FACTORS ASSOCIATED WITH DEPRESSION AMONG TUBERCULOSIS PATIENTS ATTENDING TUBERCULOSIS CLINIC AT WEBUYE COUNTY HOSPITAL

JOSEPH YAA KARISA

A THESIS SUBMITTED TO THE SCHOOL OF MEDICINE IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE OF MASTER OF MEDICINE IN FAMILY MEDICINE OF MOI UNIVERSITY

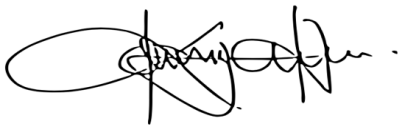
DECLARATION

Declaration by the Candidate:

This thesis is my original work and has not been presented for a degree in any other university /Institution. No part of this thesis may be reproduced without the prior permission of the author and /or Moi University.

JOSEPH YAA KARISA

SM/PGFM/02/17

Sign:  Date _____

Declaration by Supervisors

This thesis has been submitted to Moi University with our approval as University Supervisors

DR JAMES AKIRUGA AMISI

Department of Family Medicine, School of Medicine, Moi University

Sign: _____ Date _____

DR DARIA SZKWARKO, DO, MPH

Department of Family Medicine, School of Medicine, Moi University

Sign:  Date _____

DEDICATION

I dedicate my thesis to my dear wife Emily Karembo, my daughter Juliet Kadzo, my son Jared Kithi and my late Dad Prof. Stephen Karisa Beja.

ABSTRACT

Background: Tuberculosis (TB) remains a major global health problem and an infectious killer disease globally. Depression has been one of the psychiatric co-morbidities causing major sufferings to tuberculosis patients. Several studies show high and varying prevalence rates of depression among TB patients. Literature evidence indicates that early recognition of depression seems to improve overall health outcomes among TB patients. However, there are limited studies that examined the prevalence and factors associated with depressive symptoms among tuberculosis patients in Kenya. Therefore, there is a need to conduct more studies on depression among tuberculosis patients to provide more evidence in different contexts. Most of the studies done in the Kenyan context have concentrated in Nairobi and Kisumu counties. A literature search yielded scarce data for such studies in Bungoma county, western Kenya.
Objective: To establish the prevalence and factors associated with depressive symptoms among tuberculosis patients attending the TB clinic at Webuye County Hospital.
Methods: This was a cross-sectional study with a sample size of 180 participants conducted at the TB clinic at Webuye County Hospital. The study targeted adult TB patients who had been registered at the TB clinic. Patients who met the criteria were consecutively sampled. A pretested structured questionnaire designed to capture socio-demographic characteristics was administered followed by the administration of a Patient Health Questionnaire-9 (PHQ-9) questionnaire to assess for depressive symptoms among the participants. Data was coded into Statistical Package for Social Sciences (SPSS) and all statistical analysis was done using SPSS version 23. Descriptive statistics such as measures of central tendencies were used for continuous data while frequencies were used for categorical data. The study used the chi-square test to test for association at a 95% confidence interval and used logistic regression to adjust for confounders and covariates.
Results: The median age was 37 years (IQR 28,50), 66.7% were married. The prevalence of depressive symptoms among tuberculosis patients was 37.80%**.** The prevalence of depressive symptoms was high among HIV-positive patients (67.5%) followed by those in the intensive phase of TB treatment (62.7%) (p =0.000). On multiple logistic regression, for participants who were on the intensive phase of tuberculosis treatment, their odds of having depressive symptoms were 4.588 times compared to those on the maintenance phase. (p=0.000; 95% CI: 2.199-9.572). The odds of having depressive symptoms among HIV-positive patients were 3.708 times compared to those who were HIV negative (p=0.001; 95% CI: 1.736-7.923).
Conclusions: This study indicates that more than one-third of tuberculosis patients attending TB clinic at Webuye County Hospital have depressive symptoms. HIV/TB co-infection and TB treatment phase are significant factors associated with depressive symptoms among TB patients at Webuye County Hospital.
Recommendations: All TB patients should be screened for depression and monitored more carefully for depression during treatment. Moreover, patients with depressive symptoms should be referred to mental health professionals when possible.

TABLE OF CONTENTS

DECLARATION ii

DEDICATION iii

ABSTRACT iv

TABLE OF CONTENTS v

LIST OF TABLES viii

ACKNOWLEDGEMENT ix

ABBREVIATIONS x

OPERATIONAL DEFINITIONS OF VARIABLES xii

CHAPTER ONE 1

1.0 INTRODUCTION 1

1.1 Background Information 1

1.2 Problem Statement 7

1.3 Justification 9

1.4 Research Questions 10

1.5 Broad Objective 10

1.5.1 Specific Objectives 10

CHAPTER TWO 12

2.0 LITERATURE REVIEW 12

2.1 Introduction 12

2.2 Depression (major depressive disorder) 12

2.2.1 Depression Screening Tools 13

2.3 Tuberculosis 17

2.4 Factors associated with Major Depressive disorder 18

2.4.1 Gender and Depression 18

2.4.2 Socio-economic status and depression 20

2.4.3 Marital status and depression 22

2.4.4 Comorbid conditions and depression 23

2.4.5 Age and depression 24

2.5 Global Situation 25

2.6 Sub-Saharan Africa 28

2.7 Kenya 35

CHAPTER THREE 36

3.0 METHODOLOGY 36

3.1 Study Site 36

3.2 Study Design 36

3.3 Study Population 36

3.4 Inclusion Criteria 36

3.5 Exclusion Criteria 37

3.6 Sample size 37

3.7 Sampling Procedure 38

3.8 Data Collection Procedure and Tools 38

3.9 Patient Health Questionnaire (PHQ-9) 41

3.10 Validity and Reliability 41

3.11 Data Analysis 42

3.12 Study Limitations 42

3.13 Ethical Considerations 42

CHAPTER FOUR 44

4.0 RESULTS 44
4.1 Overview 44
CHAPTER FIVE 50
5.0 DISCUSSION 50
5.1 Introduction 50
5.2 Prevalence of Depression 50
5.2 Factors associated with Depressive symptoms 55
CHAPTER SIX 64
6.0 CONCLUSIONS AND RECOMMENDATIONS 64
6.1 Conclusions 64
6.2 Recommendations 64
REFERENCES 65
APPENDICES 75
Appendix 1: Informed Consent Form 75
Appendix 2: Study Questionnaire 78
Appendix 3: Patient Health Questionnaire (PHQ-9) 79
Appendix 4: IREC Approval 80
Appendix 5: Budget 81

LIST OF TABLES

Table 1: Variables under Study.....40

Table 2: Socio-demographic Characteristics.....44

Table 3: Medical characteristics of study participants. 46

Table 4: Factors Associated with Depressive symptoms Among TB Patients. 48

Table 5: Multivariate logistic regression for factors associated with Depressive symptoms 49

ACKNOWLEDGEMENT

I acknowledge Moi University, School of Medicine, and the Dean School of Medicine for the support they accorded me during this program.

I would also like to thank the Department of Family Medicine (faculty and residents) for their guidance without which this work would not be possible.

I would like to express my gratitude to my supervisor's Dr. James Akiruga Amisi and Dr. Daria Szkwarko, both from the Department of Family Medicine, School of Medicine Moi University. Their support was invaluable.

My gratitude also goes to the management and staff of Webuye County Hospital, the TB clinic, my Research Assistant, and all the participants who accepted to be part of this study.

I acknowledge my dear wife Emily Karembo, my daughter Juliet Kadzo and my son Jared Kithi. Without their moral support, this work would not be possible.

I also wish to acknowledge Institutional Research and Ethics Committee (IREC).

Above all, I thank GOD for his mercies and grace that has enabled me to come this far in my academic journey.

ABBREVIATIONS

ADRs - Adverse Drug Reactions

BDI - Beck Depression Inventory

BMI – Body Mass Index

CDI - Children's Depression Inventory

CDRS - Children's Depression Rating Scale

CES-D - Center for Epidemiologic Studies Depression Scale

CRC - Clinical Research Center

COPD - Chronic Obstructive Pulmonary Disease

DOTS- Directly Observed Treatment, Short-course

GDS - Geriatric Depression Scale

HADS - Hospital Anxiety & Depression scale

HARS - Hamilton Anxiety Rating Scale

HAM-D - Hamilton Rating Scale for Depression

HDRS - Hamilton Depression Rating Scale

HRSD - Hamilton Rating Scale for Depression

HIV – Human Immunodeficiency Virus

IREC- Institutional Research and Ethics Committee

IQR – Interquartile Range

JHC - Jimma Health Center

JOOTRH - Jaramogi Oginga Odinga Teaching and Referral Hospital

JUSH - Jimma University Specialized Hospital

MADRS - Montgomery-Asberg Depression Rating Scale

MDR-TB - Multidrug-Resistant Tuberculosis

MINI - Mini International Neuropsychiatric Interview

MTB - Mycobacterium tuberculosis

PTB- Pulmonary Tuberculosis

PHQ-9 - Patient Health Questionnaire-9

QIDS-SR - Quick Inventory of Depressive Symptomatology-Self-Report

SD – Standard Deviation

SPSS – Statistical Package for Social Sciences

TB- Tuberculosis

WCH- Webuye County Hospital

WHO-World Health Organization

OPERATIONAL DEFINITIONS OF VARIABLES

1) Concept: Tuberculosis (TB) Patient.

   Theoretical Definition: a person with an infectious disease usually caused by the bacterium *Mycobacterium tuberculosis* (MTB). Tuberculosis generally affects the lungs, but can also affect other parts of the body.

   Operational Definition: Tuberculosis Patient; Any active TB patients in both intensive and continuous phases of treatment who are confirmed to have TB by all the diagnosing criteria and are registered in the TB register at the TB clinic.

2) Prevalence –refers to the total number of individuals in a population who have a disease or health condition at a specific period of time, usually expressed as a proportion of the study population.

3) Depression (major depressive disorder)- Is a serious and common mental condition that adversely affects how someone thinks, feels, and acts. It is characterized by a persistent feeling of loss of interest and/or sadness in things or activities that you used to enjoy normally. It can also lead to several physical issues and can reduce the ability of someone to function normally at home and at work.

   - For purposes of this research, PHQ-9 cut-off scores of 4 was used to dichotomize the scores into a depressive state (PHQ-9 $\geqslant$ 5) and a non-depressive state (PHQ-9 $\leqslant$ 4).

4) Concept: Factors associated with Depression.

   Theoretical Definition: a factor is a constituent or element that brings about certain effects or results or a variable under examination in a study.

Operational Definition: the factors whose presence either increases or decreases the likelihood of having depressive symptoms. In this study, the factors to be studied will be the patient's gender, marital status, age, education level, smoking, BMI, alcohol intake, treatment phase, socioeconomic status, comorbid illnesses like diabetes, and HIV.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Tuberculosis remains a major global health problem and an infectious killer disease globally. According to the World Health Organization (WHO) global tuberculosis report of 2020, there were an estimated 10 million new cases of Tuberculosis in 2019, a number reported to be slowly on the decline for the recent past years (WHO Report, 2020). The African region is reported to be making good progress, with a 16% reduction in TB incidence rate, Kenya is among the 14 countries having the highest burden of TB, TB/HIV disease, and Multi-Drug-Resistant TB (WHO, 2015). However, Kenya is said to be on track in reaching the 2020 milestones of the End TB strategy (WHO Report, 2020).

According to the Kenya Mental Health Policy (2015-2030), mental illness cases continue to increase at an alarming rate in Kenya and the frequently diagnosed mental illness in the general hospital settings are depression, stress, substance abuse, and anxiety disorders. Depression is a serious and common mental condition that adversely affects how someone thinks, feels, and acts. It is characterized by a persistent feeling of loss of interest and/or sadness in things or activities that you used to enjoy normally. It can also lead to several physical issues and can reduce the ability of someone to function normally at home and at work. Globally, it is estimated that more than 300 million individuals suffer from depression and this corresponds to 4.4 percent of the world's population (WHO, 2017). Depression has increasingly become one of the prevalent components of the overall disease burden globally (Shirey et al., 2015).

A review by Sweetland et al (2017), stated that TB and depression have overlapping symptoms and should be approached as conditions that act synergistically. Sweetland and colleagues pointed out that factors such as inflammation, immunosuppression, poverty, undernutrition, stigma, discrimination, and side effects of anti-tuberculosis medications can impact both TB and/or depression.

If depressive symptoms in patients with TB are left unchecked, Koyanagi et al (2017) claim that this comorbid depression profoundly impacts TB treatment adherence and drug resistance, and is also correlated with increased community transmission, and increased mortality. In fact, according to Amha et al., (2021), they pointed out that, depression and TB co-existence can escalate the risk of adverse health outcomes leading to poor health-related quality of life if unrecognized. In addition, Amha and colleagues stated that the burden of TB is very high in the Sub-Saharan Africa region, and there is limited regional evidence of co-occurrence of TB and depression amongst TB patients in Sub-Saharan African countries.

Hence, it was within this context that this study sought to determine the prevalence and factors associated with depressive symptoms among TB patients at Webuye County Hospital located in the western part of Kenya. There was a need to establish the prevalence and associated factors of depressive symptoms among TB patients at Webuye County Hospital. Knowing the burden of depression and understanding the correlated factors, could help planning health care services and improve overall patient care. It would also add more knowledge to the growing literature on TB and depression. According to patient records and based on initial interviews with TB clinic staff at Webuye county hospital, indeed, there were some patient referrals to

the mental health clinic for depressive symptoms as well as other major mental health illnesses.

Several global and local studies show a high prevalence rates of depressive symptoms amongst TB patients ranging between 8% to 81% (Basu et al., 2012; Kumar et al., 2016; Masumoto et al., 2014; Sulehri et al., 2010, Kehbila et al., 2016; Ambaw et al., 2017; Ige & Lasebikan., 2011).

For instance, a Kenyan study by Lee (2015) conducted a cross-sectional study aimed at determining the prevalence rate of depression among patients with TB who were HIV co-infected and HIV non-coinfected in Kisumu County with a sample size of 51 respondents. Lee found 31 percent of the respondents were suffering from depression of variable severity. In addition, Ntarangwi (2008) also published a study on the prevalence rate of depression amongst TB patients attending TB clinic at Mbagathi District hospital Nairobi, Kenya, and found a prevalence rate of 61%. The study had a sample size of 175 participants. Indeed, these are proofs that some TB patients suffer varying severity of depression in Kenya.

In a community-based cross-sectional analysis of 48 low and middle-income countries' data conducted by Koyanagi et al (2017), Kenya was among them. The study concluded that there is a high prevalence of depression among adults' patients with tuberculosis. This state seems to contribute to poor health status per the study conclusion. The study emphasized the need for early identification and optimized depression management in individuals with TB, a measure suggested to result in a better outcome. In addition, several sub-Saharan Africa studies have pointed out that indeed some TB patients experience depressive symptoms. For instance, Westaway & Wolmarans, (1992) conducted a cross-sectional study in South Africa

and found that 65% of the patients were suffering from depressive symptoms. This study had a sample size of 100 respondents. Another study in South Africa was published in 2010 by Naidoo & Mwaba. They conducted a cross-sectional study about social support, depression, and helplessness amongst individuals treated for TB in South Africa. They observed that 64.3% of the patients had depression and the sample size for this study was one hundred and sixty-six.

In addition, Tomita et al., (2019) conducted a cohort study on household food insecurity and the major depressive episode among persons with multidrug-resistant tuberculosis (MDR-TB) in a special hospital for TB patients at KwaZulu-Natal Province in South Africa. They found a prevalence rate of depression among multidrug-resistant tuberculosis (MDR-TB) patients to be 11.35%. Moreover, Aniebue, P., & Okonkwo, (2006) reported a prevalence rate of depression to be 41.9% amongst pulmonary TB individuals at the University of Nigeria teaching hospital, Enugu. In 2009, Issa and his colleagues published a cross-sectional study that assessed comorbid depression for persons with TB in a university teaching hospital outpatient clinic in Nigeria. They found a prevalence rate of 27.7% amongst tuberculosis patients. In Tanzania, Buberwa, (2013) conducted a similar cross-sectional study that assessed the burden of comorbid depression and correlated determinants among TB patients visiting TB clinics in Temeke municipality, Dar es Salaam. Buberwa found a prevalence rate of 46.9%.

In Angola, Xavier and Peixoto published their cross-sectional study in 2015 and found the prevalence rate of depressive symptoms among TB patients to be 49.4%. Similarly, another cross-sectional study done in Uganda by Alinaitwe in 2018, found that the rate of prevalence

of depressive illness among tuberculosis patients in Mulago hospital was 23.7%. In addition, Ambaw et al., (2017) found the rate of prevalence of probable depressive state to be 54.0% after conducting a cross-sectional survey involving 657 newly diagnosed individuals with TB.

These sub-Saharan Africa studies indeed cement the evidence that some TB patients suffer depressive symptoms.

Furthermore, several factors are reported by different studies to affect depression among tuberculosis patients. These factors include; gender, socioeconomic status, side effects of the drugs, age, marital status, education level, malnutrition, duration of treatment of the disease, altered social relationship of the society, TB stigmatization, and comorbid illnesses (Basu et al., 2012; Kumar et al., 2016; Masumoto et al., 2014; Sulehri et al., 2010, Kehbila et al., 2016; Ambaw et al., 2017; Ige & Lasebikan., 2011). For example, Kehbila et al (2016) studied the prevalence and association of depressive symptoms for pulmonary tuberculosis individuals in the Southwest Region of Cameroon. They reported that females were three times more likely to be depressed than males. Similar findings by Kehbila and colleagues were reported in another study in South Ethiopia by Duko et al (2015). Duko and others studied the prevalence and correlation of anxiety and depression amongst tuberculosis individuals at WolaitaSodo University Hospital. They found that females were 72% more likely to be depressed compared to males. These findings prove that gender is one of the associated factors for depressive symptoms in patients with tuberculosis.

Moreover, Alinaitwe (2018) who studied the prevalence and associated factors of depressive illness in tuberculosis individuals, found that those participants who were separated, divorced, or widowed had two times higher odds of having depressive symptoms than those who were

married. Similarly, another study by Ige et al (2011) studied the prevalence of depression in patients with tuberculosis compared with family members as controls in a DOTS clinic in Nigeria. They found that unmarried participants had a high likelihood of depressive symptoms in comparison to married participants. Indeed, these findings prove that marital status is another factor correlated with depressive symptoms amongst patients with TB.

Another factor reported to affect depression amongst TB patients is low socioeconomic status. For example, a study by Dasa et al., (2019) who studied the prevalence rate and correlate factors for depression in patients with tuberculosis in Eastern Ethiopia, found that patients with low monthly income levels had high chances of having depression. This finding was replicated in Uganda by Alinaitwe, (2018) who reported that low socioeconomic status increases a person's risk of developing depressive symptoms.

All these previous studies about the burden of depression among patients with TB have shown high but varying prevalence rates and varying factors associated with depression. These prevalence rates and factors vary from region to region. The regional variations in associated factors for depression and prevalence necessitate the need for local or regional studies. Furthermore, the literature search yielded scarce information on the prevalence rate and correlated determinants of depression among TB patients in Bungoma County in the western part of Kenya.

There are multiple validated tools for assessing and screening for depression. The Patient Health Questionnaire-9 (PHQ-9) is a validated tool to assess depressive state and the severity of depression (Basu et al., 2012) (see appendix 5 for PHQ-9). This tool has a sensitivity of 87% and specificity of 67%, and its use in many studies is evident (Adewuya et al., 2006;

Titov et al., 2011; Richardson et al., 2010; Monahan et al., 2009; Dum et al., 2008; Gelaye et al., 2014).

In a study published in 2009, Monahan and colleagues demonstrated that PHQ-2 and PHQ-9 were valid and reliable tools to assess DSM IV depressive disorders and the severity of depression in adults' individuals who live with HIV/AIDS in western Kenya.

Given the above discussion, it is evident that there are indeed TB patients who experience depressive symptoms. And it is suggested that depressive symptoms in patients with TB can escalate the risk of adverse health outcomes and, it seems to affect one's quality of life and can also increase community transmission and mortality. Again, it was for this reason that the study sought to establish the prevalence and factors associated with depressive symptoms among TB patients at Webuye County Hospital located in the western region of Kenya.

1.2 Problem Statement

Studies have reported that depressive symptoms in patients with TB are common and seem to harm one's health. Depressive symptoms can increase the chances of adverse health outcomes if unidentified and untreated (Amha et al., 2021). Comorbid depression can impact TB treatment adherence and drug resistance, and is associated with increased community transmission, and increased mortality. The high prevalence of depressive symptoms among TB patients is said to be increasing (Koyanagi et al., 2017). In addition, comorbid depression seems to rise the chance of reactivating TB infection, accelerate the progression of the disease, and/or block the normal anti-tuberculosis treatment response coupled with immunosuppression, under-nutrition, negative coping behaviors, and substance abuse (Sweetland et al., 2017). According to Ambaw et al., (2017), depression continues to be the

most frequent comorbid mental illness and a significant cause of morbidity among tuberculosis patients.

Furthermore, tuberculosis is a treatable and curable condition and its drugs are available and accessible to most TB patients globally. The duration of TB treatment can be six months or more. Even though TB is a treatable and curable condition and its drugs readily available and accessible, it remains an infectious killer disease contributing to an enormous burden on global health. In addition, there are reported variations globally on the prevalence rates and associated factors of depressive symptoms among TB patients, so these prevalence rates cannot be generalized. According to Amha et al., (2021), they pointed out that, depression and TB co-existence can escalate the risk of adverse health outcomes leading to poor health-related quality of life if unrecognized. In addition, Amha and colleagues stated that the burden of TB is very high in the Sub-Saharan Africa region, and there is limited regional evidence of co-occurrence of TB and depression among TB patients in Sub-Saharan African countries.

The literature search showed only two published studies in Kenya which were done in Nairobi and Kisumu County, none in Bungoma County western Kenya. These two Kenyan studies reported varying results about the prevalence and associated factors of depression among TB patients. The prevalence rates were found to range from 31% to 61% (Lee, 2015, Ntarangwi, 2008). Therefore, little is known about the prevalence and current factors associated with depressive symptoms among TB patients in other regions of the country.

Hence, more is needed to know the prevalence and factors associated with depressive symptoms among TB patients in western Kenya. From the reported finding of the two Kenyan studies, they seem to suggest that depression may be one of the unrecognized conditions

contributing to the global TB burden. In addition, the variations in prevalence and factors seem to depend on both regional and the tool used in screening for depression among other variables like sample size, and study settings. Therefore, the variation in prevalence based on regions and tools used demonstrate the need for local data (Webuye region) as this information could help in better health care planning leading to early recognition of depression and optimized management among TB patients, and overall improvement in patient care.

Moreover, medical facilities in Kenya seem to underdiagnose psychiatric illnesses among patients which necessitates the need for health care worker awareness and proper use of screening tools that are easy and quick to use in a busy clinical setting (Shirey et al., 2015).

Therefore, this study sought to establish the prevalence and factors associated with depressive symptoms among TB patients at Webuye County Hospital located in the western region of Kenya.

1.3 Justification

The study sought to determine the prevalence and associated factors of depressive symptoms among TB patients at Webuye County Hospital (WCH). The identification of these factors influencing depressive symptoms amongst tuberculosis patients visiting the TB clinic at Webuye County Hospital would be vital in improving clinical care and influence practice among the health care personnel. The study would provide crucial information in the assessment of depression and TB comorbidity among adult TB patients under care in Webuye County Hospital. These findings could help clinicians in developing effective care plans for patients with TB in western Kenya. In addition, there was a need for more regional studies in Kenya to form a local database about the prevalence of depression among tuberculosis

patients. The study findings would provide essential data to help clinicians and other stakeholders in formulating guidelines for depression among tuberculosis patients. These findings would provide a good understanding of the prevalence and factors influencing depression among tuberculosis patients. In addition, the adoption of the study recommendation could lead to improved service delivery at the hospital as well as improve health and mental health outcomes among tuberculosis patients. The findings could encourage early recognition of depressive symptoms and optimized management among TB patients and overall patient care improvement.

Moreover, there was a lack of published data on factors associated with depressive symptoms among tuberculosis patients at Webuye County Hospital located in the western region of Kenya.

1.4 Research Questions

1. What is the prevalence of depressive symptoms among tuberculosis patients attending the TB clinic at Webuye County Hospital?
2. What are the factors associated with depressive symptoms among adult tuberculosis patients attending the TB clinic at Webuye county hospital?

1.5 Broad Objective

To determine the prevalence and factors associated with depressive symptoms among adult tuberculosis patients attending TB clinic at Webuye County Hospital.

1.5.1 Specific Objectives

1. To determine the prevalence and severity of depressive symptoms among adult tuberculosis patients attending TB clinic at Webuye County Hospital.

2. To establish factors associated with depressive symptoms among adult TB patients attending TB clinic at Webuye County Hospital Kenya.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

The following review of the literature confirms the varying results on the prevalence rate of depressive symptoms among TB patients, it discusses the factors associated with depressive symptoms among TB patients, tools used for screening depression, and concludes that TB and depression seem to be major contributors to morbidity and mortality globally.

2.2 Depression (major depressive disorder)

According to the American psychiatric association, depression (major depressive disorder), is a common and serious medical illness that negatively affects how you feel, the way you think, and how you act. They state that depression causes feelings of sadness and/or a loss of interest in activities once enjoyed and it can lead to a variety of emotional and physical problems and can decrease a person's ability to function at work and home. According to DSM-V, at least 5 of the depressive symptoms have to have been present during the same two-week period (and at least one of the symptoms must be diminished interest/pleasure or depressed mood) to make a diagnosis of major depressive disorder (American Psychiatric Association. 2013).

Depressive symptoms have been recognized to be associated with many chronic illnesses. For instance, in a study published in 2015 on symptoms of depression among patients attending a diabetes care clinic in rural western Kenya, Shirey, and colleagues found that depression is common among people with diabetes in rural western Kenya, which may profoundly impact diabetes control and treatment adherence. The authors also stated that there is wide acceptance

of depression as a co-morbidity condition in patients with chronic illnesses like TB, diabetes, and hypertension (Shirey et al., 2015). These findings were replicated in a study by Moussavi et al., (2007) whose study was on depression, chronic diseases, and decrements in health. They found that a significant percentage of their respondents had depressive symptoms in addition to their existing chronic physical conditions, they argued that those respondents formed a group that was often not recognized and untreated. Moussavi and colleagues also stated that comorbidity with depression significantly deteriorates the health state of people with chronic diseases, and the need for timely diagnosis and treatment of depressive disorders to reduce the burden on public health was crucial.

2.2.1 Depression Screening Tools

There are several tools used to screen for depression in the general population. These initial assessments or measurements of depressive symptoms in individuals can be helpful in determining the possible options of treatment. In addition, regular assessment during care or treatment can gauge the condition's progress as well as guiding treatment. Major depressive disorder instruments consist of both self-report measures and interviews. These instruments may be used for screening, diagnosing, and/or tracking treatment outcomes in individuals. The validity and reliability of each tool have been determined. However, health care professionals are encouraged to conduct an extensive literature review for the evidence and appropriateness of each tool to establish which tool is best suited for their practice or patients.

The Beck Depression Inventory (BDI) is commonly used for screening depression and also in measuring manifestations of behavior and depression severity. The BDI can be applied to people between the age of 13 years to 80 years. The inventory is comprised of 21 self-report

items in which a person is required to respond in a multiple-choice format. This screening tool takes about 10 minutes to answer all the responses (Beck et al., 1960). The Validity, as well as the reliability of this screening tool, has been tested throughout populations in the world (Osman et al., 2004). Several studies among TB patients have used this tool to measure depression. For example, a study in Kenya by Lee (2015) studied the prevalence of depression among TB non-coinfected and TB/HIV co-infected patients at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) and the Clinical Research Center (CRC) in Kisumu County. Lee used the Beck Depression Inventory (BDI) to measure depressive symptoms. In this study Lee found the prevalence rate of depression to be 31% (Lee, 2015).

For children, there is a modification of the adult's Beck Depression Inventory called The Children's Depression Inventory (CDI). This tool is used to measure the severity of depression in children as well as adolescents between the ages of 7 years to 17 years. It takes approximately five to fifteen minutes to administer. There are two scales that assess functional problems and emotional problems. This tool consists of three separate rating forms one for the teachers having 12 items, another one for the parents which has 17 items, and lastly a self-report having 28 items (Sun & Wang, 2015).

The Center for Epidemiologic Studies Depression Scale (CES-D) was devised to be used in the general population and currently it is applied in primary care settings as a screening tool for depression (Roadolff, 1977). This screening tool consists of a 4-point scale of 20 self-report items, which assess major depression dimensions that are faced in the previous week. The Center for Epidemiologic Studies Depression Scale (CES-D) is also used in young children from 6 years up to adulthood. This tool has been validated and its reliability measured

across cultural populations and gender differences. The administration of this screening scale takes roughly 20 minutes together with scoring (Saracino et al., 2018).

The Hamilton Rating Scale for Depression, also abbreviated as HAM-D, HRSD, or HDRS, is used in measuring depression in persons before the start of treatment, during the treatment, and also after the treatment. This scale consists of 21 items and its administration is done by a health care professional; however, the scoring of the first 17 items form the basis of the overall score and uses either a 3-point scale or a 5-point scale. The administration of this scale takes roughly 15 to 20 minutes to complete and to score (Max Hamilton, 1960). The results of a comprehensive meta-analytic review of the reliability of the Hamilton Rating Scale for Depression (HRSD) suggested that HRSD provides a reliable assessment of depression. The results also indicated good overall levels of inter-rater, internal consistency, and test-retest reliability (Trajković et al., 2011). Another depression screening tool is the Montgomery-Asberg Depression Rating Scale (MADRS), which is a 10-item scale that measures depression severity in persons of 18 years and above. A 7-point rating scale is used on each of the 10 items. The scale has a greater sensitivity of changing with time because it is an adaptation of the Hamilton Depression Rating Scale. Montgomery-Asberg Depression Rating Scale can be administered in about 20 to 30 minutes (Montgomery & Asberg, 1979).

The Geriatric Depression Scale (GDS) was specifically developed to be used in screening and measuring depression in older adults. This depression scale has 30 forced-choice “no” or “yes” questions, a helpful format for persons having cognitive dysfunction. The questions are about how a person is feeling within a specified time period. The questionnaire takes about five to seven minutes to fill (Yesavage et al., 1982).

The Quick Inventory of Depressive Symptomatology-Self-Report (QIDS-SR) is used to measure depressive symptoms severity in individuals who are 18 years and older. It contains 16 measures that are derived from the Inventory of Depressive Symptomology (IDS, 2000). These selected symptoms relate to the DSM-IV diagnostic criteria. A 4-point Likert-type scale is used to assess respondents' moods and behaviors over the last week. It takes approximately 5 to 7 minutes to complete the report (Rush et al., 2003).

The Children's Depression Rating Scale (CDRS) was specifically designed to measure depressive symptoms changes in children between the ages of six years to twelve years, however, its validity, as well as its reliability, have been determined in the adolescent populace (up to 18 years old). It is a semi-structured interview scale adapted from the Hamilton Depression Rating Scale and it covers 17 symptoms. This scale takes about ten to fifteen minutes to administer and score (Mayes et al., 2010).

Lastly, the Patient Health Questionnaire-9 (PHQ-9) consists of nine questions designed to correspond to the nine diagnostic criteria for major depressive disorder covered in the Diagnostic and Statistical Manual of Mental Disorders (DSM–IV). The 9 items are rated from 0 to 3 according to the increased frequency of experiencing difficulties in each area covered. Scores are summed and can range from 0 to 27. The score can then be interpreted as indicating either no depression, mild, moderate, moderately severe, or severe depression (Cameron, Crawford, Lawton, & Reid, 2008). In a study published in 2009, Monahan and others demonstrated that PHQ-9 and PHQ-2 were valid and reliable tools for assessing DSM IV depressive disorders and depression severity among adults living with HIV/AIDS in western Kenya.

Therefore, the need for timely recognition and treatment of depressive symptoms among TB patients is imperative in improving patients care. For instance, Shirey et al., (2015) called for increased awareness among health care workers, as well as the use of screening tools that are quick and easy to use in busy clinical settings.

2.3 Tuberculosis

Tuberculosis is an infectious disease usually caused by the bacterium *Mycobacterium tuberculosis* (MTB) and it generally affects the lungs, but can also affect other parts of the body (WHO, 2017). Tuberculosis being one of the chronic diseases, prompted many researchers in finding out the prevalence rates of depressive symptoms among TB patients and the factors associated with these depressive symptoms. As a result, several studies could be found on the prevalence of depression in tuberculosis patients, and most of these studies were done in hospital settings of Asia, Africa, and even Europe.

Literature suggests that there has been a call to term TB and depression as "TB-depression syndemic" because of the synergistic action between the two conditions via biological, social, and behavioral mechanisms to increase the burden of disease. For example, a review by Sweetland et al (2017), stated that TB and depression have overlapping symptoms and should be approached as conditions that act synergistically. They pointed out that factors such as inflammation, immunosuppression, poverty, undernutrition, stigma, discrimination, and side effects of anti-tuberculosis medications can impact both TB and/or depression. They suggested that there exists a significant relationship between tuberculosis and depression. The review also suggested that TB infection leads to increased production of pro-inflammatory

cytokines and dysregulation of the hypothalamic-pituitary-adrenal axis which can trigger or precipitate depression in these individuals (Sweetland et al., 2017).

Depressive symptoms in patients with TB are common and have a bad impact on health, and are said to go unrecognized and untreated hence increasing the risk of unfavorable health outcomes. In a cross-sectional analysis of community-based data from 48 low- and middle-income countries published in 2017 on depression comorbid with tuberculosis and its impact on health status, Koyanagi and others found that comorbid depression profoundly impacts TB treatment adherence and drug resistance, and is associated with increased community transmission, and increased mortality (Koyanagi et al., 2017). In addition, according to Amha et al., (2021), pointed out that, although comorbid depression with TB is a common and unrecognized condition, TB is highly prevalent in the Sub-Saharan Africa region, and limited evidence is available on the regional prevalence of depression among patients with TB in Sub-Saharan African countries.

2.4 Factors associated with Major Depressive disorder

2.4.1 Gender and Depression

Literature suggests that depression leads to causing disease-related disability in the world today among women. According to Kessler, (2006) he stated that depression is much more common among women than men, with female to male risk ratios of approximately two to one. In addition, Kessler reports that depression has a higher risk of first onset and recurrence in women hence leading to higher rates of prevalence in women compared to men. He stated that hormonal changes during menopause, hormone replacement therapy, pregnancy, and oral contraceptive use do not influence major depression significantly. These observations imply

that the main explanation for the higher prevalence of depression among women compared to men is based on extensive joint investigations on the effects of environmental provoking experiences and biological vulnerabilities (Accortt, Freeman, & Allen, 2008).

In addition, (Wilhelm, 2009) stated that in the male population it is frequently indicated that men have low depression rates than women, however, this does not certainly denote improved overall mental health. Wilhelm further stated that the low depression rates in men compared to women reflect several issues such as psychosocial barriers in looking for help and the rates of depression among men vary with age groups, and certain men of particular subgroups may be vulnerable. Wilhelm also stated that men frequently exhibit different behaviors and symptoms in response to depression and they display anxiety problems less frequently and men are at a greater risk of abusing substances which can have a negative health outcome later in life. Wilhelm reported that women tend to have better emotional literacy and often tend to share how they feel, while men are less likely to share their feelings. However, men can share their feelings when provided with an environment that is safe to do so (Wilhelm, 2009).

The observation of both Kessler and Wilhelm were replicated in studies among TB patients by Kehbila et al (2016) who studied the prevalence and correlates of depressive symptoms in adult patients with pulmonary tuberculosis in the Southwest Region of Cameroon. Kehbila and colleagues reported that females were three times more likely to be depressed than males. Similar findings were found in another study in South Ethiopia by Duko et al (2015) who studied the prevalence and correlates of depression and anxiety among patients with tuberculosis at WolaitaSodo University Hospital. Duko and others found that females were 72 % more likely to be depressed compared to males.

In a systematic review and meta-analysis on the prevalence of depression among patients with tuberculosis published in 2020, Duko and colleagues analyzed 25 studies that contained 4903 respondents across seven countries and found a much higher pooled prevalence of depression among females 51.54% than males 45.25% (Duko, Bedaso, & Ayano, 2020).

However, the observation of both Kessler and Wilhelm was in contrast to some other studies done among TB patients. For instance, in Nigeria Issa et al., (2009) studied depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic and found that more males were depressed compared to females. Similar findings were found by Adem et al., (2014) who studied the prevalence and pattern of depression in patients with tuberculosis and found that more males were depressed compared to females.

2.4.2 Socio-economic status and depression

Psychiatric morbidity and poor access to health care have been associated with low socioeconomic status. Among the psychiatric disorders, depression demonstrates a more debatable relationship with low socioeconomic status. For instance, Lorant et al., (2003) conducted a meta-analysis aimed at evaluating the shape, magnitude, and modifiers of such a relationship. Lorant and colleagues found that low socioeconomic status individuals had higher chances of being depressed, however, the likelihoods of a new episode were much lower than the chances of persisting depression. They concluded that socioeconomic disparity in depression is diverse and differs according to how a psychiatric disorder is assessed or measured, the measurement and definition of low socioeconomic status, and the contextual characteristic of time and region.

In addition, Freeman et al., (2016) lamented that many studies that have investigated the relationship between socioeconomic status and depression are limited in their national scope, they used unstandardized measurements and definitions across populations and analyzed different components of socioeconomic status separately. Therefore, Freeman and others conducted a cross-sectional study aimed at evaluating the association between socioeconomic status and depression across three European countries. The presence of depression was measured using a Composite International Diagnostic Interview and socioeconomic status was computed by using the combined scores of the total number of years educated (0-22) and the quintiles of the country-specific income level of the household (1-5). They found a significant relationship between depression and low socioeconomic status across all countries and the odds of depression were significantly reduced for every unit increase in the socioeconomic status index. In addition, higher education significantly reduced the odds for depression in each country, however, income did not. They concluded that the socioeconomic status index appears to predict symptoms of depression across European countries and this can be an important factor in developing preventive strategies for depression across Europe.

Similar findings have been observed among studies done on TB patients. For example, a study by Dasa et al., (2019) who studied the prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia found that patients with low monthly income levels were four times more likely to have depression. This finding was replicated in Uganda by Alinaitwe, (2018) who studied the prevalence and factors associated with depressive illness in patients with tuberculosis. Alinaitwe reported that low socioeconomic status increases a person’s risk of developing depressive symptoms.

2.4.3 Marital status and depression

Literature suggests that marriage has some protective effects on the health of a person; that is, a married person is more likely to be healthier compared to a separated, divorced, widowed or never-married individuals (Manzoli, Villari, M Pirone, & Boccia, 2007). Married persons are said to experience much lower rates of depression (Afifi, Cox, & Enns, 2006). Jang et al., (2009) stated that several mechanisms mediate how marriage is beneficial, these mechanisms include financial security among couples, access to economic resources, social support, and marital partners' influence on health behaviors. Jang and others in their study found that at a younger age, married women showed lower rates of depressive symptoms compared to their unmarried counterparts. However, this gap reduced and completely disappeared because of the age-related increase in symptoms of depression among married women. They also found that the association between depressive symptoms and marital status remained fairly the same for men of all ages.

Similar observations among TB patients have been reported. For instance, Alinaitwe, (2018) who studied the prevalence and factors associated with depressive illness in patients with tuberculosis found that those participants who were separated, divorced, or widowed had two times higher odds of having depressive illness than those who were married. Similarly in another study by Ige et al (2011) who studied the prevalence of depression in tuberculosis patients in comparison with non-tuberculosis family contacts visiting the DOTS clinic in Nigeria. Ige and colleagues found that unmarried participants were more likely to have depressive symptoms compared to the married participants.

2.4.4 Comorbid conditions and depression

Anxiety and depression are common complications of chronic diseases, but they remain undertreated notwithstanding the significant deleterious consequences on the health of patients. For instance, DeJean et al., (2013) conducted a systematic review on patient experiences of depression and anxiety with chronic disease. The study aimed at reviewing empirical qualitative studies on patients' experiences with chronic disease and comorbid depression or anxiety. The chronic diseases included chronic obstructive pulmonary disease (COPD), heart disease, diabetes, and stroke. The study also highlighted the implications of management and screening of depression and/or anxiety on chronic disease outcomes. DeJean and colleagues stated that depression may aggravate a chronic disease, and also affect adherence to self-management. Therefore, early detection of depression through screening, and early treatment, may decrease patient distress hence improving symptoms of the chronic disease thus leading to a better quality of life. In this systematic review, DeJean and colleagues found that patients tended to experience depression or anxiety together with their chronic disease as either independent or inter-related. They concluded that chronic disease and depression or anxiety can be interrelated or independent. Some patients may not accept depression as an isolated condition, or they may not acknowledge that the conditions are distinct due to overlapping symptoms.

DeJean and colleagues' findings were replicated in Canada by Patten, (2001) who studied long-term medical conditions and major depression in the Canadian population. Patten found that patients who had one or more chronic medical conditions were at an increased risk of having major depressive disorder. Conditions such as sinusitis, migraine headaches, as well as back problems were the illnesses having the highest association with major depression.

Patten stated that having a chronic disease approximately doubled the chance of developing major depression. Patten concluded that a big percentage of Canada's general population suffers from chronic medical conditions and they are at an increased risk of major depression and suggested that chronic disease plays an important role in the etiology of major depression.

2.4.5 Age and depression

Literature shows that the association between depressive symptoms and age is inconsistent. Street, (2004) states that there are conflicting results from many studies that investigated the influence and relationship of aging on the severity of depression. For instance, in a study by Rothermund & Brandtstädter, (2003) they concluded that depressive symptoms increase with age and there is a major increase in depression among older persons (66 years and above). From literature, a U-shaped relationship has been proposed between depression and age. Kessler and colleagues (1992) analyzed two large national surveys data and reported that there was a decline in depressive symptoms from young adulthood to midlife, thereafter depressive symptoms start to go up again with increasing age (R. C. Kessler, Foster, Webster, & House, 1992).

Previous studies among TB patients have found that age is one of the factors associated with depressive symptoms and it seems to explain some of the variances in the prevalence rate of depression. For example, Ige & Lasebikan, (2011) conducted a cohort study among tuberculosis patients in comparison with non-tuberculosis family members in a Nigerian tertiary care hospital. They found that depressive symptoms were significantly associated with older age. Contrary, Lee., (2015) found that younger age (13-54 years) patients to be significantly more depressed than older individuals above 55 years.

In an Ethiopian study published in 2014, Adem and others assessed the prevalence and pattern of depression in patients with Tuberculosis, they used Kessler psychological distress scale (K10) to assess for depressive symptoms and with a sample size of 222 TB patients, they found that age was significantly associated with depressive symptoms among the participants (Adem et al., 2014). In addition, Ambaw et al., (2017) conducted a cross-sectional survey among 657 people newly diagnosed with TB in Ethiopia and found that older age was significantly associated with increased prevalence of depressive symptoms among TB patients. In contrast, age was not significantly associated with depressive state among TB patients in another Nigerian study by Aniebue, P., & Okonkwo, (2006).

These findings seem to fail in establishing the conclusive age patterns of depressive symptom levels. This inconsistency could be due to past studies that adopted screening scales for depression which contained somatic items that seem to bring an age bias and that these past studies, mixed women and men in their samples and yet literature evidence shows that gender variation in depressive symptoms differs with age (R. C. Kessler et al., 1992).

2.5 Global Situation

Globally, studies have shown varying results on the prevalence rate of depression among TB patients ranging from 8% to 81% (Basu et al., 2012; Kumar et al., 2016; Masumoto et al., 2014; Sulehri et al., 2010). For example, Basu et al., (2012) conducted a cross-sectional observational study in a Directly Observed Treatment Short-course (DOTS) clinic in West Benga India to assess the prevalence of depression in tuberculosis patients. With a sample size of 106 and using the nine-item Patient Health Questionnaire (PHQ-9) to assess for depression, Basu and colleagues found 62% of the patients were depressed, and two-third of the depressed

patients were suffering from mild to moderate depression whereas 5.5% of patients were severely depressed.

In Pakistan, Sulehri and colleagues in 2010, carried out another cross-sectional study among hospitalized TB patients in a TB Hospital, Faisalabad. With a sample size of 60 TB patients following convenience sampling technique, they found that 80% of the patients were suffering from depression. They used the Beck's Depression Inventory-II (BDI-II) tool to assess for depression. Similarly, in a study published in 2014, Masumoto and colleagues observed that 16.8% of the participants had a depressive state after conducting a cross-sectional survey on the prevalence and associated factors of depressive state among pulmonary tuberculosis patients in Manila, Philippines. They recruited five hundred and sixty-one (561) participants in ten different health facilities using a consecutive sampling technique. The study used the Patient Health Questionnaire-9 (PHQ-9) tool to screen for the depressive state.

These variations in prevalence could have resulted from differing sample sizes, varying study population demographics, and differing screening tools used. Additionally, it is important to note that these studies were all cross-sectional studies, performed in hospital settings, and may not be generalizable to broader populations.

Regarding the factors associated with depressive symptoms among TB patients, a variety of factors have been confirmed by different scholars to be associated with depressive symptoms among these patients. However, these scholars have reported varying factors that are significantly associated with depressive state among TB patients. From these studies, some of the factors associated with depressive symptoms among TB patients were age, marital status, education level, gender, socioeconomic status, side effects of the drugs, malnutrition, duration

of treatment of the disease, altered social relationship of the society, TB stigmatization and Comorbid illnesses.

Concerning gender as one of the reported factors associated with depression among TB patients, some Asian studies showed varying results. For example, in a study done in West Benga India, in 2012, Basu and others observed that males (54.5%) were more depressed compared to females (45.5%). This finding was replicated in Pakistan by Sulehri et al., (2010), who found males to be more depressed than females. However, in these two studies, they concluded that gender was not statistically significant. In contrast, gender was significantly found to be associated with depressive state among pulmonary tuberculosis patients in Manila, Philippines (Masumoto et al., 2014).

Another factor reported is low socioeconomic status, this factor was found to be associated with depressive state among TB patients in Faisalabad, Pakistan (Sulehri et al., 2010), West Benga India (Basu et al., 2012) as well in Manila, (Masumoto et al., 2014) and all were statistically significant.

Some literature data suggested that poverty is a risk factor for both depression and TB, and can lead to negative synergies which can be deadly. In addition, TB can unreasonably affect people living in poverty and other socially vulnerable populations such as homeless people, the severely mentally ill, incarcerated, drug-addicted persons, those co-infected with HIV, and institutionalized people (Pachi, Bratis, Moussas, & Tselebis, 2013). Moreover, people living in poverty have a greater risk of exposure to TB due to poorly ventilated living conditions and overcrowding which favor TB transmission. Other secondary factors such as HIV co-infection and substance abuse can compromise the immunological response to TB exposure (Sweetland

et al., 2017). In addition, poverty increases the risk of exposure to precipitating factors such as social exclusion, violence, abuse, and discrimination, while at the same time lacking adequate access to health care, education, and other essential services (Funk, Drew, Knapp, & Knapp, 2012). This collection of chronic stressors can lead to sustained neuroendocrine and autonomic responses, the elevation of pro-inflammatory cytokines and, this eventually could lead to depression (Berk et al., 2013).

Marital status, BMI, low perceived confidant social support, and adverse drug reactions (ADRs) were found to be significantly associated with depressive states among tuberculosis patients in the Philippines (Masumoto et al., 2014).

These studies used different tools to screen and assess depression among tuberculosis patients, the tools mainly used were Beck Depression Inventory-II and Patient Health Questionnaire (PHQ-9).

One major recommendation made in most of the studies is screening for depressive symptoms can help identify TB patients who need support and treatment. One study pointed out that there is an urgent need for more such studies on the prevalence of depression among TB patients (Basu et al., 2012). Another study emphasized timely diagnosis and treatment of depression among TB patients and this should be done all over the world and more so in lower-middle-income countries like Pakistan (Sulehri et al., 2010).

2.6 Sub-Saharan Africa

Several sub-Saharan Africa studies show a high prevalence of depressive symptoms among TB patients ranging between 9.3% to 65%, however, this is a narrow range compared to the global prevalence rate (Amha et al., 2021, Kehbila et al., 2016; Ambaw et al., 2017; Ige &

Lasebikan., 2011). Most of these studies were done in hospital settings using different sample sizes and also different tools to screen or diagnose depression.

For instance, Westaway and Wolmarans, (1992) conducted a cross-sectional study in South Africa, and with a sample size of one hundred (100) respondents, they found that 65% of the patients were suffering from depressive symptoms. They used the Beck's Depression Inventory (BDI) tool to screen for depression. Another study in South Africa was published in 2010 by Naidoo and Mwaba. They conducted a cross-sectional study on helplessness, depression, and social support among people being treated for tuberculosis in a public health TB clinic within the Cape Metropole region in South Africa. With a sample size of 166 respondents, they observed that 64.3% of the patients had depression. Naidoo and Mwaba used the Beck's Depression Inventory (BDI) tool to assess for depression. They also found that there was no significant association between HIV status and depressive symptoms (Naidoo & Mwaba, 2010). In addition, Tomita et al., (2019) conducted a cohort study on the major depressive episode and household food insecurity among individuals with multidrug-resistant tuberculosis (MDR-TB) in a specialized TB hospital in KwaZulu-Natal Province, South Africa. With a sample size of 141 newly admitted microbiologically confirmed MDR-TB inpatients, they found a prevalence rate of depression among multidrug-resistant tuberculosis (MDR-TB) patients to be 11.35%. Although this prevalence rate was lower compared to the previous studies done in South Africa, Tomita and others focused on a cohort of multidrug-resistant tuberculosis (MDR-TB) patients and they used Mini International Neuropsychiatric Interview version 6.0 (MINI 6.0) to assess for depression. Tomita and others concluded that major depressive episode in patients with MDR-TB was significantly

associated with household food insecurity, and it was independent of their socio-economic status.

Similar variations in the prevalence rate of depressive symptoms among TB patients can also be seen in west African countries like Nigeria. For instance, Aniebue, P., & Okonkwo, (2006) reported a prevalence rate of 41.9% amongst 105 pulmonary tuberculosis patients who were consecutively recruited at the University of Nigeria teaching hospital, Enugu. They also pointed out that unemployment and duration of treatment were significantly associated with depressive symptoms among the affected participants, however, age and marital status were not significantly associated with a depressive state. In 2009, Issa and his colleagues published a cross-sectional study that assessed depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic in Nigeria. With a sample size of sixty-five (65) participants, they found a prevalence rate of 27.7% amongst tuberculosis patients and the study did not find any significant relationship between depressive symptoms and marital status, gender, weight gain, place of residence, and side effects of drugs (Baba A Issa, Abdullah D Yussuf, 2009). In addition, Ige & Lasebikan, (2011) conducted a cohort study aimed at determining the prevalence of depression in tuberculosis patients in comparison with non-tuberculosis family members and its correlation with disease patterns in a Nigerian tertiary care hospital. With eighty-eight (88) respondents with TB and 81 family members visiting the DOTS Centre, they observed that the prevalence of depression was 45.5% among TB patients and 13.4% among family members. They also found that depressive symptoms were significantly associated with older age, duration of illness, and disease extent, however, gender and marital status were not associated with depressive symptoms.

A varying prevalence of depressive symptoms among TB patients can be seen amongst central African countries like Cameroon, Angola, and Zambia. For example, Kehbila et al., (2016) published a hospital-based cross-sectional study aimed at determining the prevalence and correlates of depression in adult patients with pulmonary TB (PTB) in the Southwest region of Cameroon. In this study, depression was diagnosed using the standard nine-item Patient Health Questionnaire (PHQ-9). Using a convenient sampling method, they recruited 265 patients with pulmonary TB (PTB), and they found the prevalence of depression to be 61.1%, with a significant proportion (36.6 %) having mild depression. The study also pointed out that there were significant relationships between depressive symptoms and BMI, gender, treatment phase, HIV/TB co-infection, duration of treatment, and family history of mental illness.

Looking at Angola, Xavier and Peixoto published their cross-sectional study in 2015, and from a sample size of eighty-one (81) TB patients, they found that the prevalence rate of depressive symptoms among TB patients was 49.4%. They also found that gender, extra-pulmonary TB, and multi-drug resistant TB were significantly associated with depressive symptoms. However, the study did not find any significant relationship between depressive symptoms and marital status, lower education level, and lower-income level (Xavier & Peixoto, 2015). In a study done in Zambia, Van Den Heuvel et al., (2013) reported a prevalence rate of depressive symptoms among TB patients to be 9.3%. The study was conducted at 16 primary health care centers across Zambia and 649 adult patients with tuberculosis (TB), human immunodeficiency virus (HIV), or both and were receiving treatment, they were recruited using a consecutive sampling method.

The variations in prevalence rates seen in West Africa, Central Africa, and South Africa are also replicated amongst East African countries like Ethiopia, Kenya, Tanzania, and Uganda. For example, in a study published in 2014, Adem and others assessed the prevalence and pattern of depression in patients with Tuberculosis in Jimma university specialized Hospital (JUSH) and Jimma Health Center (JHC) TB follow-up clinic, Ethiopia. They used Kessler psychological distress scale (K10) to assess for depressive symptoms. With a sample size of 222 TB patients, they found a prevalence rate of depression among TB patients to be 19.82%. They also found that duration of treatment, age, and HIV co-infection were significantly associated with depressive symptoms among the participants, however, marital status, sex, education status, and occupational status were not significantly associated with the depressive state (Adem et al., 2014). In 2015 another cross-sectional study was conducted by Duko and colleagues, which assessed the prevalence and correlates of depression and anxiety among patients with TB at WolaitaSodo University Hospital and Sodo Health Center, Ethiopia. Duko and colleagues used the Hospital Anxiety & Depression Scale (HADS) to assess for anxiety and depression. With a sample size of 417 TB patients, the study showed that the prevalence of depression and anxiety among patients with TB were 43.4 % and 41.5 % respectively and there were significant relationships between depressive symptoms and co-morbid chronic illnesses like HIV/TB co-infection and perceived TB stigma (Duko, Gebeyehu, & Ayano, 2015). In addition, Ambaw et al., (2017) found the prevalence of probable depression to be 54.0% after conducting a cross-sectional survey among 657 people newly diagnosed with TB. The study was conducted in five districts in Ethiopia and depressive symptoms were measured using the Patient Health Questionnaire (PHQ-9). Ambaw and others also found that female sex, lower educational status, older age, rural residence, poor perceived social support, lower

household income, and marital status were significantly associated with increased prevalence of depressive symptoms among TB patients. Lastly, in 2019, Dasa and others published an institutional-based cross-sectional study that assessed the prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia. The study was conducted among 403 tuberculosis patients attending eleven tuberculosis treatment centers in eastern Ethiopia. They observed that the prevalence of depression among tuberculosis patients was 51.9% with 34.2% mild cases. Dasa and colleagues used the Patient Health Questionnaire (PHQ-9) to measure depressive state. They also found that TB treatment duration, level of TB treatment, lower monthly income, age, and occupation were significantly associated with depressive symptoms. However, the study did not find any significant relationship between depressive symptoms and marital status, HIV status, family size, education status, and residence (Dasa et al., 2019).

A cross-sectional study done in Uganda by Alinaitwe in 2018, found that the prevalence rate of depressive illness among TB patients in Mulago hospital was 23.7% and level of education, family history of depression, age, treatment phase, and gender were significantly correlated with depressive illness. The study was conducted among 308 tuberculosis patients attending the tuberculosis clinic in Mulago Hospital and they were recruited using a consecutive sampling method. However, the study did not find any significant relationship between depressive symptoms and marital status, type of TB, HIV status, and employment status (Alinaitwe, 2018). In Tanzania, Buberwa, (2013) conducted a similar cross-sectional study that assessed the prevalence of depression and associated factors among Tuberculosis patients attending TB clinics in Temeke municipality, Dar es Salaam. With a sample size of 390 participants recruited using a consecutive sampling method, Buberwa found a prevalence rate

of 46.9% and the factors which were significantly associated with depressive symptoms were age, personal history of mental illness, religion, and duration of treatment.

The aforementioned studies done in sub-Saharan Africa show high prevalence rates of depressive symptoms among the populations studied, despite using different tools in assessing the severity of depressive symptoms.

In a systematic review and meta-analysis on the magnitude of depression and associated factors among patients with tuberculosis in sub-Saharan Africa published in 2021, Amha and colleagues found that the pooled prevalence of depression among patients with tuberculosis was 39.42%. Multi-drug resistance treatment, comorbid chronic illnesses, and being on the intensive phase of treatment were significant factors associated with depressive symptoms among patients with tuberculosis (Amha et al., 2021).

In another systematic review and meta-analysis on the prevalence of depression among patients with tuberculosis published in 2020, Duko and colleagues analyzed 25 studies that contained 4903 respondents across seven countries and found that the pooled prevalence of depression among patients with tuberculosis is 45.19%. They also found a higher prevalence in multidrug-resistant tuberculosis (MDR-TB) 52.34% compared to non-multidrug-resistant tuberculosis 43.47% patients. In addition, they observed a much higher pooled prevalence of depression among females 51.54% than males 45.25%. Based on the tool used to measure depression, HRDS had the highest pooled prevalence of depression of 61.09%, followed by BDI with 55.62%, then HADS with 46.5%, and lastly PHQ-9 with 37.71% pooled prevalence of depression (Duko et al., 2020).

2.7 Kenya

A literature search found limited studies done locally on the prevalence of depressive symptoms in tuberculosis patients. The studies which were done in Kenya also showed varying results on the prevalence rates of depression among TB patients. The prevalence rates in Kenya ranged from 31% to 61% (Ntarangwi., 2008; Lee., 2015). These studies used Beck's Depression Inventory (BDI) to screen and assess for depression among TB patients. For instance, Lee., (2015) conducted a cross-sectional study aimed at determining the prevalence of depression among TB non-coinfected and TB/HIV co-infected patients in Kisumu County with a sample size of 51 respondents. Lee found a prevalence rate of depression to be 31% and also found that younger age (13-54 years) patients to be significantly more depressed than older individuals above 55 years. In addition, Lee pointed out that males showed higher depression rates (40%) than females (23%), and low income was associated with depressive symptoms. The study also found that patients in the intensive phase had a higher depression rate (42%) compared to those on continuous phase (22%) and patients with TB only, had a higher depression rate (35%) than those patients with TB/HIV (28%).

Looking at the Kenyan context, the studies on the prevalence of depression among tuberculosis patients were done in hospital settings located in urban areas and also used a similar screening tool; Beck's Depression Inventory (BDI) to assess for depressive symptoms. The literature search also revealed that there was no study done in Bungoma County located in western Kenya aimed at assessing the prevalence and factors associated with depressive symptoms among tuberculosis patients using the standard nine-item Patient Health Questionnaire (PHQ-9).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Site

The study was conducted at Webuye County Hospital in western Kenya at the hospital's TB clinic which offer care for both pediatric and adult TB patients. Webuye County Hospital is a level four hospital in Bungoma County. According to the hospital's annual work plan for 2015/2016, it has a catchment population of 98,494. It offers a variety of health services including a special clinic for tuberculosis patients. The economic activity of Webuye is sugar cane and maize farming, animal husbandry, wholesale and retail shops.

3.2 Study Design

The study was a cross-sectional study aimed at assessing the prevalence and factors associated with depression among tuberculosis patients attending the TB clinic at Webuye County Hospital.

3.3 Study Population

All diagnosed and registered TB patients at the TB clinic at Webuye County Hospital between 1st April 2019 to 31st March 2020.

3.4 Inclusion Criteria

All individuals above 18 years with active tuberculosis (extra-pulmonary or pulmonary including bacteriologically positive and negative), consented to participate in the study and were registered at the TB clinic at Webuye County Hospital. Individuals above 18 years were included because they are legally allowed to give informed consent. In addition, literature

suggests that the greatest risk of major depressive disorder extends from mid to late adolescence to early forties.

3.5 Exclusion Criteria

Patients aged younger than 18 years were excluded from the study. Patients who were severely sick (physically) and cognitively impaired or unstable were admitted to the ward and were excluded in the study.

3.6 Sample size

The sample size was calculated based on the Peduzzi et al 1996 formula (Peduzzi et al 1996) for sample size determination for a logistic regression model to assess factors associated with an outcome of interest.

i.e**. n=10k/p**

Where **n** is the sample size, (minimum number required to power the study adequately), **k** is the number of covariates (the number of independent variables under study) and **p** is the smallest of the proportion of positive or negative cases.

For the **K, 11** factors were considered that is (age, BMI, gender, monthly income, education level, marital status, HIV co-infection, Diabetes, smoking, alcohol intake, and treatment phase). These factors were found to be associated with depression among tuberculosis patients by more than one study during the literature review.

For the **P**, 0.61 was used based on a previous study on the prevalence of depression among tuberculosis patients. (Ntarangwi., 2008).

Thus n=10k/p

n=10*11/0.61

n= 180

According to preliminary data, more than 120 presumptive TB cases were seen at the TB clinic and an average of 15 was confirmed TB cases monthly.

3.7 Sampling Procedure

Active TB patients in both intensive and continuous phases of treatment who were confirmed to have TB by all the diagnosing criteria and were registered in the TB register at the TB clinic were recruited using consecutive sampling. Those who did not meet the inclusion criteria were excluded. The sampling was done until the sample size was achieved.

3.8 Data Collection Procedure and Tools

Patient interviews were conducted by the principal investigator and one research assistant using a structured questionnaire and a Patient Health Questionnaire (PHQ-9) to assess depressive state among TB patients. The research assistant was a registered nurse trained on how to obtain informed consent, how to administer PHQ-9, and other data collection methods. Data collection was conducted during the normal working hours from Monday to Friday starting from 8.00 am to 5.00 pm. The structured questionnaire was designed to assess socio-demographic factors such as working status, marital status, monthly income, education level, alcohol consumption, smoking status, and co-morbidities like diabetes. Other data about the patient such as treatment phase, HIV status, BMI, type of TB, was collected from the TB register and treatment card from the clinic as shown in the table 1 below.

Upon arrival at the clinic, eligible participants were informed about the study and their consent sought. Those who declined were reassured and offered normal clinic service. For consenting participants normal clinic services were offered before data collection. The information that was collected directly from the participant through the questionnaire include: marital status, monthly income, education level, alcohol consumption, smoking status, and co-morbidities like diabetes. Patient Health Questionnaire (PHQ-9) was then administered by principal investigator or the research assistant to assess for depressive symptoms among participants. Other data like treatment phase, HIV status, BMI, type of TB, was collected from the TB register. All eligible participants were noted on the TB register, this eliminated occurrence of double interview on repeat visits.

Table 1: Variables under Study

Variable	Units	Data Source
Gender	Male vs female	Structured survey
Age	In years OR date of birth	Structured survey
Marital status	Single, married, divorced, separated, widow	Structured survey
HIV	Yes, No, never tested	TB register
BMI	Weight and height	TB register
Diabetes	Yes, vs no vs never tested per patient report	Structured Survey
Smoking	Never smoked, former smoker, current smoker	Structured Survey
Treatment phase	intensive vs continuous	TB Register
Education level	None, Primary, secondary, college, university,	Structured Survey
Monthly income	Below KES 10,000 per month, Between KES 10,000 and 19,999 per month, Between KES 20,000 and 30,000 per month, Over KES 30,000 per month	Structured Survey
Alcohol	Never, former taker, current taking	Structured Survey

3.9 Patient Health Questionnaire (PHQ-9)

The PHQ-9 consists of 9 questions that correspond to 9 criteria for unipolar major depression per the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) (Adewuya et al., 2006). The questionnaire requests respondents to answer how often they have experienced depressive symptoms during the previous 14 days, and each question has a 3-level rating scale: 0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day. Total scores range from 0 to 27 and indicate the severity of depression. PHQ-9 scores can be dichotomized and has a high sensitivity and specificity (Adewuya et al., 2006; Titov et al., 2011; Richardson et al., 2010; Monahan et al., 2009; Dum et al., 2008). In addition, the following cut-off points can be used to assess depression severity; (0-4) none or minimal, (5-9) mild, (10-14) moderate, (15-19) moderately severe, and (20-27) severe. PHQ-9 tool was selected for this study as it has been used universally for research in primary care settings, and in TB patients by other scholars (Basu et al., 2012). In addition, the questionnaire is very short, requiring only a few minutes to complete. In terms of diagnostic performance in patients with comorbidities, it has been reported that the psychometric properties of the questionnaire are similar to other questionnaires such as the Hospital Anxiety and Depression Scale and BDI (Dum et al., 2008; Titov et al., 2011) although no comparative study with other questionnaires have been conducted in TB patients.

3.10 Validity and Reliability

Reliability is the degree to which an assessment tool produces consistent results whereas validity refers to how well the questionnaire, accurately measures what it is supposed to measure. The structured questionnaire was piloted at Bungoma County Hospital to confirm the reliability and validity of the questionnaire before conducting the study. The research

assistant was recruited from the TB clinic and trained on how to conduct a standardized interview.

3.11 Data Analysis

Data was coded into Statistical Package for Social Sciences (SPSS) and statistical analysis was done using SPSS version 23. A cut-off score of 4 was used to dichotomize PHQ-9 scores into a non-depressive state (PHQ-9 $\leqslant$ 4) and depressive state (PHQ-9 $\geqslant$ 5) in this study. Descriptive statistics such as measures of central tendencies; measures of spread were used for continuous data while frequencies were used for categorical data. Bivariate analyses were conducted for each factor and depression. The study used the chi-square test and in cases where the expected count was below 5 then Fisher's exact test was used to test for association at a 95% confidence interval. Significant variables, as well as potential confounders from the bivariate analysis, were included in a logistic regression analysis. Adjusted odds ratio at 95% confidence interval was calculated.

3.12 Study Limitations

The study shared the limitation of a cross-sectional study design, it is difficult to demonstrate the cause-and-effect relationship. The probability of overestimation of the prevalence of depressive symptoms, due to the fact that the PHQ-9 has some biological symptoms of TB.

3.13 Ethical Considerations

Ethical approval was sought from the Institutional Research and Ethics Committee (IREC) of Moi University and approval was granted under approval number **FAN: IREC 3166**. Permission to conduct the study was also sought and granted by the Webuye County Hospital management team.

Informed consent was obtained from the study participants. Those who failed to give consent were assisted without discrimination. Those participants who had high PHQ-9 scores were referred to the mental health clinic for further management and some were counseled at the TB clinic.

Participants' information was treated as confidential and was not used for any other purpose other than the study. Filled questionnaires were kept in a locked cabinet by the principal investigator to ensure confidentiality is maintained throughout the study. A unique identifier was used for each questionnaire and there was a separate document linking the unique identifications to TB register serial numbers that only the research team had access to. Data were de-identified and placed in an electronic database. The database had two levels of password protection.

CHAPTER FOUR

4.0 RESULTS

4.1 Overview

This chapter highlights the key findings on the prevalence and factors associated with depressive symptoms among tuberculosis patients attending the TB clinic at Webuye County Hospital. One hundred and eighty participants met the inclusion criteria and were enrolled in the study.

Table 2: Socio-demographic Characteristics

Variable	**Median**	**IQR**
Age	37	28,50
Age categories	**Frequency**	**Percent**
18 – 29	51	28.3
30 – 39	48	26.6
40 – 49	35	19.4
> 50	46	25.7
Gender	**Frequency**	**Percent**
Male	103	57.2
Female	77	42.8
Marital status	**Frequency**	**Percent**
Married	120	66.70
Single	35	19.40
Divorced	3	1.70
Separated	15	8.3
Widowed	7	3.9
Education	**Frequency**	**Percent**
Primary	30	16.70
Secondary	102	56.70
College	43	23.90
University	5	2.80
Income in KSh/month	**Frequency**	**Percent**
Below 10,000	67	37.20
10,000-19,999	51	28.30
20,000-30,000	25	13.90
>30,000	10	5.50
Student	27	15.00

A total of 180 participants were included in the analysis as shown in table 2 above. The median age of the participants was 37 (IQR 28, 50) years. Most of the study participants, 103 (57.2%) were male, the females were 42.8%. The majority of the study participants, 120 (66.70%) were in a marriage relationship, this was followed by 35 (19.4%) who were single, 3 (1.7%) were divorced, 17 (8.3%) were separated and 7 (3.9%) were widowed. Most of the study participants 56.7 percent had secondary education, this was followed by 29.6% who had a college education, 16.7% with primary education, and 2.8% with university education. The majority of the study respondents, 67 (37.2%) were having a monthly income below Ksh. 10,000, this was followed by 51 (28.3%) who were earning between Ksh 10,000-19,999 per month, 27 (15%) were students, 25 (13.9%) were earning between Ksh 20,000-30,000 per month and 10 (5.5%) were earning more than Ksh 30,000 per month. Overall, most of the participants were married, had attained secondary school education, and were earning below Ksh. 10,000.

Table 3: Medical characteristics of study participants.

Variable		
Treatment Phase	**Frequency**	**Percentage**
Intensive	75	41.70
Maintenance	105	58.30
HIV/AIDs	**Frequency**	**Percentage**
Positive	58	32.20
Negative	122	67.80
Type of TB	**Frequency**	**Percentage**
Pulmonary	144	80.00
Extrapulmonary	36	20.00
Smoking	**Frequency**	**Percentage**
Never smoked	138	76.7
Former smoker	42	23.3
Current smoker	0	0
Alcohol drinking	**Frequency**	**Percentage**
Never drinker	131	72.8
Former drinker	35	19.4
Current drinker	14	7.8
Diabetes	**Frequency**	**Percentage**
No	136	75.60
Yes	1	0.60
Not Tested	43	23.90
	Mean	**Std. Deviation**
Weight	54.48	9.53
Height	166.80	8.52
BMI	19.50	3.26
Depression	**Frequency**	**Percentage**
No Depression	112	62.20
Depressed	68	37.80
Level of Depression	**Frequency**	**Percentage**
No depression	112	62.2
Mild depression	57	31.70
Moderate depression	11	6.10
Moderately severe	0	0
Severe	0	0

The prevalence of depression among TB patients was found to be 37.80% as shown in table 3 above**.** Mild depression was 31.7% of the subjects, 6.1% of the subjects had moderate depression. The mean weight, height, and BMI were 54.48(SD 9.53), 166.8 (SD 8.52), and 19.5 (SD 3.26) respectively. The participants who were on the intensive phase of TB treatment were 41.7% and 58.3% were in the maintenance phase. Eighty percent (80%) of the participants had pulmonary TB while 20% had extra-pulmonary TB, only one case of MDR-TB was noted during this study. Thirty-two percent (32.2%) of the participants were HIV positive while 67.8% were HIV negative. Only one patient had diabetes, but a majority of the participants 136 (75.6%) did not have diabetes while 43 (29.3%) reported that they were not tested for diabetes. The majority of the participants had never smoked cigarettes 138 (76.7%), 23.3% reported to have smoked but stopped and there were no respondents who were currently smoking. Most of the participants had never taken alcohol 131 (72.8%), 19.4% reported to have taken alcohol but stopped and 7.8% reported to be taking alcohol as shown in table 3 above.

Overall, most of the respondents were in the maintenance phase of treatment, a majority had pulmonary tuberculosis, and most never smoked cigarettes or took alcohol. The majority of the participants were HIV negative and one patient was diabetic, however, most of the respondents had no depressive symptoms. There were no cases of moderately severe or severe depression among the participants.

Table 4: Factors Associated with Depressive symptoms Among TB Patients.

	Depression, *N (%)*		
Variable	**No**	**Yes**	**Chi-square *p*-value**
Gender			
Male	63 (61.0)	40 (39.0)	0.735
Female	49 (64.0)	28 (36.0)	
Age in years			
18 – 29	38 (74.5)	13 (25.5)	0.123
30 – 39	25 (52)	23 (48)	
40 – 49	20 (57)	15 (43)	
> 50	29 (63)	17 (37)	
BMI			
Underweight < 18.5	48 (62.3)	29 (37.7)	0.745
Normal 18.5-24.5	56 (60.8)	36 (39.2)	
Overweight > 25	8 (73)	3 (27)	
Marital status			
Married	64 (53.3)	56 (46.7)	0.064
Single	28 (80)	7 (20)	
Divorced	2 (67)	1 (33)	
Separated	12 (80)	3 (20)	
Widowed	6 (86)	1 (14)	
Education level			
Primary	22 (73.3)	8 (26.7)	0.422
Secondary	61 (59.8)	41 (40.2)	
College	25 (58.1)	18 (41.9)	
University	4 (80.0)	1 (20.0)	
Treatment Phase			
Intensive	28 (37.3)	47 (62.7)	**0.000**
Maintenance	84 (80)	21 (20)	
HIV/AIDs			
Positive	19 (32.8)	39 (67.2)	**0.000**
Negative	93 (76.2)	29 (23.8)	
Type of TB			
Pulmonary	89 (61.8)	55 (38.2)	0.818
Extrapulmonary	23 (63.8)	13 (36.2)	
Diabetes			
No	83 (61.0)	53 (39.0)	0.544
Yes	0 (0.0)	1 (100.0)	
Not Tested	29 (67.4)	14 (32.6)	
Alcohol Intake			
Never took alcohol	101 (77.0)	30 (23.0)	0.082
Former drinker	6 (43.0)	8 (57.0)	
Current drinker	22 (62.9)	13 (37.1)	
Smoking			
Never smoked	88 (64.0)	50 (36.0)	0.175
Former smoker	20 (47.0)	22 (53.0)	
Income in KSh/month			
Below 10,000	37 (55.0)	30 (45.0)	0.181
10,000-19,999	33 (65.0)	18 (35.0)	
20,000-30,000	15 (60.0)	10 (40.0)	
>30,000	6 (75.0)	2 (25.0)	
Student	23 (79.0)	6 (21.0)	

Those who were HIV positive had the highest prevalence of depression (67.2 %) and this was statistically significant (p =0.000) as shown in table 4 above. Those who were on the intensive phase of TB treatment had a high prevalence of depression (62.7 %) and this was statistically significant (p =0.000). The other factors were not statistically significant.

Overall, the treatment phase and HIV/AIDs co-infection were significant factors associated with depressive symptoms among TB patients at Webuye County Hospital (WCH).

Table 5: Multivariate logistic regression for factors associated with Depressive symptoms

Variable	Odds Ratio	*p*-value	95% CI	
Age	1.000	0.99	0.977	1.024
Treatment Phase (Intensive vs Maintenance)	4.588	0.000	2.199	9.572
HIV/AIDs (Positive vs Negative)	3.708	0.001	1.736	7.923

Adjusting for age and HIV/AID co-infection, the odds of having depressive symptoms for participants how were on the intensive phase were 4.588 times higher compared to those who were on the maintenance phase. In addition, adjusting for age and treatment phase, the odds of having depressive symptoms for those patients with TB/HIV coinfection was 3.708 times higher than those patients who had no HIV coinfection as shown in table 5 above.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

This study was set out to determine the prevalence rate and factors associated with depressive symptoms among tuberculosis patients attending the TB clinic at Webuye County Hospital.

5.2 Prevalence of Depression

In this study, the prevalence rate of depressive symptoms among tuberculosis patients attending the TB clinic at Webuye County Hospital was 37.8%. This prevalence rate of depressive symptoms was comparably higher to the study done in Kenya by Lee in 2015, who studied the prevalence of depression among TB non-coinfected and TB/HIV co-infected patients at Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) and the Clinical Research Center (CRC) in Kisumu County with a sample size of 51 respondents. Lee found that the prevalence rate of depression among the participants was 31% (Lee, 2015). This variation could be explained by the different sample sizes used and that Lee used Beck's Depression Inventory-II (BDI-II) to assess for depressive symptoms while this current study used Patient Health Questionnaire (PHQ-9). In addition, these differences in prevalence rates might possibly be due to the different sensitivity and specificity of the screening tools. BDI has a sensitivity of 90% and specificity 79% while PHQ-9 has a sensitivity of 88% and specificity 85%.

Looking at other sub-Saharan Africa studies, this prevalence rate was comparably higher to some studies done in Ethiopia, Uganda, Nigeria, South Africa, and Zambia. For example, in

a cross-sectional study done in Uganda by Alinaitwe in 2018 who studied the prevalence and factors associated with depressive illness in patients with tuberculosis in Mulago hospital. Alinaitwe found that the prevalence rate of depressive illness among TB patients in Mulago hospital was 23.7%. This is possibly due to the use of different screening tools where the PHQ-9 was used in this study as compared to a diagnostic tool Mini-International Neuropsychiatric Interview (MINI) in Alinaitwe study. In addition, the Alinaitwe study used a sample size of 308 compared to 180 in this current study.

In another study published in 2014, Adem and others assessed the prevalence and pattern of depression in patients with Tuberculosis in Ethiopia, and with a sample size of 222 TB patients, they found a prevalence rate of depression among TB patients to be 19.82%. This variation could be explained by the different sample sizes used and that Adem and colleagues used Kessler psychological distress scale (K10) to assess for depressive symptoms while this study used Patient Health Questionnaire (PHQ-9). In addition, Tomita et al., (2019) conducted a cohort study in a specialized TB hospital in KwaZulu-Natal Province, South Africa among multidrug-resistant tuberculosis (MDR-TB) patients. With a sample size of 141 newly admitted microbiologically confirmed MDR-TB inpatients, they found a prevalence rate of depressive symptoms to be 11.35% which was three-times much lower compared to this study. Although this prevalence rate was lower compared to this study, Tomita and others focused on a cohort of multidrug-resistant tuberculosis (MDR-TB) patients and they used Mini International Neuropsychiatric Interview version 6.0 (MINI 6.0) to diagnose depression compared to this study which used Patient Health Questionnaire (PHQ-9) for screening depressive symptom. In addition, their study was a cohort study while the current study was a cross-sectional study.

Issa and his colleagues published a cross-sectional study that assessed depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic in Nigeria. They found a lower prevalence rate of 27.7% compared to the current study. This is possibly due to the use of different sample sizes, they used a sample size of 65 compared to 180 in this study, however, both studies used Patient Health Questionnaire (PHQ-9) to screen for depressive symptoms among TB patients. The study also used similar cut-off score of 4 to dichotomize the scores into a depressive state (PHQ-9 $\geqslant$ 5) and a non-depressive state (PHQ-9 $\leqslant$ 4) (Baba A Issa, Abdullah D Yussuf, 2009). In a study done in Zambia, Van Den Heuvel et al., (2013) reported a prevalence rate of depressive symptoms among TB patients to be 9.3% which was much lower compared to the current study. This is possibly due to the use of different screening tools where PHQ-9 was used in this current study as compared to a diagnostic tool Mini-International Neuropsychiatric Interview (MINI). In addition, the study used a sample size of 231 compared to 180 in this study.

However, the prevalence rate of depression in this study was comparably lower to the study done in Kenya by Ntarangwi in 2008 where he reported a prevalence rate of depression to be 61% among 175 study participants (Ntarangwi., 2008). This variation could be possible due to the different screening tool used, Ntarangwi used Beck's Depression Inventory-II (BDI-II) to assess for depressive symptoms compared to this study which used Patient Health Questionnaire (PHQ-9). In addition, these differences in prevalence rates might possibly be due to the different sensitivity and specificity of the screening tools. BDI has a sensitivity of 90% and specificity 79% while PHQ-9 has a sensitivity of 88% and specificity 85%.

More studies in sub-Saharan Africa have also shown comparably higher prevalence rates of depressive symptoms among TB patients compared to this current study. For instance, a study done in Ethiopia by Ambaw et al showed a prevalence of probable depression to be 54.0% (Ambaw et al., 2017). This study was a cross-sectional survey among 657 people newly diagnosed with TB. Symptoms of depression were measured using the Patient Health Questionnaire (PHQ-9). Their prevalence rate was higher than that of this study, this could be due to the fact that the study population and timing of the study were different. In 2015 another cross-sectional study was conducted in Ethiopia by Duko and his colleagues, with a sample size of 417 TB patients, the study showed that the prevalence of depression among patients with TB was 43.4 %, which is comparatively higher than this study. This variation could be due to the different sample sizes used and the tools used to measure depressive symptoms.

Moreover, in 2019, Dasa and others published an institutional-based cross-sectional study that assessed the prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia. The study was conducted among 403 tuberculosis patients attending eleven tuberculosis treatment centers in eastern Ethiopia. They observed that the prevalence of depression among tuberculosis patients was 51.9% which is comparatively higher compared to this study. Looking at Angola, Xavier and Peixoto published their cross-sectional study in 2015, and from a sample size of eighty-one (81) TB patients, they found a higher prevalence rate of depressive symptoms among TB patients of 49.4% compared to this current study.

In the Southwest region of Cameroon, Kehbila et al., (2016) published a hospital-based cross-sectional study aimed at determining the prevalence and correlates of depression in adult patients with pulmonary TB (PTB). Using a convenient sampling method, they recruited 265

patients with pulmonary TB (PTB), and they found the prevalence of depression to be 61.1%, with a significant proportion (36.6 %) having mild depression. This prevalence rate was comparatively higher than that of this study, possibly due to the differences in sample size used. In Tanzania, Buberwa, (2013) conducted a similar cross-sectional study to determine the prevalence of depression and associated factors among tuberculosis patients. With a sample size of 390 participants recruited using a consecutive sampling method, Buberwa found a slightly higher prevalence rate of 46.9% compared to the current study.

Another study in South Africa was published in 2010 by Naidoo and Mwaba. They observed a comparably much higher prevalence rate of 64.3%. This is possible due to different tools used because Naidoo and Mwaba used the Beck's Depression Inventory (BDI) tool to assess for depressive symptoms while this study used PHQ-9.

The differences in the prevalence of depression across all these studies in sub-Saharan Africa could be attributable to several factors, including differences in the population being studied, the sample size, screening tools used, the study period, different cut-off scores employed, classification of tuberculosis and treatment status of TB patients who were on follow up.

In addition, a study done in India by Basu et al showed a prevalence of 62%, the study was a cross-sectional observational study conducted in a DOTS clinic and a total of 110 patients were included in the study. Patient Health Questionnaire-9 was used to assess depression and its severity. The difference in prevalence rate could be attributed to the population studied (DOTS clinic) and different sample sizes.

In a systematic review and meta-analysis on the magnitude of depression and associated factors among patients with tuberculosis in sub-Saharan Africa published in 2021, Amha and colleagues found that the pooled prevalence of depression among patients with tuberculosis was 39.42% (Amha et al., 2021). This pooled prevalence rate replicated the findings of this study. Moreover, in another systematic review and meta-analysis on the prevalence of depression among patients with tuberculosis published in 2020, Duko and colleagues analyzed 25 studies that contained 4903 respondents across seven countries and found that the pooled prevalence of depression among patients with tuberculosis is 45.19%. They also found a higher prevalence in multidrug-resistant tuberculosis (MDR-TB) 52.34% compared to non-multidrug-resistant tuberculosis 43.47% patients (Duko et al., 2020).

In addition, these differences in prevalence rate could be due to the chronicity of tuberculosis, which seems to be prone to poor social support and perceived stigma, this could worsen the depressive feelings leading to increased disease severity which in turn precipitates clinical depression (Duko et al., 2020). Moreover, literature data suggest that TB infection could worsen depressive symptoms in patients because of hypothalamic-pituitary-adrenal axis dysregulation and inflammatory response to TB infection (Bozza et al., 2007). Furthermore, the hypothalamic-pituitary adrenal axis dysregulation has been proposed in the pathophysiology of mood disorders with depression included (Keller et al., 2017).

5.2 Factors associated with Depressive symptoms

In this study, the treatment phase of TB was significantly associated with depressive symptoms among TB patients. The odds of developing depressive symptoms among those who were on intensive phase were 4.588 times higher as compared to those who were on the

maintenance phase. Similar findings are reflected in a cross-sectional study done in Uganda by Alinaitwe in 2018 where he found that being in the intensive phase of treatment doubled the chances of a person having a depressive illness (Alinaitwe, 2018). In another study in Cameroon by Kehbila et al., (2016), they found a significant relationship between depressive symptoms and the treatment phase of TB. These findings were also replicated in a systematic review and meta-analysis on the magnitude of depression and associated factors among patients with tuberculosis in sub-Saharan Africa published in 2021 by Amha and colleagues. They found that being on the intensive phase of treatment was significantly associated with depressive symptoms among patients with tuberculosis (Amha et al., 2021).

The possible explanation to account for this finding lies in the notion that patients with TB are perceived as a source of contagion in the community once a diagnosis of TB is made, which may lead to discrimination, social isolation, stigma, and rejection in this initial phase, and this may predispose individuals to a higher risk for depression (Koyanagi et al., 2017). Furthermore, some anti-TB drugs can induce depression (Pachi et al., 2013). Alternatively, depression may be a psychological reaction to the symptoms of TB (e.g., chronic cough, fatigue, weight loss) or associated disability (Pachi et al., 2013; Koyanagi et al., 2017). In addition, the association between depressive symptoms and the treatment phase of TB could be due to the fact that the symptoms of tuberculosis tend to be prominent in the intensive phase compared to the continuation phase of TB treatment (Alinaitwe, 2018).

Regarding comorbid conditions, this study found that those TB patients with HIV/AIDS coinfection were 3.708 times more likely to have depressive symptoms compared to those patients who had no HIV coinfection. This finding was consistent with a previous study in

Cameroon by Kehbila et al., (2016) where they found that patients with HIV/TB co-infection were 2.5 times more likely to be depressed than those without co-infection. Similar findings were reflected in a cross-sectional study done in Ethiopia by Adem and others in 2013 where a significant relationship was found between HIV/TB co-infection and depressive symptoms. In another study in Ethiopia by Duko et al., (2015), which assessed the prevalence and correlates of depression and anxiety among patients with TB, produced similar findings.

The association between depressive symptoms and TB/HIV coinfection could be due to the dual burden of TB and HIV co-infection among TB patients, which seem to escalate the probability of poor mental health. In addition to this, the depressive symptoms might be due to the combined side effects of some anti-TB and antiretroviral drugs on the mental health of the patients. Moreover, some anti-HIV drugs can affect mental health. Most notably, the non-nucleoside reverse transcriptase inhibitor (NNRTI) efavirenz has been associated with depressive symptoms among HIV patients (Yohannes et al., 2020; Kenedi & Goforth, 2011).

In contrast to the finding of this study with regards to HIV/TB co-infection, the Kenyan study by Lee in Kisumu County found no association between HIV/AIDs co-infection and depression (Lee, 2015). In this current study, 67% of the HIV-positive patients had depressive symptoms compared to 28% in Lee's study. The variation could possibly be explained by the different sample sizes used and that Lee used Beck's Depression Inventory-II (BDI-II) to assess for depressive symptoms while this current study used Patient Health Questionnaire (PHQ-9). The sample size in Lee's study was 51 respondents while the current study had 180 participants.

In this study age was not significantly associated with depressive symptoms, this is in contrast to studies by Ambaw et al (2017), Dasa et al., (2019), Buberwa, (2013), Alinaitwe, (2018), Adem et al., (2014) and Ige & Lasebikan, (2011) which have all shown a significant association between age and depressive symptoms. For instance, Ambaw et al (2017), found that for every 14 years increase in age, the risk of having depressive symptoms increased by 19.0%. However, the reasons for this finding by Ambaw and others are not clear (Ambaw et al 2017). In addition, a study in Uganda by Alinaitwe, (2018) found that being above 50 years was significantly associated with more depressive illness compared to being aged between 30-50 years which was protective for depressive illness. In Kenya, Lee., (2015) found that younger age (13-54 years) to be significantly more depressed than older individuals above 55 years. However, similar findings to this study are reflected in a study by Aniebue and colleagues in 2006 where age was not significantly associated with depressive symptoms (Aniebue, P., & Okonkwo, 2006).

The inconsistency of association between depressive symptoms and age has been reported in the literature. For instance, Street, (2004) stated that there are conflicting results from many studies that investigated the influence and relationship of aging on the severity of depression. In addition, the literature suggests that there is a U-shaped relationship between depression and age, this relationship was derived from a study by Kessler and colleagues (1992), who analyzed two large national surveys data and reported that there was a decline in depressive symptoms from young adulthood to midlife, thereafter depressive symptoms start to go up again with increasing age (R. C. Kessler et al., 1992).

In this study, gender had no significant relationship with depressive symptoms among TB patients. Similar findings can be seen in other studies by Issa et al., (2009) and Adem et al., (2014). However, this finding was in contrast with studies by Ambaw et al (2017), Duko et al., (2015), Alinaitwe, (2018), and Kehbila et al., (2016) which have all shown a significant association between gender and depressive symptoms. For example, a study by Kehbila et al in 2016 reported that females were three times more likely to be depressed than males. In another study in South Ethiopia by Duko et al (2015), females were 72 % more likely to be depressed compared to males. The association between females and depressive symptoms could possibly be due to female hormones like estrogen and also the social roles of women in society (Alinaitwe, 2018). However, according to Kessler, (2006), he stated that hormonal changes during menopause, hormone replacement therapy, pregnancy, and oral contraceptive use do not influence major depression significantly. These observations imply that the main explanation for the higher prevalence of depression among women compared to men is based on extensive joint investigations on the effects of environmental provoking experiences and biological vulnerabilities (Accortt et al., 2008).

Moreover, the literature suggests that depression leads to causing disease-related disability in the world among women today. Kessler, (2006) stated that depression is much more common among women than men, with female to male risk ratios of approximately two to one. In addition, Kessler reported that depression has a higher risk of first onset and recurrence in women hence leading to higher rates of prevalence in women compared to men.

In addition, Wilhelm (2009) stated that in the male population it is frequently indicated that men have low depression rates than women, however, this does not certainly denote improved

overall mental health. Wilhelm further stated that the low depression rates in men compared to women reflect several issues such as psychosocial barriers in looking for help and the rates of depression among men vary with age groups, and certain men of particular subgroups may be vulnerable. Wilhelm also stated that men frequently exhibit different behaviors and symptoms in response to depression and they display anxiety problems less frequently and men are at a greater risk of abusing substances which can have a negative health outcome later in life. Wilhelm reported that women tend to have better emotional literacy and often tend to share how they feel, while men are less likely to share their feelings. However, men can share their feelings when provided with an environment that is safe to do so (Wilhelm, 2009).

Regarding marital status, this study found no significant association between marital status and depressive symptoms among TB patients. This finding was replicated in other studies by Xavier et al., (2015), Issa et al.,(2009), and Adem et al., (2014). However, this finding was in contrast with other studies by Alinaitwe, (2018), Ambaw et al (2017), Duko et al., (2015), and Kehbila et al., (2016) which have all shown a significant association between marital status and depressive symptoms. For instance, Alinaitwe, (2018) found that the odds of developing depressive illness when one is separated, divorced, or widowed were two times higher compared to the ones who were married. Similarly in another study by Ige et al (2011) in Nigeria showed that unmarried participants were more likely to have depressive symptoms compared to the married. This could be due to reduced social support in the face of a chronic illness like tuberculosis (Duko et al 2015). Also, could be due to the lack of marital partners' influence on health behaviors (Jang et al., 2009).

In addition, the literature suggests that marriage has some protective effects on the health of a person; that is, a married person is more likely to be healthier compared to separated, divorced, widowed, or never-married individuals (Manzoli et al., 2007). Married persons are said to experience much lower rates of depression (Afifi et al., 2006). Jang et al., (2009) stated that several mechanisms mediate how marriage is beneficial, these mechanisms include financial security among couples, access to economic resources, and social support. Furthermore, they also found that the association between depressive symptoms and marital status remained fairly the same for men of all ages.

In this study, education level had no significant association with depressive symptoms among TB patients. This reflects similar findings in other studies by Adem et al., (2014), Dasa et al., (2019), and Xavier et al., (2015). However, this finding was in contrast with studies by Ambaw et al (2017), Alinaitwe, (2018), and Kehbila et al., (2016) which showed a significant relationship between education level and depressive symptoms among TB patients. For example, a study by Kehbila et al (2016) in the Southwest region of Cameroon showed that depression was more common among people with low educational attainment. Similarly in Uganda, Alinaitwe, (2018) found that participants with a lower level of education were more likely to have depressive illness than their counterparts with higher education. This could possibly be due to suggestions that a higher level of education leads to better income and access to a wide range of health services, hence better (mental) health outcomes (Ambaw et al 2017).

With regard to the level of income, this study found no significant association between the level of income and depressive symptoms among TB patients. This finding was replicated in

other studies by Xavier et al., (2015) and Adem et al., (2014). However, this finding was in contrast with studies by Dasa et al., (2019), Alinaitwe, (2018), Ambaw et al (2017), and Aniebue et al., (2006) which have all shown a significant correlation between the level of income and depressive symptoms. Low socioeconomic status has been implicated in many studies as a risk factor for depressive symptoms (Alinaitwe, 2018). Moreover, people living in poverty have a greater risk of exposure to TB due to poorly ventilated living conditions and overcrowding which favor TB transmission. In addition, poverty increases the risk of exposure to precipitating factors such as social exclusion, violence, abuse, and discrimination, while at the same time lacking adequate access to health care, education, and other essential services (Funk et al., 2012). This collection of chronic stressors can lead to sustained neuroendocrine and autonomic responses, the elevation of pro-inflammatory cytokines and, this eventually could lead to depression (Berk et al., 2013).

However, some scholars have noted that socioeconomic disparity in depression is diverse and differs according to how a psychiatric disorder is assessed or measured, the measurement and definition of low socioeconomic status, and the contextual characteristic of time and region (Lorant et al., 2003). In addition, Freeman et al., (2016) lamented that many studies that have investigated the relationship between socioeconomic status and depression are limited in their national scope, they used unstandardized measurements and definitions across populations and analyzed different components of socioeconomic status separately. This could explain the variations in many studies.

BMI was not significantly associated with depressive symptoms in contrast to a study done in Cameroon by Kehbila et al., (2016) which showed a significant association between BMI and depressive symptoms.

Generally, looking at the sociodemographic factors, this study found no significant risk factors for depressive symptoms among participants. These findings differ from a cross-sectional analysis of community-based data from 48 low and middle-income countries conducted by Koyanagi et al (2017), which Kenya was among them, they found that older age, female sex, lower levels of wealth, smoking, and diabetes were significantly associated with depressive symptoms (Koyanagi et al., 2017). Depression conventionally is believed to have a higher preponderance in females, the elderly, those with low BMI, and among those with lower educational status (Koyanagi et al., 2017; Mohammedhussein et al., 2020; Shrestha, 2020).

Our findings suggest that being male or female does not offer any protection or benefit when suffering from TB and depression comorbidity. However, patients with lower income were found to have high rates of depression 45% but were not statistically significant.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The prevalence of depressive symptoms among tuberculosis patients attending TB clinic at Webuye County Hospital, Bungoma County, Western Kenya was 37.8 %.

HIV/AIDs and TB treatment phase were significant factors associated with depressive symptoms among TB patients at Webuye County Hospital.

6.2 Recommendations

All TB patients should be screened for depression and monitored more carefully for depression during treatment. Moreover, patients with depressive symptoms should be referred to mental health professionals when possible.

REFERENCES

Accortt, E. E., Freeman, M. P., & Allen, J. J. B. (2008). Women and major depressive disorder: Clinical perspectives on causal pathways. *Journal of Women's Health*, *17*(10), 1583–1590. https://doi.org/10.1089/jwh.2007.0592

Adem, A., Tesfaye, M., & Mohammed, M. (2014). The Prevalence and Pattern of Depression in Patients with Tuberculosis on Follow up at Jimma University Specialized Hospital and Jimma Health Center. *Medicine Science | International Medical Journal*, *3*(1), 955. https://doi.org/10.5455/medscience.2013.02.8097

Adewuya, A. O., Ola, B. A., & Afolabi, O. O. (2006). Validity of the patient health questionnaire (PHQ-9) as a screening tool for depression amongst Nigerian university students. *Journal of Affective Disorders*, *96*(1–2), 89–93. https://doi.org/10.1016/j.jad.2006.05.021

Afifi, T. O., Cox, B. J., & Enns, M. W. (2006). Mental health profiles among married, never-married, and separated/ divorced mothers in a nationally representative sample. *Social Psychiatry and Psychiatric Epidemiology*, *41*(2), 122–129. https://doi.org/10.1007/s00127-005-0005-3

Alinaitwe, R. (2018). Prevalence and factors associated with depressive illness in patients with tuberculosis in Mulago Hospital, (June).

Ambaw, F., Hanlon, C., Alem, A., & Mayston, R. (2017). Burden and presentation of depression among newly diagnosed individuals with TB in primary care settings in Ethiopia. *BMC Psychiatry*, *17*(1), 57. https://doi.org/10.1186/s12888-017-1231-4

Amha, H., Mulugeta, H., Getnet, A., Haile, D., Anteneh, K., Tilahun, M., & Desta, M. (2021). Magnitude of depression and associated factors among patients with tuberculosis in sub-

Saharan Africa : A systematic review and International Classification of Diseases. *Journal of Affective Disorders Reports*, *4*(January), 100080. https://doi.org/10.1016/j.jadr.2021.100080

Aniebue, P., & Okonkwo, K. (2006). Prevalence of depressive symptoms amongst pulmonary tuberculosis patients at the University of Nigeria teaching hospital, Enugu. *International Journal of Medicine and Health*, 99–117.

Baba A Issa, Abdullah D Yussuf, S. I. K. (2009). Depression comorbidity among patients with tuberculosis in a university teaching hospital outpatient clinic in Nigeria, 133–138.

Basu, G., Chatterjee, C., Singh, R., & Biswas, S. (2012). Prevalence of depression in tuberculosis patients : An experience from a DOTS clinic. *Indian Journal of Research and Reports in Medical Sciences*, *2*(4), 2–5.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1960). An Inventory for Measuring Depression The difficulties inherent in obtaining, 561–571.

Berk, M., Williams, L. J., Jacka, F. N., O'Neil, A., Pasco, J. A., Moylan, S., … Maes, M. (2013). So depression is an inflammatory disease, but where does the inflammation come from? *BMC Medicine*, *11*(1), 1–16. https://doi.org/10.1186/1741-7015-11-200

Bozza, V. V., D'Attilio, L., Mahuad, C. V., Giri, A. A., Del Rey, A., Besedovsky, H., … Bay, M. L. (2007). Altered cortisol/DHEA ratio in tuberculosis patients and its relationship with abnormalities in the mycobacterial-driven cytokine production by peripheral blood mononuclear cells. *Scandinavian Journal of Immunology*, *66*(1), 97–103. https://doi.org/10.1111/j.1365-3083.2007.01952.x

Buberwa, G. (2013). Prevalence of depression among tuberculosis patients attending clinics in Temeke municipal, Dar es salaam, Tanzania. *Muhimbili University of Health and*

Allied Sciences.

Cameron, I. M., Crawford, J. R., Lawton, K., & Reid, I. C. (2008). Psychometric comparison of PHQ-9 and HADS for measuring depression severity in primary care. *British Journal of General Practice*, *58*(546), 32–36. https://doi.org/10.3399/bjgp08X263794

Dasa, T. T., Roba, A. A., Weldegebreal, F., Mesfin, F., Asfaw, A., Mitiku, H., … Tesfaye, E. (2019). Prevalence and associated factors of depression among tuberculosis patients in Eastern Ethiopia, 1–7.

DeJean, D., Giacomini, M., Vanstone, M., & Brundisini, F. (2013). Patient experiences of depression and anxiety with chronic disease: A systematic review and qualitative meta-synthesis. *Ontario Health Technology Assessment Series*, *13*(16), 1–33.

Duko, B., Bedaso, A., & Ayano, G. (2020). The prevalence of depression among patients with tuberculosis : a systematic review and meta - analysis. *Annals of General Psychiatry*, 1–11. https://doi.org/10.1186/s12991-020-00281-8

Duko, B., Gebeyehu, A., & Ayano, G. (2015). Prevalence and correlates of depression and anxiety among patients with tuberculosis at WolaitaSodo University Hospital and Sodo Health Center , WolaitaSodo , South Ethiopia , Cross. *BMC Psychiatry*, 1–7. https://doi.org/10.1186/s12888-015-0598-3

Dum, M., Pickren, J., Sobell, L. C., & Sobell, M. B. (2008). Comparing the BDI-II and the PHQ-9 with outpatient substance abusers. *Addictive Behaviors*, *33*(2), 381–387. https://doi.org/10.1016/j.addbeh.2007.09.017

Freeman, A., Tyrovolas, S., Koyanagi, A., Chatterji, S., Leonardi, M., Ayuso-Mateos, J. L., … Haro, J. M. (2016). The role of socio-economic status in depression: Results from the COURAGE (aging survey in Europe). *BMC Public Health*, *16*(1), 1–8.

https://doi.org/10.1186/s12889-016-3638-0

Funk, M., Drew, N., Knapp, M., & Knapp, M. (2012). Mental health, poverty and development. *Journal of Public Mental Health*, *11*(4), 166–185. https://doi.org/10.1108/17465721211289356

Gelaye, B., Michelle A. Williams, Seblewengel Lemma, Negussie Deyessa, Yonas Bahretibeb, Teshome Shibre, Dawit Wondimagegn, Asnake Lemenhe, Jesse Fann, Ann Vander Stoep, and X.-H. A. Z. (2014). Validity of the Patient Health Questionnaire-9 for Depression Screening and Diagnosis in East Africa. *Bone*, *23*(1), 1–7. https://doi.org/10.1016/j.psychres.2013.07.015.Validity

George, D. and Mallery, P. (2003). No TitleSPSS for Windows step by step: A simple guide and reference. *Boston: Allyn and Bacon*.

Ige, O. M., & Lasebikan, V. O. (2011). Prevalence of depression in TB patients in comparison to non-tuberculous family contacts visiting the DOTS clinic in tertiary care hospital and its correlation with disease pattern. 2008;17:3–5. *Mental Health in Family Medicine*, 235–242.

Jang, S. N., Kawachi, I., Chang, J., Boo, K., Shin, H. G., Lee, H., & Cho, S. il. (2009). Marital status, gender, and depression: Analysis of the baseline survey of the Korean Longitudinal Study of Ageing (KLoSA). *Social Science and Medicine*, *69*(11), 1608–1615. https://doi.org/10.1016/j.socscimed.2009.09.007

Kehbila, J., Ekabe, C. J., Aminde, L. N., Noubiap, J. J. N., Fon, P. N., & Monekosso, G. L. (2016). Prevalence and correlates of depressive symptoms in adult patients with pulmonary tuberculosis in the Southwest Region of Cameroon. *Infectious Diseases of Poverty*, *5*(1), 51. https://doi.org/10.1186/s40249-016-0145-6

Keller, J., Gomez, R., Williams, G., Lembke, A., Lazzeroni, L., Murphy, G. M., & Schatzberg, A. F. (2017). HPA axis in major depression: Cortisol, clinical symptomatology and genetic variation predict cognition. *Molecular Psychiatry*, *22*(4), 527–536. https://doi.org/10.1038/mp.2016.120

Kenedi, C. A., & Goforth, H. W. (2011). A Systematic Review of the Psychiatric Side-Effects of Efavirenz, 1803–1818. https://doi.org/10.1007/s10461-011-9939-5

Kessler, R. C., Foster, C., Webster, P. S., & House, J. S. (1992). The relationship between age and depressive symptoms in two national surveys. *Psychology and Aging*, *7*(1), 119–126. https://doi.org/10.1037/0882-7974.7.1.119

Kessler, Ronald C. (2006). The epidemiology of depression among women. *Women and Depression: A Handbook for the Social, Behavioral, and Biomedical Sciences*, *74*, 22–38. https://doi.org/10.1017/CBO9780511841262.004

Koyanagi, A., Vancampfort, D., Carvalho, A. F., Devylder, J. E., & Haro, J. M. (2017). Depression comorbid with tuberculosis and its impact on health status : cross-sectional analysis of community-based data from 48 low- and middle-income countries, 1–10. https://doi.org/10.1186/s12916-017-0975-5

Kumar, K., Kumar, A., Chandra, P., & Kansal, H. (2016). A study of prevalence of depression and anxiety in patients suffering from tuberculosis. *Journal of Family Medicine and Primary Care*, *5*(1), 150. https://doi.org/10.4103/2249-4863.184641

Lee, E. (2015). Prevalence of Depression among Active TB and DEPRESSION AMONG ACTIVE TB AND TB / HIV PATIENTS IN KISUMU, 1–35. Retrieved from http://digitalcollections.sit.edu/isp_collection

Lorant V, Deliège D, Eaton W, Robert A, Philippot P, A. M. (2003). Socioeconomic

inequalities in depression: a meta-analysis. *Am J Epidemiol*.

Manzoli, L., Villari, P., M Pirone, G., & Boccia, A. (2007). Marital status and mortality in the elderly: A systematic review and meta-analysis. *Social Science and Medicine*, *64*(1), 77–94. https://doi.org/10.1016/j.socscimed.2006.08.031

Masumoto, S., Yamamoto, T., Ohkado, A., Yoshimatsu, S., Querri, A. G., & Kamiya, Y. (2014). Prevalence and associated factors of depressive state among pulmonary tuberculosis patients in Manila , The Philippines, *18*(October 2013), 174–179.

Max Hamilton. (1960). Scale for depression. *Matrix*, 56–63.

Mayes, T. L., Bernstein, I. H., Haley, C. L., Kennard, B. D., & Emslie, G. J. (2010). Psychometric properties of the children's depression rating Scale-Revised in adolescents. *Journal of Child and Adolescent Psychopharmacology*, *20*(6), 513–516. https://doi.org/10.1089/cap.2010.0063

Mohammedhussein, M., Alenko, A., Tessema, W., & Mamaru, A. (2020). Prevalence and Associated Factors of Depression and Anxiety Among Patients with Pulmonary Tuberculosis Attending Treatment at Public Health Facilities in Southwest Ethiopia, 1095–1104.

Monahan, P. O., Shacham, E., Reece, M., Kroenke, K., Ong'Or, W. O., Omollo, O., … Ojwang, C. (2009). Validity/reliability of PHQ-9 and PHQ-2 depression scales among adults living with HIV/AIDS in Western Kenya. *Journal of General Internal Medicine*, *24*(2), 189–197. https://doi.org/10.1007/s11606-008-0846-z

Montgomery, S. A., & Asberg, M. (1979). A new depression scale designed to be sensitive to change. *British Journal of Psychiatry*, *134*(4), 382–389. https://doi.org/10.1192/bjp.134.4.382

Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: results from the World Health Surveys. *Lancet*, *370*(9590), 851–858. https://doi.org/10.1016/S0140-6736(07)61415-9

Naidoo, P., & Mwaba, K. (2010). Helplessness, depression, and social support among people being treated for tuberculosis in South Africa. *Social Behavior and Personality*, *38*(10), 1323–1334. https://doi.org/10.2224/sbp.2010.38.10.1323

Ntarangwi, M. (2008). Prevalence of depression among TB patients attending TB clinic at Mbagathi District hospital Nairobi, Kenya [M.Sc. Clinical Psychology Dissertation], 2–3.

Osman, A., Kopper, B. A., Barrios, F., Gutierrez, P. M., & Bagge, C. L. (2004). Reliability and validity of the Beck Depression Inventory - II with adolescent psychiatric inpatients. *Psychological Assessment*, *16*(2), 120–132. https://doi.org/10.1037/1040-3590.16.2.120

Pachi, A., Bratis, D., Moussas, G., & Tselebis, A. (2013). Psychiatric Morbidity and Other Factors Affecting Treatment Adherence in Pulmonary Tuberculosis Patients, *2013*.

Patten, S. B. (2001). Long-term medical conditions and major depression in a Canadian population study at waves 1 and 2. *Journal of Affective Disorders*, *63*(1–3), 35–41. https://doi.org/10.1016/S0165-0327(00)00186-5

Peduz, P., Concato, J., Kemper, E., Holford, T. R., & Feinstein, A. R. (1996). Study of the Number of Events per Variable in Logistic Regression Analysis, *49*(12), 1373–1379.

Pruchno, R., Wilson-genderson, M., & Cartwright, F. P. (2009). Depressive Symptoms and Marital Satisfaction in the Context of Chronic Disease : A Longitudinal Dyadic Analysis, *23*(4), 573–584. https://doi.org/10.1037/a0015878

Richardson, L. P., McCauley, E., Grossman, D. C., McCarty, C. A., Richards, J., Russo, J. E.,

… Katon, W. (2010). Evaluation of the Patient Health Questionnaire-9 Item for Detecting Major Depression Among Adolescents. *Pediatrics*, *126*(6), 1117–1123. https://doi.org/10.1542/peds.2010-0852

Roadolff, L. S. (1977). The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385–401.

Rothermund, K., & Brandtstädter, J. (2003). Depression in later life: Cross-sequential patterns and possible determinants. *Psychology and Aging*, *18*(1), 80–90. https://doi.org/10.1037/0882-7974.18.1.80

Rush, A. J., Trivedi, M. H., Ibrahim, H. M., Carmody, T. J., Arnow, B., Klein, D. N., … Keller, M. B. (2003). The 16-item Quick Inventory of Depressive Symptomatology (QIDS), clinician rating (QIDS-C), and self-report (QIDS-SR): A psychometric evaluation in patients with chronic major depression. *Biological Psychiatry*, *54*(5), 573–583. https://doi.org/10.1016/S0006-3223(02)01866-8

Saracino, R.M., Cham, H., Rosenfeld, B., & Nelson, C. J. (2018). Confirmatory factor analysis of the Center for Epidemiologic Studies Depression Scale in oncology with examination of invariance between younger and older patients. *European Journal of Psychological Assessment.*

Shirey, K., Manyara, S. M., Atwoli, L., Tomlin, R., Gakinya, B., Cheng, S., … Pastakia, S. (2015). Journal of Clinical & Translational Endocrinology Symptoms of depression among patients attending a diabetes care clinic in rural western Kenya, *2*, 51–54. https://doi.org/10.1016/j.jcte.2015.02.002

Shrestha, P. (2020). Depression among TB patients and associated factors in Kathmandu Valley , Nepal.

Street, B. M. (2004). The relationship between age and depression: a self-efficacy model.

Sun, S., & Wang, S. (2015). The Children's Depression Inventory in Worldwide Child Development Research: A Reliability Generalization Study. *Journal of Child and Family Studies*, *24*(8), 2352–2363. https://doi.org/10.1007/s10826-014-0038-x

Sweetland, A. C., Kritski, A., Oquendo, M. A., Sublette, M. E., Pala, A. N., Silva, L. R. B., … Wainberg, M. L. (2017). Addressing the tuberculosis–depression syndemic to end the tuberculosis epidemic, *124*(0 0), 1108–1114. https://doi.org/10.1016/j.neuroimage.2015.08.075.MGH-USC

Titov, N., Dear, B. F., McMillan, D., Anderson, T., Zou, J., & Sunderland, M. (2011). Psychometric comparison of the PHQ-9 and BDI-II for measuring response during treatment of depression. *Cognitive Behaviour Therapy*, *40*(2), 126–136. https://doi.org/10.1080/16506073.2010.550059

Tomita, A., Ramlall, S., Naidu, T., Mthembu, S. S., Padayatchi, N., & Burns, J. K. (2019). Major depression and household food insecurity among individuals with multidrug-resistant tuberculosis (MDR-TB) in South Africa. *Social Psychiatry and Psychiatric Epidemiology*, *54*(3), 387–393. https://doi.org/10.1007/s00127-019-01669-y

Trajković, G., Starčević, V., Latas, M., Leštarević, M., Ille, T., Bukumirić, Z., & Marinković, J. (2011). Reliability of the Hamilton Rating Scale for Depression: A meta-analysis over a period of 49years. *Psychiatry Research*, *189*(1), 1–9. https://doi.org/10.1016/j.psychres.2010.12.007

Van Den Heuvel, L., Chishinga, N., Kinyanda, E., Weiss, H., Patel, V., Ayles, H., … Seedat, S. (2013). Frequency and correlates of anxiety and mood disorders among TB- and HIV-infected Zambians. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*,

25(12), 1527–1535. https://doi.org/10.1080/09540121.2013.793263

Westaway, M. S., & Wolmarans, L. (1992). Depression and self-esteem: Rapid screening for depression in black, low literacy, hospitalized tuberculosis patients. *Social Science and Medicine*, *35*(10), 1311–1315. https://doi.org/10.1016/0277-9536(92)90184-R

WHO. (2017). Depression and Other Common Mental Disorders Global Health Estimates.

WHO. (2015). Use of high burden country lists for TB by WHO in the post-2015 era. *WHO Press*, (April), 19. https://doi.org/http://www.who.int/tb/publications/global_report/high_tb_burdencountrylists2016-2020.pdf

WHO Report, G. T. (2017). *TUBERCULOSIS*.

Wilhelm. (2009). Men and depression. *Aust Fam Physician*.

Xavier, P. B., & Peixoto, B. (2015). Emotional distress in angolan patients with several types of tuberculosis. *African Health Sciences*, *15*(2), 378–384. https://doi.org/10.4314/ahs.v15i2.10

Yesavage, J. A., Brink, T. L., Rose, T. L., Lum, O., Huang, V., Adey, M., & Leirer, V. O. (1982). Development and validation of a geriatric depression screening scale: A preliminary report. *Journal of Psychiatric Research*, *17*(1), 37–49. https://doi.org/10.1016/0022-3956(82)90033-4

Yohannes, K., Mokona, H., Abebe, L., Feyisso, M., Tesfaye, A., Tesfaw, G., & Ayano, G. (2020). Prevalence of depressive symptoms and associated factors among patients with tuberculosis attending public health institutions in Gede ’ o zone , South Ethiopia, 1–9.

APPENDICES

Appendix 1: Informed Consent Form

INFORMED CONSENT

Study title: Prevalence and factors associated with depression among tuberculosis patients attending TB clinic at Webuye County Hospital.

Invitation to participate

You are invited to participate in this study on Prevalence and factors associated with depression among tuberculosis patients attending TB clinic at Webuye County Hospital.

Basis for selection

You are eligible to participate in this study since you are registered at the TB clinic.

Purpose of the study

To determine the prevalence and factors associated with depression among tuberculosis patients attending TB clinic at Webuye County Hospital.

Procedures

You will be asked some questions about your personal details and some of your information will be from the TB register. The patient may be referred for further evaluation if need be.

Potential benefits

There is no financial reward for participation in this study. Knowing the prevalence and factors associated with depression among tuberculosis patients will help to improve care for the patients in the clinic and inform policy.

Potential risks

There are no risks in this study as no invasive procedures will be used.

Guarantee of confidentiality

To ensure confidentiality, your name will not appear on any materials or reports of the research findings (including web site postings of the results, conference presentations or publications). Materials associated with this study will be kept under lock and key in a cabinet. The signed consent form will be stored separately from your data to ensure complete confidentiality.

Withdrawal from participation

Participation in this study is voluntary and your decision to or not to participate will not affect your care at Webuye County Hospital. If you decide not to participate, you are free to withdraw your consent and to discontinue your participation at any time.

Offer to answer any questions

If you have any questions about the procedures at any time, please do not hesitate to ask. All questions about the procedures and the study in general will be answered. However, some questions may not be answered until after you have completed the procedures to ensure that the answers will not affect your responses.

Participant's statement

I am voluntarily making the decision to participate and my signature certifies that I have heard and understand the aforementioned information. Also my questions have all been answered to my satisfaction and signing this document doesn't mean I waive any legal rights.

Participant's signature …… Date…….

Researcher's statement

In my judgment, the aforementioned participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to do so.

Researcher's

Name……

Researcher's signature ……

Date……...……

0724675145

josephyaa22@gmail.com

Appendix 2: Study Questionnaire

Date of interview _____

1) Age: _____ (years) (as recorded in the TB register)
2) Gender: Male [ ] Female [ ]
3) Weight _____kgs Height _____m BMI _____

   Underweight < 18.5 [ ] Normal range 18.5 – 24.5 [ ] Overweight > 25 [ ]

4) Marital status: (Please tick)

   Single [ ] Married [ ] Divorced [ ] Separated [ ] Widowed [ ]

5) Education level completed:(Please Tick)

   None [ ] Primary [ ] Secondary [ ] College [ ] University [ ]

6) What is your family`s monthly income? (Please Tick)

Below KES 10,000 per month	
Between KES 10,000 and 19,999 per month	
Between KES 20,000 and 30,000 per month	
Over KES 30,000 per month	
Student	

7) Treatment phase: Intensive [ ] maintenance [ ] (as recorded in the TB register)
8) Do you have Diabetes (high sugar)? Yes [ ] No [ ] Never tested [ ]
9) Do you have HIV/AIDs? Yes [ ] No [ ] Never tested [ ]
10) Have you ever consumed alcohol?

    Never consumed [ ] Former consumer [ ] Current consuming [ ]

11) Have you ever used any form of tobacco (cigarettes, tobacco, cigar, pipes)

    Never used [ ] Former user [ ] Current using [ ]

Appendix 3: Patient Health Questionnaire (PHQ-9)

The Patient Health Questionnaire (PHQ-9)

Patient number _____ Date _____

Over the past 2 weeks, how often have you been bothered by any of the following problems?		**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 fidgety 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 in some way	0	1	2	3
Column total			_____	+ _____	+_____
Add totals together			_____		

If you checked off any problems, how difficult have those 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 []Extremely difficult

Appendix 4: IREC Approval

MU/MTRH-INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET

Reference: IREC/2018/251
Approval Number: 0003166

6th December, 2018

Dr. Joseph Yaa Karisa,
Moi University,
School of Medicine
P.O. Box 4606-30100,
ELDORET-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
06 DEC 2018
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Karisa,

RE: FORMAL APPROVAL

The MU/MTRH- Institutional Research and Ethics Committee has reviewed your research proposal titled: -

"Factors Associated with Depression among Tuberculosis Patients Attending Tuberculosis Clinic at Webuye County Hospital".

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 3166*** on 6th December, 2018. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; hence will expire on 5th December, 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date. You will be required to submit progress report(s) on application for continuation, at the end of the study and any other times as may be recommended by the Committee.

Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. You will also be required to seek further clearance from any other regulatory body/authority that may be appropriate and applicable to the conduct of this study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc	CEO	-	MTRH	Dean	-	SOP	Dean	-	SOM
	Principal	-	CHS	Dean	-	SON	Dean	-	SOD

Appendix 5: Budget

BUDGET

Index	**STATIONERY & EQUIPMENT**	**QUANTITY**	**COST/UNIT (Kshs.)**	**TOTAL (Kshs.)**
1	Printing papers	5 rims	500.00	2,500.00
2	Ball-point pens	1 Packet	20.00	400.00
3	Pencils	5	20.00	100.00
4	Erasers	5 pieces	20.00	100.00
5	Pocket files	5	100.00	100.00
6	Staples	2	200.00	400.00
8	Printing of draft proposal	7 copies	@500.00	3,500.00
9	Printing of the final proposal manuscript	5 copies	@500.00	2,500.00
10	Printing of the final thesis and publication			100,000
11	Lunch allowances for the research assistant			20,000.00
12	Travelling expenses			10,000.00
13	Communication & liaison expenses			5,000.00
14	IREC fee			5000.00
15	Plagiarism certificate			5000.00
16	Miscellaneous expenses			10,000.00
GRAND TOTAL				**164,600.00**