-A,
Muhimbili University of Health and Allied Sciences,
P.O. Box 65001,
DAR ES SALAAM

Re: INTRODUCTION LETTER OF SALMA KARIM MOHAMED

We would like to inform you that the bearer of this letter is Salma Karim Mohamed with Reg. No. **HD/MUH/T.644/2023** is a student at Muhimbili University of Health and Allied Sciences (MUHAS) "pursuing MPH-Regular Track.

As part of her studies, she will be doing an elective research titled: "**Factors Associated with Depression Among Postgraduate Students in Dar es Salaam. A Case Study of Muhimbili University of Health and Allied Sciences."**

The research has been approved by the Chairman of University Senate.

Kindly provide her the necessary assistance to facilitate the conduct of her research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c.c Salma Karim Mohamed

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