

**INFLUENCE OF PHYSICAL ACTIVITY ON PSYCHOLOGICAL WELL-BEING OF
TYPE II DIABETIC PATIENTS TAKING ORAL HYPOGLYCAEMIC DRUGS IN KISII
TEACHING AND REFERRAL HOSPITAL, KENYA.**

BY

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THE DEGREE OF MASTER OF PUBLIC HEALTH
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DECLARATION

I hereby declare that this thesis is my original work, except where due references have been cited and that it has not been submitted to any university in entirety or partially for an award of any degree.

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DEDICATION

I dedicate this thesis to those who believed in me more than myself especially, my husband Mr. James Nyandieka. Thanks for the continuous support.

ABSTRACT

In 2011, 366 million people had diabetes worldwide and the prevalence of the disease in Africa is estimated to be 3.8% (14.7 million adults) with undiagnosed diabetes of about 78 percent. In Kenya, the prevalence of diabetes is 4.2% in the general population with prevalence of 2.2% percent in rural areas and 12.2% in urban areas. In Kisii Sub-County, the prevalence of diabetes is 11% which is higher than the national prevalence. Persons who have been diagnosed with diabetes become frustrated and worried about future complications and cost of treatment, which causes psychosocial disorders including stress, anxiety and depression. Physical activity has been shown in numerous studies to improve mental health in the general population, but less evidence is available to show if similar positive improvements in well-being can be seen in persons with Type II diabetes. The main objective of the study was to determine the influence of physical activity on psychological well-being of Type II diabetes patients. The study adopted across sectional design and a total of 202 diabetic patients out of the 400 regular patients attended to at Kisii Teaching and Referral Hospital were selected by systematic random sampling method, where every second patient was recruited to participate in the study. Data was collected using a pretested questionnaire with three sections gathering information on socio-demographic profile, physical activity, psychological well-being, and other health profile details of the patient. On psychological well-being, depression, Anxiety and Stress Scale-42 (DASS-42) was used and for physical activity, International Physical Activity Questionnaire (IPAQ short version was used. Descriptive statistics was used to summarize the data using proportions. Linear and logistic regression was applied to assess the relationship between physical activity and psychological well-being. This study revealed that the prevalence of depression, anxiety and stress in Kisii Teaching and Referral Hospital was 41.1%, 64.9% 49% respectively. Anxiety symptoms were more prevalent than depression and stress. In physical activity 7(3.5%) were inactive, 55(27.2%) were moderately active and over two thirds 140(69.3%) were very active. On the association between physical activity and psychological well-being, coefficient of determination in linear regression revealed that the adjusted R square for depression; anxiety and stress was 0.191; 0.157 and 0.126 respectively. This implied that physical activity could significantly account for 19.1% of the cases of depression ($R^2 = 0.191$, $F = 48.477$, $p = 0.000$), 15.7 % cases of anxiety ($R^2 = 0.157$, $F = 38.543$, $p = 0.000$) and 12.6% of the cases of stress ($R^2 = 0.126$, $F = 29.933$, $p = 0.000$). Binary regression revealed that socio- demographic variables as gender, age, sex, marital status, level of education and duration lived with diabetes had no influence on depression, anxiety and stress. Only increase in the level of physical activity of diabetic patients reduced the occurrence of depression, anxiety and stress. Increasing levels of physical activity was able to reduce the chances of being depressed ($OR = 0.201$, $C. I. = 0.104 - 0.386$, $p = 0.000$) anxiety (Adjusted $OR = 0.161$, $C. I. = 0.070 - 0.372$, $p = 0.000$) and stress (Adjusted $OR = 0.136$, $C. I. = 0.070 - 0.267$, $p = 0.000$). This study is consistent with a growing body of research that supports that physical activity is a behavior that improves both physical and mental health and therefore should be used to reduce prevalence of these psychological problems among the diabetics. Management of stress, anxiety and depression will improve clinical outcomes and decrease the associated resource utilization and costs.

TABLE OF CONTENTS

DECLARATION.....	i
ACKNOWLEDGEMENTS	ii
DEDICATION.....	iii
ABSTRACT.....	iv
TABLE OF CONTENTS	v
ACRONYMS AND ABBREVIATIONS.....	ix
OPERATIONAL DEFINITIONS	x
TABLES.....	i
FIGURES.....	ii
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Background.....	1
1.3 Statement of the Problem.....	5
1.4 Justification of the Study	7
1.5 General Objective	8
1.5.1 Specific Objectives	8
1.6 Research Questions.....	9
1.7 Significance of the study.....	9
1.8 Limitations of the study	10
1.9 Assumptions.....	10
1.10 Conceptual Framework.....	11
CHAPTER TWO	13
LITERATURE REVIEW	13
2.1 Introduction.....	13
2.2 Psychological Well-being of Type II Diabetes Patients	13

2.2.1 Trend of the Psychological well-being of Type II Diabetic Patients	13
2.2.2 Summary of Knowledge Gap on Psychological Well-being.....	14
2.3 Level Physical Activity among Type II diabetic Patients	15
2.3.1 Recommended Guide Lines for Physical Activity	15
2.3.2 Trend of Physical Activity among Type II Diabetic Patients	15
2.3.4 Reason for low Physical Activity among the Diabetics	16
2.3.5 Summary of Knowledge Gaps on Level of Physical Activity.....	16
2.4 Association between Physical Activity and Psychological Well-being.....	17
2.4.1 Physical activity and depression	17
2.4.2 Physical Activity and Anxiety	18
2.4.3 Physical Activity and Stress	18
2.4.4 Summary of Knowledge Gap on the Association between Physical Activity and Psychological Well-being	19
2.5 Association between Socio-demographic Variables and Psychological Well-being	20
CHAPTER THREE	21
METHODOLOGY	21
3.1 Introduction.....	21
3.2 Study Design.....	21
3.3 Study Population.....	21
3.4 Study Area	22
3.5 Sample Size Determination and Sampling Procedure	23
3.6 Study Variables and Measurement	23
3.6.1 Study Variables.....	23
3.6.2 Measurements	23
3.7 Pilot Study and Standardization.....	26
3.8 Data Collection Tools and Process	26
3.9 Data Presentation/ Analysis Plan	26
3.10 Inclusion and Exclusion Criteria.....	27
3.10.1 Inclusion criteria.....	27
3.10.2 Exclusion criteria	27
3.11 Ethical Approval and Consideration	27

3.11.1 Ethical Approval	27
3.11.2 Ethical Considerations.....	28
CHAPTER FOUR.....	29
RESULTS	29
4.1 Introduction.....	29
4.2 Psychological well-being	29
4.2.1 Distribution of Depression	34
4.2.3 Distribution of Anxiety	35
4.2.4 Distribution of Stress.....	35
4.3 Physical Activity	36
4.3.1 Association between Physical Activity and Psychological Well-being.....	37
4.4 Socio-demographic and diabetic profile of the study participants	39
4.5.1 Association between Physical Activity, Socio-demographic variables and Psychological Well-being.....	40
CHAPTER FIVE	43
DISCUSSION	43
5.1 Introduction.....	43
5.2 Psychological Wellbeing	43
5.3 Physical Activity Level.....	46
5.4 Relationship between Physical Activity Levels, Socio-demographic characteristics and Psychological Wellbeing	46
5.4.1 Association between Physical Activity and Psychological Wellbeing	46
5.4.2 Association between Socio-demographic Variables and Psychological Well-being	49
CHAPTER SIX	52
SUMMARY, CONCLUSION AND RECOMMENDATION.....	52
6.1 Summary of Findings.....	52
6.2 Conclusion	53
6.3 Recommendations.....	53
6.4 Suggestion for Further Study	54
REFERENCE.....	56

APPENDICES	68
Appendix A: Consolidate questionnaire for physical activity and well being.....	68
Appendix B: informed consent letter	73
Appendix C: Map of Kenya and Kisii Teaching and Referral Hospital.....	74
Appendix D: Ethical Approval From Maseno University	79
Appendix E: Ethical Approval from Kisii Teaching and Referral Hospital	76

ACRONYMS AND ABBREVIATIONS

ADA	American Diabetes Association
AHA	American Heart Association
CVD	Cardiovascular disease
DASS	Depression, Anxiety, and Stress Scale
DAWN	Diabetes Attitude, Wishes and Needs
GHQ	General Health Questionnaire
GHQ-12	General Health Questionnaire-12
HbA1C	Glycosylated hemoglobin
IDF-	Diabetes Federation
IPAQ	International Physical Activity Questionnaire
JOOTRH	Jaramogi Oginga Odinga Teaching and Referral Hospital
MET	Metabolic equivalent rate
SPSS	Statistical package for social science
UKPDS	United Kingdom Prospective Diabetes study

OPERATIONAL DEFINITIONS

Psychological well-being or good mental health - Relates to self-esteem, cognitive function, personality and mood, including positive effects such as happiness, vigor and morale. In this study, psychological well-being will be measured in terms of depression, anxiety and stress.

Anxiety - A form of negative self-appraisal characterized by worry, self-doubt, and apprehension or tension. Anxiety indications may be bone pains, being tired, headache, nervous, poor sleeping, forgetting, hesitations, hypochondriacs etc. (Link, 1993).

Stress includes some or all of the following symptoms: muscle tension, headache, stomach upset, racing heart, high blood pressure, sweating, flushing, dry mouth, and behaviors ranging from aggression to hyperactivity to withdrawal.

Depression is a state of being associated with feelings of hopelessness or a sense of defeat. People with depression often feel “down” or “blue” even when circumstances would dictate otherwise. All people feel “depressed” at times, but a “depressed” person feels this way much of the time. Others are loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep and appetite, low energy, and poor concentration.

Physical activity is bodily movement produced by the contraction of skeletal muscle that requires energy expenditure in excess of resting energy expenditure. This includes daily routine activities such as household jobs, shopping, and work. In this study physical activity

will be classified as sedentary, light, moderate and heavy activity. The individual will be categorized to less activity if they accumulate less than 600 MET minutes/week of total physical activity, moderate activity if they achieve at least 600 MET minutes/week of total physical activity and highly active if they achieve at least a total physical activity of 3000 MET minutes/week.

Exercise is a subset of physical activity: planned, structured, and repetitive bodily movement performed to improve or maintain one or more components of physical fitness. In the present study, the terms “physical activity” and “exercise” will be used interchangeably.

MET (metabolic equivalent of a task) - MET is the ratio of metabolic equivalence of a certain activity to a standard resting metabolic rate of sitting quietly, equal to 1 MET (Ainsworth *et al.*, 2000). Physical activity at 3 METs uses three times much energy as stationary sitting. MET-hours are units of exercise volume in which intensity in METs is multiplied by duration of the activity in hour.

TABLES

Table 3.1 Categories of stress, depression and anxiety	24
Table 4.1 Significant Difference between Normal and Cases of Psychological Problems	33
Table 4.2 Depressive symptoms distribution.....	34
Table 4.3 Anxiety symptoms distribution.....	35
Table 4.4 Stress symptoms distribution	36
Table 4.5: Classification of population physical activity levels by category	37
Table 4.6: Association between physical activity and psychological well-being of Type II diabetics	37
Table 4.7: Socio-demographic and diabetic profile of the study participants	40
Table 4.8: Regression Coefficients for the association between physical activity and psychological well being.....	41

FIGURES

Figure 1.1 Relationship between Physical Activity, Socio-demographic Characteristics and Psychological Wellbeing.....	12
Figure 4.1 Prevalence of Depression, Anxiety and Stress Symptoms in Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya	29
Figure 4.2 The Distribution of Depression Score	30
Figure 4.3 The Distribution of Anxiety Score	31
Figure 4.4 The Distribution of Stress Score.....	32
Figure 4.5: Scatter plot of depression and physical activity level.....	38
Figure 4.6: Scatter plot of anxiety and physical activity level.....	38
Figure 4.7: Scatter plot of stress and physical activity level.....	39

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The chapter contains background to the study (the prevalence of the condition worldwide, in sub-Saharan Africa and in Kenya), problems / losses associated with being diagnosed with diabetes especially in developing countries, the aim of the study and the benefits that will be derived from the findings of this research. The weakness of the study and assumption are highlighted and a conceptual framework showing how physical activity may help in stopping progression from normal glucose metabolism to diabetes and its associated complications given.

1.2 Background

Diabetes has reached epidemic proportion worldwide and is associated with large economic burden, increased risk of cardiovascular disease (CVD) and premature death. In 1995 approximately 135 million adults had diabetes worldwide and this was projected to be 300 million people by 2025 (King *et al.*, 1998). Unfortunately, in 2011, 366 million (8.3%) adults worldwide had diabetes and this is projected to rise to 552 million people by 2030 or 9.9% of adults' equivalent to approximately three more people with diabetes every ten seconds (Diabetes atlas 2011). The increase in prevalence and incidence of diabetes is as a result of more people becoming overweight in addition to leading sedentary lifestyle (Frank *et al.*, 2010).

In Africa, Type II diabetes accounts for 90% of diabetes cases. In the year 2011, the prevalence of the disease in the continent was estimated by the International Diabetes Federation (IDF) to be 3.8%, equivalent to 14.7 million adults. Even though the prevalence of Type II diabetes was

projected to rise to 4.3% or 28 million people in 2030 if the trend continued (IDF, 2011), in 2013 the number had risen to 20 million adult population (20-79 years), and the prevalence of the condition had also risen to 4.9% (IDF, 2013). The African region has the highest undiagnosed diabetes of about 78% and an estimated 344,000 deaths can be attributed to diabetes. The present epidemiological transition of diabetes in Africa is strongly linked to westernization of life-style characterized by decreased amount of physical activity and increased consumption of energy dense or high fat diets as a result of rapid urbanization (Mbanya *et al.*, 2010). According to Diabetes Research and Clinical Practice 2010 report, the urban population in developing countries is projected to double between 2010 and 2030, meaning more people will be having diabetes. The increasing prevalence of the disease in Africa presents an additional challenge to sub-Saharan Africa, as it competes for resources with communicable diseases (IDF, 2009).

Four out of five people with diabetes now live in developing countries, with most affected men and women being of working age (IDF, 2010). The relative and absolute mortality rates are higher in the 20-39-year age group- the most economically active population. In Africa, there is lack of access to the anti-diabetic drugs at affordable cost, leading to underuse and avoidable metabolic complications (Mbanya *et al.*, 2009). But even with adequate drugs, medication is not enough to make a diabetic feel good and live full life. Physical activity and good nutrition provide real payoffs (Deborah, 2008).

In Kenya, IDF estimated diabetes prevalence to be about 3.3% in 2007, but the government itself believes the rate is much higher i.e. about 10% of the population (Azevedo, 2008). A local study showed a prevalence of 4.2% in the general population with a prevalence rate of 2.2% in rural areas and 12.2% in urban areas (Dirk *et al.*, 2009). In 2013 the number of adult population (20-

79 years) that had diabetes in Kenya was estimated to be 749,250 with a prevalence of 3.58% (IDF, 2013). If the trend continues; by 2025 the number of people living with diabetes is expected to rise highly. According to the Ministry of Health report in 2012, Mt Kenya region, Kisii and Mombasa are some of the regions that have recorded increased diabetes cases. Central, Nyanza and Coast provinces have high prevalence rates at 10 percent (Kiarie, 2010). In 2008 Mombasa had the highest prevalence of diabetes 12%, followed by Nairobi, Nyeri and Kisii counties which had a prevalence of about 11%, Meru followed closely (Kaberia, 2008). This increase may be due to inactive lifestyle, low level of awareness, negative attitudes and unhealthy diet practices.

Diabetes can be a very tough illness to live with and its impact on quality of life is great especially around diagnosis, starting insulin and on developing complications (Rubin, 2000). For many patients, the demands of self-care can be burdensome, frustrating and overwhelming, affecting the physical, psychological and social aspects of everyday life (Debono & Cachia, 2007). Adjustment to the disease is often accompanied by a variety of negative emotional responses including anger, guilt, frustration, denial and loneliness. The patients may also feel hopeless about the possibility of avoiding long term complications (Rubin, 2000). As the number of years lived with diabetes increase significantly, the risk of developing diabetic complications and health care expenditures also increase, as a result such patients are more prone to develop psychological illnesses as depression, anxiety and stress. An occurrence of a complication during previous years significantly decreases the quality of life. Increased tension, anxiety and disturbance in overall mood are seen in those with microvascular complication (UKPDS, 1999). It is important for developing countries to estimate the prevalence of anxiety and depression and

their associated factors amongst people with diabetes, thereby to initiate early treatment so as to improve clinical outcomes and decrease the associated resource utilization and costs. So far, there is limited information regarding these conditions among people with diabetes in developing countries. In this study therefore the prevalence of anxiety, depression and stress in an outpatient sample of people with Type II diabetes will be estimated so as to identify scale of the problem amongst study participants using DASS-42.

An observational study conducted by Blair & Church, (2007) found that patients with Type II diabetes who are physically active or have moderate to high levels of cardiorespiratory fitness are much less likely than their sedentary and unfit peers to develop cardiovascular disease or to die. A physically active lifestyle may attenuate or reverse some of the pathophysiological abnormalities associated with the diabetic state, thus resulting in a relative protection against subsequent adverse health effect in individuals with diabetes. In addition, cardio-respiratory fitness is inversely associated with glucose intolerance (Colberg *et al.*, 2010). The use of various types of exercise activity in the reduction of glucose level in Type II diabetes mellitus and management of diabetes related complications in patients is well known but limited studies have been carried out on the use of physical activity in the management psychological complications in diabetes. Even though physical activity could help reduce the risk of depression, there is insufficient data to determine the optimal level of physical activity needed for preventive effect or to say whether increasing high level of physical activity bring a corresponding reduction in risk (Dunn *et al.*, 2001). Physical activity may also act as a buffering or coping strategy for psychosocial stress although this has not yet been fully established in diabetic patients.

Lustman *et al.*, (2000) showed in a meta-analytic review of the literature that depression was associated with hyperglycemia in patients with type 1 and Type II diabetes. Significant association also exist between HbA1C (Glycosylated hemoglobin) level and anxiety score, regular physical exercise and all subscale of scores of well-being. Higher level of depression is associated with increasing number of complications of diabetes (De Groot *et al.*, 2001). In the general population, there is now strong and consistent evidence, mainly coming from surveys, showing that physical activity makes people feel better, as well as feeling better about themselves, and feeling happier and more satisfied with life (Biddle *et al.*, 2000). This has not yet been established in diabetic patients especially in Kenya. The present study therefore will highlight the scale of the problem (stress, anxiety and depression) among diabetic patients in Kisii Teaching and Referral Hospital and determine if exercise cause improvements in the variables associated with sound mental health in these patients. Information on physical activity will be gathered using international physical activity questionnaire (IPAQ) short version. So far, there is limited information regarding the use of physical activity in the management of Type II diabetes in developing countries as Kenya.

1.3 Statement of the Problem

The global economic and disease burden associated with diabetes is large and continues to grow (King *et al.*, 1998). According to diabetes Atlas 2011, diabetes caused 4.6 million deaths and at least USD 465 billion dollars in health care expenditure in adults in 2011. In 2013, 20,350 deaths were diabetes related in Kenya (IDF, 2013). Other loses due to diabetes include; lost earning due to lost work days, lower productivity at work and permanent disability. Such loses are perhaps larger in poorer countries because premature death due to diabetes occur at much younger ages (IDF, 2009).

The quality of life in diabetics decrease compared to the general population because their daily life involves many restrictions, which may affect their mood, mental health, physical and social functioning (Schram *et al.*, 2009). Both diabetes and anxiety/depression are associated with premature morbidity and mortality, and when these conditions co-exist, the risk of developing co-morbidities, complications, patient suffering and associated cost, increase. In most hospitals in developing countries psychological problems as anxiety stress and depression amongst people with diabetes mostly remain undiagnosed. This is a cause for concern as it prevents initiation of treatment for these concomitant conditions and allows frustration to build up in patients, thereby contributing to poor clinical outcomes. Moreover, depression and chronic psychological stress is known to activate the hypothalamic-pituitary-adrenal axis, stimulate the sympathetic nervous system, increase inflammatory and platelet aggregation responses and decrease insulin sensitivity (Vogelzangs *et al.*, 2007), thereby contributing to poor glycemic control and increasing the risk of complications. Depressed and anxious individuals are also less likely to comply with diabetes self-care recommendations and more likely to follow sedentary lifestyles, remain physically inactive, indulge in smoking and high fat diet (Ciechanowski *et al.*, 2000). This worsens the complication of diabetes and may lead to early deaths.

Since psychological problems in diabetic patients are rarely diagnosed, only small minority of people with diabetes receive psychological treatment for diabetes-related problems. But still for significant number of patients' medication either does not adequately relieve symptoms of psychological problems or produce unpleasant side effects (Babyak *et al.*, 2000). The Potential mechanisms through which exercise could improve psychological well-being include

psychological factors, such as increased self-efficacy, a sense of mastery, distraction, and changes in self-concept, as well as physiological factors such as increased central norepinephrine transmission, changes in the hypothalamic adrenocortical system, serotonin synthesis and metabolism, and endorphins (Craft *et al.*, 2007).

1.4 Justification of the Study

In Kisii Teaching and Referral Hospital, the only public hospital in the district attending the large number of diabetic in the area (prevalence of 11%), the patients are likely to experience high levels of anxiety, stress and depression since the area is rural hence possibilities of higher level of gender inequities, social insecurity, lower level of education, and greater level of poverty, financial difficulties and other forms of economic stressors. There is also likelihood of patients receiving inadequate information on physical activity as the hospital lacks enough medical professionals to attend to the high number of patients at the clinic. The medical professionals majorly concentrate on the prescription of drugs and diet in the management of diabetes, while physical activity as diabetes management strategy is often ignored. The clinic also lacks a psychiatrist who can diagnose the emotional problems among this population. Physical activity maintenance in relation to the disease is a solution but not yet well established or linked with the effect of the disease in the study setting. Physical activity may be a cost-effective alternative for those who prefer not to use medication or who cannot access therapy, has minimal adverse side-effects and has the potential to improve physical health.

Even though safe exercise participation among this population can be complicated by the presence of diabetes-related health complications such as cardiovascular diseases (CVD), hypertension, neuropathy, or microvascular changes making them to lead sedentary lifestyle,

brisk walking and participation in domestic chores are enough exercise for the diabetics with complications and older diabetic individuals. This group will likely benefit from being assessed for conditions that might be associated with risk of CVD, contraindicate certain activities, or predispose to injuries, including severe peripheral neuropathy, severe autonomic neuropathy, and preproliferative or proliferative retinopathy if strenuous exercise is to be recommended.

This study therefore made attempt to explore the influence of physical activity on psychological well-being of Type II diabetic patients, at Kisii Teaching and Referral Hospital in Kenya while considering other socio-demographic factors in the etiology.

1.5 General Objective

To determine the influence of physical activity on psychological well-being of Type II diabetic patients, at Kisii Teaching and Referral Hospital in Kenya.

1.5.1 Specific Objectives

1. To assess the psychological well-being among Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya.
2. To assess the level of physical activity and socio-demographic characteristics among Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya.
3. To establish the association between physical activity levels, socio-demographic characteristics and psychological well-being of Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya.

1.6 Research Questions

1. What is the psychological well-being among Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya?
2. What is the level of physical activity and socio-demographic characteristics among Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya?
3. What is the association between physical activity levels and psychological well-being of Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya?

1.7 Significance of the study

Physical activity has been shown to help in the management of various complications associated with diabetes as CVD, hypertension and hyperglycemia, but less evidence is available to prove that it can be used in the management of psychological complications in diabetes. Physical activity causes increased glucose uptake into active muscles balanced by hepatic glucose production, with a greater reliance on carbohydrate to fuel muscular activity as intensity increases. This it does by improving insulin action, blood glucose control, and fat oxidation and storage in muscle. This reduces complication due to diabetes, cost of treatment, frustrations and worries about future complications and hence may reduce stress, depression and anxiety experienced by persons with diabetes. Depression, anxiety and stress leads to development of diabetes related complications as CVD that lead to early deaths among this population hence needs to be minimized in diabetes. The use of physical activity in the management of stress, anxiety and depression will improve clinical outcomes and decrease the associated resource utilization and costs. The results from this study will be shared with health professionals attending to diabetic patients to be used to make general recommendation, about the learned

effectiveness of exercise on psychological well-being of diabetic patients. The study will also help in designing future studies on the effectiveness of diabetes care.

1.8 Limitations of the study

1. The study was cross sectional, hence was difficult to draw conclusion about causation. Nevertheless, the study gives a picture of the current situation.
2. Both physical activity level and well-being were self- reported and hence recall bias may exist. But self-reported psychological measures have good reliability and acceptable validity. The recall period in this study was a bit short (a week).

1.9 Assumptions

1. The participants who were identified for the study were able to communicate and answer questions in English, Kiswahili or Gusii language.
2. The patients were willing to give accurate information on their previous week's physical activity and on their psychological feelings.

1.10 Conceptual Framework

This is based on a conceptual framework in Figure. 1.1, which shows that some of the domains from which depression, anxiety and stress may originate or contribute are social background factors-the socio-economic and demographic variables of gender, education, income, occupation, region, ethnicity, age, and marital status. Each of these factors has been found to play a role in feelings of well-being (Campbell, 1981).With gender women consistently have higher rates of mental problems than men, and in the United States, women may have twice the rate of depression (National Alliance on Mental Illness [NAMI], 2009).Income and occupational status can help provide some of the circumstances that lead to feelings of well-being. Education too was a contributor to greater feelings of well-being, at least among women, perhaps because it confers other positive feelings of status, self-worth, and efficacy. Marriage also tended to have a positive effect, probably because it is a social support system. Well-being also improved with age, even into the oldest age category, which would not be expected from the general prediction of a positive relationship of social status and well-being. This may have occurred because increasing age brings with it a greater acceptance of one's lot in life (McTeer & Curtis, 1990).Morgan *et al* in 2012 found that those who had elevated depressive symptoms were more likely to be female, younger, separated/divorced and have low levels of physical activity. Physiological changes that occur as a result of the physical stress of activity may reduce the impact of other nonphysical stressors that might otherwise lower levels of well-being (Buffone, 1980). In addition, physical activity may have a tranquilizing effect as a result of muscular relaxation following activity (De Vries, 1968). Or it may be that biochemicals released in the body during vigorous activity act as natural opiates and have a mood-altering effect on the individual (Allen, 1983; Stein & Belluzzi, 1978). Prevalence of depression and other mental

problems is increased among those diagnosed with stroke, heart disease, diabetes, and HIV, and depression may in fact deteriorate physical conditions more quickly (Rosenthal, 2003). Exercise likely has psychological benefits for persons with Type II diabetes, although evidence for acute and chronic psychological benefits is limited.

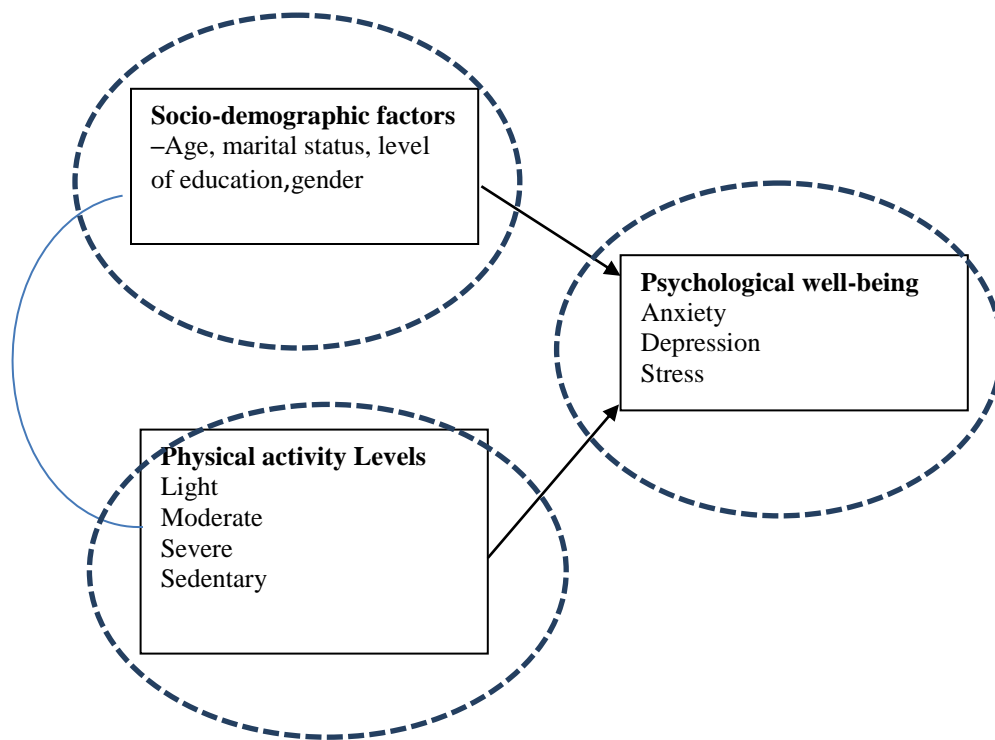


Figure 1.1 Relationship between Physical Activity, Socio-demographic Characteristics and Psychological Wellbeing

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter highlights the recommended physical activity a person should involve himself/herself in, the trend of physical activity among Type II diabetes patients which has been observed in various parts of the world, their trend of psychological well-being and how physical activity may influence their psychological well-being.

2.2 Psychological Well-being of Type II Diabetes Patients

2.2.1 Trend of the Psychological well-being of Type II Diabetic Patients

Type II diabetic patients experience health problems including psychiatric and psychological complications that influence their general health (Abbas *et al.*, 2011). Patients with poorer glycemic control, have a higher prevalence of concomitant psychiatric illnesses, such as depression and eating disorders. Complications of diabetes have an important impact on patient's psychological health. Knowledge of long-term complications may be frightening for patients (Debono & Cachia 2007). The Diabetes Attitudes Wishes and Needs(DAWN) study reported that diabetes-related distress is high at diagnosis - 85.2% reported feeling shocked, guilty, angry, anxious, depressed or helpless (Funnell, 2006). Anxiety is a typical response during the early stages of diabetes when a patient does not know what to expect and may fear the worst (Nizami *et al.*, 2005). Long after diagnosis, problems of living with diabetes become prevalent, including fear of future complications and resulting social disabilities, as well as immediate social and psychological burdens. Three of four (73.6%) reported at least one of these fears or burdens

(Funnell, 2006). All these studies were done in developed countries. Comparable studies on the trend of psychological well-being however are limited in developing countries.

Poor psychological functioning causes suffering, can seriously interfere with daily diabetes self-management, and is associated with poor medical outcomes and high costs (Egede, *et al.*, 2002). Close association exist between diabetes and depression where depression affecting more than one in eight diabetic patients. Depressive disorders generally have been associated with poor outcome of diabetes and have contributed to the high economic burden of health care costs. Depressive disorders occur at higher rates among individuals with diabetes, with controlled studies reporting that 9 to 27% of diabetic patients suffer from major depressive disorder at any single point in time. Adult depressed patients reported more symptoms of diabetes and showed worse metabolic control than did diabetic patients who were not depressed (Nizami *et al.*, 2005).

2.2.2 Summary of Knowledge Gap on Psychological Well-being

Being diagnosed with diabetes causes frustrations, hopelessness and fear, future complications and early death. This leads to stress anxiety and depression which worsens the condition hence needs to be treated. So far, there is limited information regarding the prevalence of these conditions among people with diabetes in developing countries and in Kenya as well.

2.3 Level Physical Activity among Type II diabetic Patients

2.3.1 Recommended Guide Lines for Physical Activity

The guidelines for the amount of physical activity that an individual should engage in a routine basis to obtain/ or maintain health has been developed by leading international bodies. Although they vary on specifics, the general features are the same. The widely used guideline is from the American Heart Association (AHA) and the American Diabetes Association (ADA) that recommend carrying out at least 150 minutes of moderate-intensive aerobic activity, or at least 90 minutes of vigorous aerobic exercise per week (Buse, *et al.*, 2007). The activity should be distributed over at least three days per week, with no more than 2 consecutive days of inactivity. While physical activity may be contraindicated for some patients, the new guidelines recommend moderate intensity of physical activity (i.e., 30 min of moderate-intensive physical activity ≥ 5 days/week) for most patients, particularly those with Type II diabetes (Pate *et al.*, 2003). These guidelines are often not met by diabetic patients, due to fear of injury after developing complication, lack of awareness on the importance of exercise in diabetes, time, facility and laziness.

2.3.2 Trend of Physical Activity among Type II Diabetic Patients

Initiating and maintaining regular physical activity remain difficult challenges in diabetic patients (Wing, *et al.*, 2001). In the USA, approximately two-thirds of the diabetics do not exercise sufficiently (Morrato, *et al.*, 2003). In the United Kingdom (UK), 68% of Type II diabetic patients were categorized as inactive (Thomas *et al.*, 2004). High failure rate is also reported in other nations, example Hungary 34% (Hanko, *et al.*, 2007) and Malaysia 54% (Tan & Magarey, 2008). In the United Arab Emirates, the situation appears to be even worse and only

3% of the studied population met the recommended guidelines for physical activity (Al-Kaabi *et al.*, 2009). Higher percentages of those who are married engage in moderate to high physical activity compared to those who are single/widow/widowers (Kelley *et al.*, 2006).

2.3.4 Reason for low Physical Activity among the Diabetics

The reasons why people are non-adherent to exercise include; feeling of tiredness, difficulty to exercise and spending most of the time watching television. Besides, lack of time, inadequate facilities such as recreational Centre and safe places to perform exercise could influence physical activity among diabetic patients (Thomas *et al.*, 2004). Laziness and lack of interest also contribute to inactivity (Nor Shazwani *et al.*, 2010). People in higher socio-economic group take part in more leisure time physical activity than those from lower socio-economic group. Low education attainment predicts higher level of inactivity (Kelley *et al.*, 2006). In general, physical activity levels are much higher in Africa than in the Western world, especially in populations living in rural areas. Physical activity levels decrease with urbanization in African populations (Sobngwi *et al.*, 2002). With urbanization, there is a reduction in manual jobs, routine travels by foot or bicycle and physically active elements of housework, shopping and other elements diminish substantially.

2.3.5 Summary of Knowledge Gaps on Level of Physical Activity

Physical activity may be used in the management of diabetes and its related complications, but there is limited data available in Kenya to confirm or say that the physical activity the diabetics involve in is beneficial to them. Data on the level of physical activity among the diabetic patients is lacking in Kenya.

2.4 Association between Physical Activity and Psychological Well-being

Physical activity has been reported to help with a wide spectrum of issues ranging from self-esteem and sense of social inclusion to clinical disorders such as schizophrenia, depression, and anxiety (Paula, 2009). Exercise do away with anxiety and stress of human (Link, 1993).

2.4.1 Physical activity and depression

Within depression domain, evidence suggests that achieving the current physical activity recommendations in sedentary individuals is as effective as antidepressant medication at treating mild to moderate depression (Barbour *et al.*, 2007), a common co-morbidity affecting around one quarter of individuals with Type II diabetes mellitus (Dunn *et al.*, 2005). In support that exercises may have an effect on depression, “a Gallup poll identified exercise as a close second behind religion as an alternative means of relieving depression” (Weinberg and Gould, 2003). During exercise, there is an increased release of β -endorphins and brain neurotransmitters, which have protective physiological effects on depression and serves as a buffer against development of psychological illness (Craft *et al.*, 2007). Epidemiological evidence shows that physical activity is associated with a decreased risk of developing clinically defined depression. Experimental studies have shown that aerobic and resistance exercise may be used to treat moderate and more severe depression, usually as an adjunct to standard treatment. The anti-depressant effect of exercise can be of the same magnitude as that found for other psychotherapeutic interventions. No negative effects of exercise have been noted in depressed populations (Mutrie, 2000). Exercise has been shown to produce larger antidepressant effects when the exercise training program was longer than nine weeks and involved more sessions (Craft, 1997; North *et al.*, 1990), and exercise was of longer duration, higher intensity, and performed a greater number of days per week. Exercise used in combination with individual psychotherapy or exercise

together with drug therapy produced the largest effects; however, these effects were not significantly different from the effect produced by exercise alone (Craft, 1997). Even though exercise is cost effective, has positive health benefits, and is effective in alleviating depression, and a viable alternative to many of the more traditional therapies, these reports are based on the general population. Reports on the influence of exercise on depression in clinical population are rare in developing countries especially among the diabetics.

2.4.2 Physical Activity and Anxiety

Likewise, exercise has a low-to-moderate effect in reducing anxiety. Exercise training can reduce trait anxiety; single exercise sessions can reduce state anxiety (Taylor, 2000). Daily anxiety can be reduced by physical exercise (Ragling & Morgan, 1987). Exercise can produce an anxiety reduction similar in magnitude to other commonly employed anxiety treatments and can be considered at least as good as these techniques, but in addition, it has many other physical benefits (Lander, 2008). In one study, subjects were placed in one of three groups: jogging, stress-inoculation training, and waiting list. The participants' self-report statements indicated that both the jogging and stress-inoculation groups had lower levels of anxiety than the waiting-list group immediately following the intervention. Furthermore, this finding held true when researchers followed up one month and 15 months later (doitfit experts)

2.4.3 Physical Activity and Stress

In stress, aerobic exercise training protects against the emotional and physiological consequences of stress. Balance of evidence suggests that sensitivity to stress is reduced after exercise training (Salmon, 2000). Single sessions of moderate exercise can reduce short-term physiological reactivity to brief psychosocial stressors and enhance recovery as demonstrated by systolic and

diastolic pressure, galvanic skin response (an indicator of emotional stress which measures the resistance of the skin to electric current), muscle tension, or self-reported psychological symptoms. These symptoms are seen in people who are fitter or who improve their fitness with training and even after a single exercise session (Taylor, 2000). The use of habitual exercise as a stress management technique has the benefits of mood enhancement, increased self-esteem and reduced psychological and physical stress reactions. It has been greater the skill in exercise, the greater the appreciation of the quality of life and self-discovery (Berger, 1994). It is believed that exercise can lead to a reduction of stress-related illness by buffering reactions to stressful life events (Landers, 2001). These finding were obtained when the general population were studied and not in clinical population.

2.4.4 Summary of Knowledge Gap on the Association between Physical Activity and Psychological Well-being

The effects of various types of exercise activity on the reduction of glucose level in Type II diabetes mellitus patients is well known but limited studies have been carried out on the use of physical activity in the management psychological complications (stress, anxiety and depression) in diabetes. Such information is lacking in Kenya. The association of physical activity and improvements of general well-being and quality of life has not received the same level of thorough examination in subjects with Type II diabetes as compared to the general population. This aspect is many times forgotten in the management of the disease, and little attention is often given to the psychological implications of diabetes (Bradley & Gamsu, 1994). This study is therefore considered relevant as it can yield valuable information that can be used in the

management of psychological disturbances experienced by the diabetic patients hence reducing severity of complication and early deaths.

2.5 Association between Socio-demographic Variables and Psychological Well-being

Socio-demographic (age, gender, marital status level of education) variables have been shown to influence psychological well-being. In a study conducted in Qatar, depression, anxiety and stress scores were found to be higher and more frequent among females compared to males (Bener *et al.*, 2011). Study conducted by Morgan *et al* in 2011 also revealed that depressive symptoms were negatively associated with male gender, older age groups, while depressive symptoms were positively associated with social class 5-6, significantly and positively associated with being separated/divorced or widowed (Morgan *et al.*, 2011). A previous study by Roupa *et al.*, in 2009 reported that sex was strongly related to the occurrence of anxiety and depression symptoms with women appearing to have three times the percentages of anxiety (62%) in comparison with men (21.5%) (Roupa *et al.*, 2009). Duration of diabetes has also been shown to be associated with higher prevalence of depression (Lype *et al.*, 2009).

It has been shown that, age, gender, ethnicity, economic situation make difference in people with perceived stress and that women have higher level of stress compared to men (Thoit, 2010) and inverse relation of stress with age, where stress reach pick at midlife and late age (Pearlin *et al*, 2005).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter, the study area (Kisii) is described including its location on the map of Kenya. The study design, study population and how the sample size was arrived at are given. Data collection instruments and measurements are described and how the resultant data was analyzed is stated.

3.2 Study Design

The study adopted a cross sectional research design and data was collected once from a participant for a period of between February to June 2014 and analyzed. The cross-sectional design helped in describing the prevalence of psychological problems (stress, anxiety and depression), physical activity and the association between the two among diabetic patients seeking treatment in Kisii Teaching and Referral Hospital.

3.3 Study Population

The participants were patients diagnosed with Type II diabetes by the age of 30-70 years and were regularly attending the Kisii Teaching and Referral Hospital. There were approximately 400 patients seen on a regular basis for a three-month cycle at the time of the study. This number formed the sampling frame.

3.4 Study Area

The study was conducted at Kisii Teaching and Referral Hospital. The hospital is located in Kisii town, Kisii County in southwestern part of Kenya in Nyanza province on latitude $0^{\circ}40'13''$, and longitude $34^{\circ}46'17''$. The town is about 309 Km from Nairobi and about 114 Km from Kisumu. Kisii town is predominantly inhabited by the Gusii community. Kisii Teaching and Referral Hospital is the largest government owned health facility in the southern Nyanza and the second largest hospital in Nyanza province after Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH). The hospital was started in 1916 by the colonial government to treat natives and injured soldiers. With time, the hospital grew to a district hospital and was elevated to level-5 categories in 2007 an equivalent of a provincial referral hospital. Just as other public hospitals in Kenya, the hospital operates on cost sharing principle where in addition to the government funds, the patients give service charge fees. Approximately 16,000 are attended to in the hospital.

The diabetics are attended to in general consultation room 4 (diabetic clinic) in case of complication arising before clinic day. On a clinic day (every Friday), the patients are attended to in all the rooms within special clinic unit by one consultant doctor, five doctors, six clinical officers, four nurses and one nutritionist. Approximately 400 diabetic patients regularly visit Kisii Teaching and Referral Hospital for review.

3.5 Sample Size Determination and Sampling Procedure

The sample consisted of 202 diabetic patients. This sample size was determined by the formula proposed by Yamane (1967). The formula is as shown below;

$$n = N / \{ 1 + N (e)^2 \}$$

Where n is sample size

N is population size and

e is the level of precision

$$n = 400 / \{ 1 + 400(0.05)^2 \} = 200$$

Systematic random sampling procedure was used to select individual patients to participate in the study. In this case every 2nd patient who attended the diabetic clinics usually scheduled for Fridays was selected.

3.6 Study Variables and Measurement

3.6.1 Study Variables

In this study, the dependent variables were the psychological well-being (depression, anxiety and stress) which were scored on a Likert scale and rated on the scale proposed by Fisher *et al* in 2008. The independent variables were physical activity, socio- demographic variable as age, gender, marital status level of education, and the duration lived diabetes.

3.6.2 Measurements

a) *Psychological well-being*

DASS-42 was used to assess the psychological well-being of this population. The Depression Anxiety Stress Scale, (Lovibond & Lovibond, 1995), is made up of 42 self-report items to be completed over five to ten minutes each reflecting a negative emotional symptom. Each of these was rated on a four-point Likert scale of frequency or severity of the participants' experiences over the last week. These scores ranged from 0, meaning that the client believed the item "did not apply to them at all", to 3 meaning that the client considered the item to "applied to them very much, or most of the time". The *Depression* scale had subscales that assessed dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/ involvement, anhedonia and inertia. The *Anxiety* scale assessed increased heartbeat, skeletal muscle effects, situational anxiety and subjective experience of anxious affect. The *Stress* scale's subscales highlighted levels of non-chronic provocation through difficulty relaxing, nervous stimulation and being easily upset/agitated, irritable/over-reactive and impatient. The symptom scores for the DASS-42 were categorized into normal, mild, moderate, severe and very severe according to the Table 3.1, based on previous pretest of the scale (Fisher *et al.*, 2008)

Table 3.1 Categories of stress, depression and anxiety

Category	Normal	Mild	Moderate	Severe	Very severe
Depression	0-9	10-13	14-20	21-27	28+
Anxiety	0-7	8-9	10-14	15-19	20+
Stress	0-14	15-18	19-25	26-33	34+

a. Physical activity

The physical activity scale was constructed using short version of International Physical Activity Questionnaire (IPAQ). This questionnaire assesses physical activity across comprehensive set of

domains including leisure time, domestic and gardening, work related and transport related physical activities. The short version assesses specific activity including walking, moderate intensity activities vigorous intensity activities which were then scored separately then the scores summed. The IPAQ was scored by assigning an intensity code expressed in terms of metabolic equivalent (METs). The following MET values were then used for analysis of IPAQ data; walking=3.3 METs, moderate physical activity=4.0 METs and vigorous physical activity=8.0 METs. Hence

Walking MET-minutes/week = $3.3 \times \text{walking minutes} \times \text{walking days}$

Moderate MET-minutes/ week = $4.0 \times \text{moderate intensity minutes} \times \text{moderate days}$

Vigorous MET-minutes/week = $8.0 \times \text{vigorous intensity minutes} \times \text{vigorous days}$

Total physical activity MET-minutes/week = sum of walking + moderate + vigorous MET minutes/ week.

The patients were categorized to less activity if they accumulated less than 600 MET minutes/week of total physical activity, moderate activity if they achieved at least 600 MET minutes/week of total physical activity and highly active if they achieved at least a total physical activity of 3000 MET minutes/week (IPAQ Research committee, 2005)

b. Socio-demographic profile and Other health profile

The details regarding diabetes including the duration of the condition, duration of treatment, type of treatment being received, and complications due to diabetes was collected. Information on age, sex, marital status and level of education was also included.

3.7 Pilot Study and Standardization

Pilot study was conducted in Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) Hospital among 10 diabetic patients seeking treatment at the facility to pretest the validity and reliability of the questionnaire that was to be used for the study. Content and construct validity (overall communality > 0.7) ascertained the validity of the questionnaire. Reliability test through split-half technique revealed adequate internal consistency ($\alpha > 0.6$)

3.8 Data Collection Tools and Process

Data was collected using a pretest questionnaire with three sections gathering information on socio-demographic profile, physical activity, psychological well-being, and other health profile details of the patients. The researcher introduced herself to the participants to establish rapport and informed them about the purpose of the study. Those who accepted to take part in the study signed informed consent form. The respondents were required to fill all the sections of the questionnaire. In scoring physical activity, IPAQ cleaning guidelines were used such that those with responses of 'don't know' or 'refused' for any variable in the equation were excluded from analysis (IPAQ Research Committee, 2005). Truncation rule was also used. Only complete questionnaires were used for the final analysis.

3.9 Data Presentation/ Analysis Plan

The data was entered into SPSS version 21.0 and analyzed using descriptive and inferential statistics for each data set individually and combined. Descriptive data was generated to show the nature of the data and the distribution pattern of the data using means and proportions for all variables of interest. Linear regression was used to assess the association between psychological well-being (stress, anxiety and depression) symptoms and physical activity. Binary regression

was done to assess the association between outcome variable (stress anxiety and depression) and physical activity and socio-demographic variables using Odds Ratio (OR).

3.10 Inclusion and Exclusion Criteria

3.10.1 Inclusion criteria

A patient diagnosed with Type II diabetes for more than one year, taking oral hypoglycemic agents without insulin therapy, age ≤ 70 years.

3.10.2 Exclusion criteria

The diabetic patients eligible for the study but had co-morbid history of any psychiatric illness and/or receiving drugs, which could induce depression/anxiety such as interferon, patients whose family member (parent, sibling, spouse, and child) died in last six weeks, and/or those who lost their job during the same time period, were excluded. Women who were diagnosed with diabetes during pregnancy (gestational diabetes) were also excluded.

3.11 Ethical Approval and Consideration

3.11.1 Ethical Approval

Permission to conduct the study was sort from Maseno University School of graduate studies while ethical approval was obtained from Maseno University Ethics Review Board and Kisii Teaching and Referral Hospital Ethics Committee.

3.11.2 Ethical Considerations

In this study, the participants had the right to voluntarily accept or refuse to participate without any penalty or restriction after being informed of what the research was trying to find out. The rights and obligations of the participants were communicated to them as outlined in the informed consent letter. There was no incentive for participating in the study. The participants were informed not to write their names on the questionnaires that were to be used for the data collection which were instead numbered for the purposes of confidentiality. The participants were allowed to ask any question relating to research being carried out.

CHAPTER FOUR

RESULTS

4.1 Introduction

The chapter gives the description of the participants, the distribution of psychological well-being (stress, anxiety and depression) physical activity level and associations between depression anxiety and stress and physical activity as analyzed using linear and binary logistic regression.

4.2 Psychological well-being

The psychological well-being of Type II diabetics was measured as either those having depression, anxiety and those with stress. The conditions were further measured as normal, mild, moderate, severe or very severe. It emerged that over half i.e. 119 (58.9%) and 103 (51%) were normal for stress and depression respectively and only 71 (35.1%) were normal for anxiety. Over half i.e. 112 (55.5%) had moderate to very severe anxiety while only slightly above a third i.e. 74 (36.7%) were moderately to very severely stressed. Figure 4.1 reveals the depression, anxiety and stress scores in Type II diabetics. While these scores are not diagnostic, they indicate the possible presence of depression, anxiety and stress in these patients

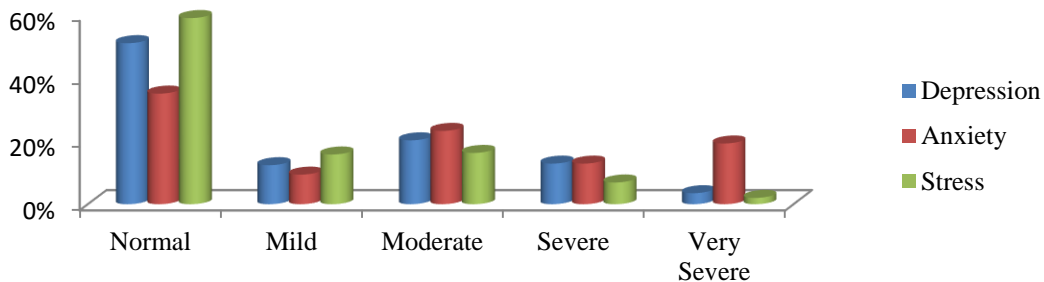


Figure 4.1 Prevalence of Depression, Anxiety and Stress Symptoms in Type II diabetics attending clinics at Kisii Teaching and Referral Hospital in Kenya (n=202)

The mean of depression score among the diabetic patients Kisii Teaching and Referral Hospital described mild situation of condition with a mean score of $10.81(\pm 8.641)$ (mild depression). Anxiety mean score was $11.18(\pm 7.948)$ (moderate anxiety) while stress stood at a mean score of $13.05 \pm (8.689)$ (normal). From the graphs, it appears that the distribution factors for depression stress and anxiety were normal. From the means above the population of type-2 diabetic patients in Kisii Teaching and Referral Hospital were more anxious followed by depression. Stress was non-common among the population. The figures below show the distribution of the conditions.

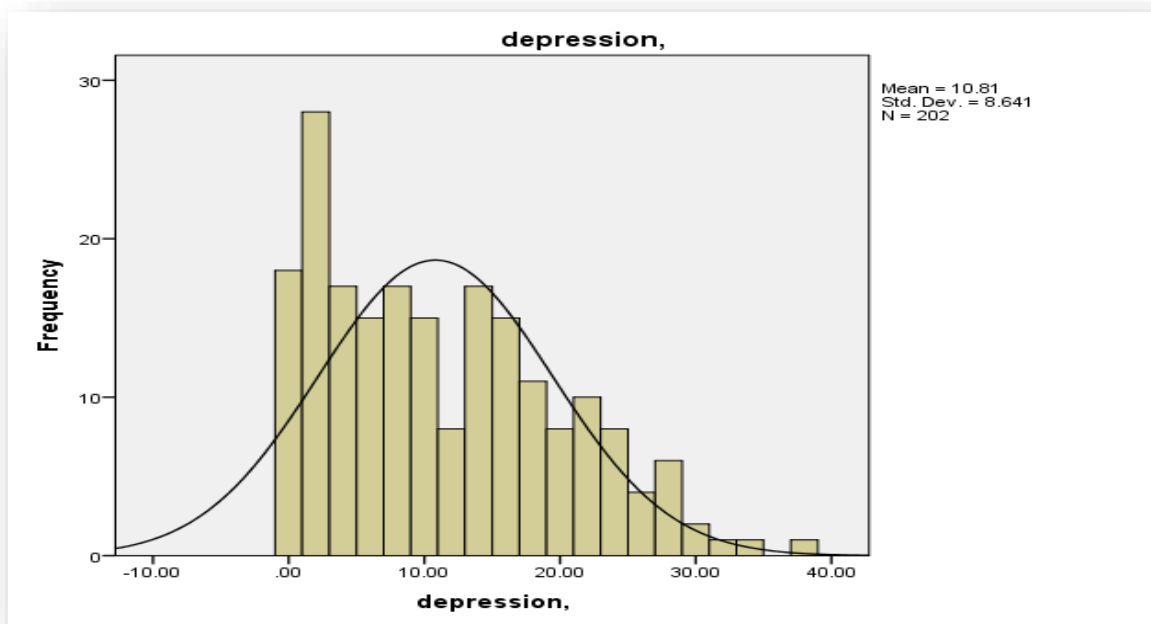


Figure 4.2 The Distribution of Depression Score

From the graph above graph (Figure4.2, the mean score for depression among these patients was $10.81 (\pm 8.641)$. This value corresponds to normal depression on the Fisher et al.,2008scale for depression. On the scale values 0-9is considered normal, 10-13 mild, 14-20 moderate, 21-27

severe and 28+ very severe depression. On anxiety, the mean score was 11.18 (± 7.948). This mean corresponds to moderate anxiety on the Fisher *et al*, 2008 scale. On the scale, the values 0-7 are considered normal, 8-9 mild, 10-14 moderate, 15-19 severe and 20+ very severe anxiety. The graphical representation is as shown on Figure 4.3 below.

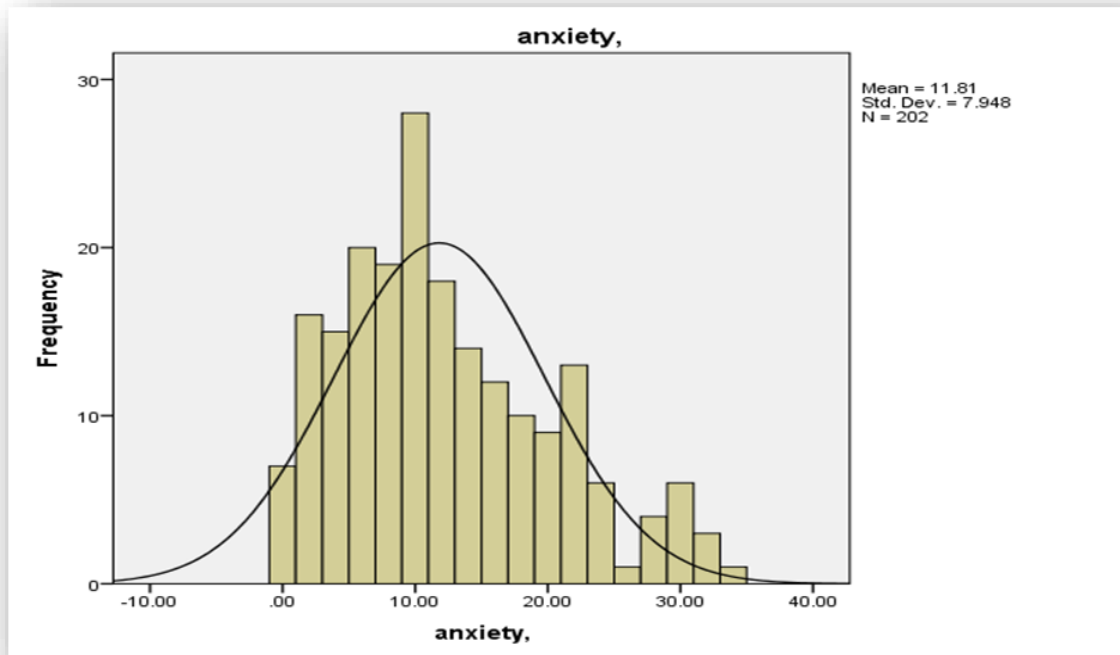


Figure 4.3 *The Distribution of Anxiety Score*

On stress, the mean score was $13.05 \pm (8.689)$ a value that corresponds to normal stress based on the scale proposed by Fisher *et al* of 2008. On the scale values 0-14 are considered normal, 15-18 mild, 19-25 moderate, 26-33 severe and 34+ very severe stress.

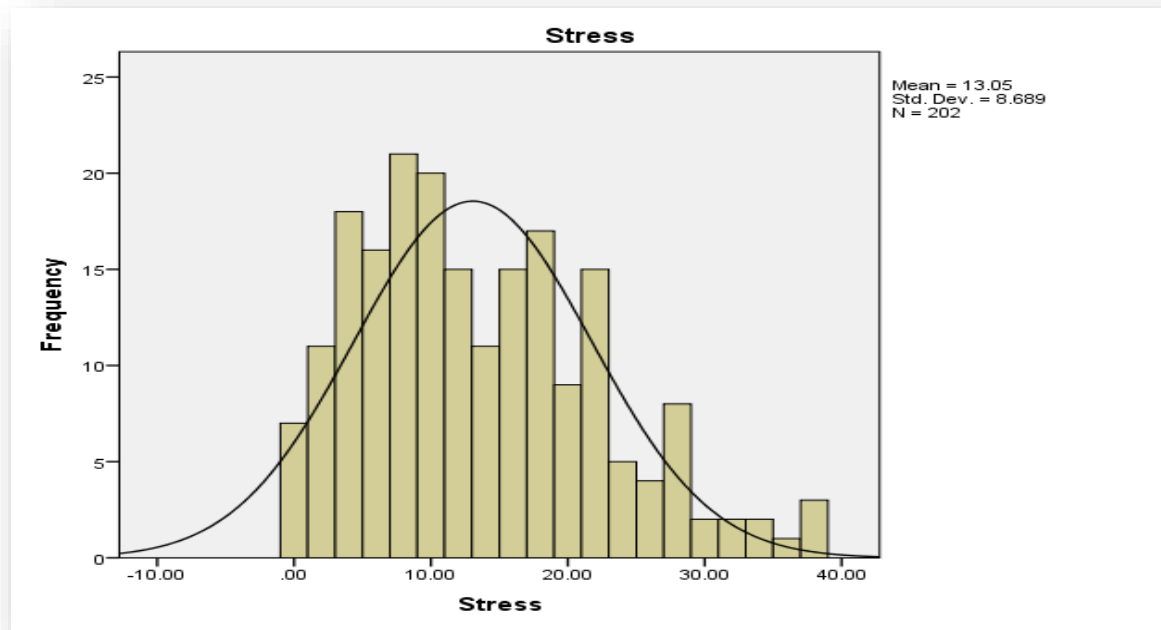


Figure 4.4 The Distribution of Stress Score

Further analysis of the level of depression, anxiety and stress was done to establish how significant these cases were. A case of the condition in this study was further reconsidered as any mild to very severe condition to classify the population as having or not having stress, anxiety and depression. The analysis was also to establish the existence of significant difference when these psychological problems coexisted; having or not having combination of depression and anxiety, depression and stress, stress and anxiety and having depression, anxiety and stress. The results are as illustrated in the Table 4.1 below.

Table 4.1 Significant Difference between Normal and Cases of Psychological Problems

<i>Psychological Indicators</i>	Normal n (%)	Abnormal n (%)	Z score	95% C.I	P value
<i>Depression (D)</i>	51	49	0.40	-0.08-0.12	0.6877
<i>Anxiety (A)*</i>	35.1	64.9	-5.99	-0.39-0.20	< 0.0001
<i>Stress (S)*</i>	58.9	41.1	3.58	0.08-0.28	0.0003
<i>DA</i>	53	47	1.21	-0.04-0.16	0.2278
<i>DS*</i>	64.4	35.6	5.79	0.19-0.39	< 0.0001
<i>AS*</i>	58.9	41.1	3.58	0.08-0.28	0.0003
<i>DAS*</i>	64.4	35.6	5.79	0.19-0.39	< 0.0001

**indicate presence of significant difference*

DA-Depression and anxiety, DS-Depression and stress, AS-Anxiety and stress and DAS-Depression, anxiety and stress

Based on the result above there appears to be no significant difference between cases depressed and normal ($z=0.40$, $CI=-0.08-0.12$, $p=0.6877$). With anxiety, there was significant difference between normal and abnormal cases ($z=-5.99$, $CI=-0.39-0.20$, $p<0.0001$) majority of the patients were significantly anxious. Likewise, there appears to be significant difference between the normal and stressed patients ($z=3.58$, $CI=0.08-0.28$, $p=0.0003$) in favor normal cases. Those who were normal for stress were more than the abnormal cases. The anxiety cases were much higher among the Type II diabetic patients as compared to depression and stress. There was no significant difference between normal and abnormal cases of a combination of depression and anxiety ($z=1.21$, $CI=-0.04-0.16$, $p=0.2278$). Cases normal for a combination of depression and stress and the abnormal cases were significantly different ($z=5.79$, $CI=0.19-0.39$, $p<0.0001$). Those who were normal for a combination of depression and stress were more than those who did not have a combination of the two psychological problems. Likewise, there was significant difference between those who had a combination of anxiety and stress and those who were normal ($z=3.58$, $CI=0.08-0.28$, $p=0.0003$) in favor

of the normal cases. From the result above, those who were stressed also had anxiety (41.1%). Significant difference existed among those who had a combination of depression anxiety and stress and those who did not have a combination of these psychological problems($z=5.79$ CI=0.19-0.39, $p<0.0001$). The normal cases were more than the abnormal cases.

4.2.1 Distribution of Depression

In Kisii Teaching and Referral Hospital it emerged that the commonest depression symptom experienced by the diabetic patients is feeling sad and depressed (70.8% of the sampled diabetics). While the least common depression symptom experienced was feeling not worth much of a person and feeling that life was meaningless (42.1% of the participants) the results are as shown in the Table 4.2 below.

Table 4.2 Depressive symptoms distribution

Statement	Normal n (%)	Mild n (%)	Moderate n (%)	Severe n (%)
I couldn't seem to experience any positive Feelings at all.	91 (45)	72 (35.6)	34 (16.8)	5 (2.5)
I just couldn't seem to get going	101(50)	67 (33.2)	23 (11.4)	11 (5.4)
I felt that I had nothing to look forward to	113 (55.9)	45 (22.3)	25 (12.4)	19 (9.4)
I felt sad and depressed.	59 (29.2)	77 (38.1)	40 (19.8)	26(12.9)
I felt that I had lost interest in just about everything	101 (50)	59 (29.2)	19 (9.4)	23(11.4)
I felt I was not worth much of a person.	117 (57.9)	45 (22.3)	24 (11.9)	16 (7.9)
I felt that life wasn't worthwhile.	113 (55.9)	48 (23.8)	27 (13.4)	14 (6.9)
I couldn't to get enjoyment out of things I did	104 (51.5)	53(26.2)	27(13.7)	18 (8.9)
I felt down hearted and blue.	97 (48)	63 (31.2)	33 (16.3)	9 (4.5)
I was unable to become enthusiastic about anything.	91 (45)	63 (31.2)	32 (15.8)	16 (7.9)
I felt I was pretty worthless.	114 (56.4)	47 (23.3)	26 (12.9)	15 (7.4)
I could see nothing in the future to be hopeful about.	113 (55.9)	45 (22.3)	26 (12.9)	18 (8.9)
I felt that life was meaningless.	117 (57.9)	45 (22.3)	27 (13.4)	13 (6.4)
I found it hard to work up the initiative to do things	100 (49.5)	57 (28.2)	29 (14.4)	16 (7.9)

4.2.3 Distribution of Anxiety

In anxiety; awareness of dryness of mouth was experienced by the highest percentage of the participants (68.8%). The lowest percentage (40.6%) experienced breathing difficulty (e.g. breathlessness or excessively rapid breathing in the absence of physical exertion. The results are shown on Table 4.3 below.

Table 4.3 Anxiety symptoms distribution

Statement	Normal n (%)	Mild n(%)	Moderate n (%)	Severe n (%)
I was aware of dryness of mouth.	63 (31.2)	76 (37.6)	42 (20.8)	21 (10.4)
I experienced breathing difficulty (e.g. breathlessness or excessively rapid breathing in the absence of physical exertion	120 (59.4)	52 (25.7)	16.9 (7.9)	14 (6.9)
I had a feeling of shakiness (e.g. legs going to give way)	83 (41.1)	69 (34.2)	23 (11.4)	27 (13.4)
I found myself in a situation that made me so anxious I was most relieved when they ended	73 (36.1)	75 (37.1)	32 (15.8)	22 (10.9)
I had a feeling of faintness.	87 (43.1)	72 (35.6)	31 (15.3)	12 (5.9)
I perspired noticeably (e.g. hands sweaty) in the absence of high temperature or physical exertion.	73 (36.1)	70 (34.7)	40 (19.8)	19 (9.4)
I felt scared without any good reason	75 (37.1)	78 (38.6)	32 (15.8)	17 (8.4)
I had difficulty in swallowing	152 (75.2)	30 (14.9)	8 (4)	12 (5.9)
I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat.	91 (45)	63 (31.2)	34 (16.8)	14 (6.9)
I felt I was close to panic.	76 (37.6)	69 (34.2)	37 (18.3)	20 (9.9)
I feared that I would be thrown by some trivial but unfamiliar task.	113 (55.9)	60 (29.7)	19 (9.4)	10 (5)
I felt terrified.	90 (44.6)	65 (32.2)	27 (13.4)	20 (9.9)
I was worried about situations in which I might panic and make fool of myself	92(45.5)	76 (37.6)	18 (8.9)	16 (7.9)
I experienced trembling (e.g. hands).	101 (50)	58(28.7)	24 (11.9)	19 (9.4)

4.2.4 Distribution of Stress

In stress symptom, most of the participants found themselves getting upset by quite trivial thing (76.2%), while the least number of participants (51%) found it hard to wind down the results are shown on Table 4.4.

Table 4.4 Stress symptoms distribution

Statement	Normal n (%)	Mild n(%)	Moderate n (%)	Severe n(%)
I found myself getting upset by quite trivial things.	48 (23.8)	98 (48.5)	30(14.9)	26 (12.9)
I tended to over react to situations	69 (34.2)	83 (41.1)	31 (15.3)	19 (9.4)
I found it difficult to relax	80 (39.6)	72 (35.6)	32 (15.8)	18 (8.9)
I found myself getting upset rather easily.	61 (30.2)	91 (45)	32 (15.8)	18 (8.9)
I felt that I was using a lot of nervous energy.	89 (44.1)	66 (32.7)	35 (17.3)	12 (5.9)
I found myself getting impatient when I was delayed in any way (e.g. lift, traffic light, being kept waiting)	68 (33.7)	72 (35.6)	31 (15.3)	31 (15.3)
I felt that I was rather touchy.	90 (44.6)	74 (36.6)	26 (12.9)	12 (5.9)
I found it hard to wind down	99 (49)	64 (31.7)	23 (11.4)	16 (7.9)
I found that I was very irritable.	72 (35.6)	80 (39.6)	32 (15.8)	18 (8.9)
I found it hard to calm down after something upset me	66 (32.7)	83 (41.1)	24 (11.9)	29 (14.4)
I found it hard to tolerate interruptions to what I was doing.	71 (35.1)	78 (38.6)	42 (20.8)	11 (5.4)
I was in a state of nervous tension.	73 (36.1)	84 (41.6)	32 (15.8)	13 (6.4)
I was intolerant of anything that kept me from getting on with what I was doing.	75 (37.1)	80 (39.6)	27 (13.4)	20 (9.9)
I found myself getting agitated	85 (42.1)	74 (36.6)	27 (13.4)	16 (7.9)

4.3 Physical Activity

In physical activity, the patients were classified as being less active if they accumulate less than 600 MET minutes/week of total physical activity, moderate active if they achieved at least 600 MET minutes/week of total physical activity and highly active if they achieve at least a total physical activity of 3000 MET minutes/week (IPAQ Research Committee, 2005). The Mean for the total met minutes /week was 5960.019 with a standard Deviation=4144.15373. The mean value indicates high level of physical activity. The study

revealed that 7(3.5%) were inactive; 55(27.2%) were moderately active and over two thirds 140(69.3%) being very active. The details are contained in Table 4.5.

Table 4.5: Classification of population physical activity levels by category

Physical activity level	Frequency n(%)
Inactive	8 (3.5)
Moderate activity	54(26.7)
Very active	140(69.3)

4.3.1 Association between Physical Activity and Psychological Well-being

To establish the nature of association between physical activity and psychological well-being, linear regression was used and the analysis revealed that the adjusted R square for depression; anxiety and stress was 0.191; 0.157 and 0.126 respectively. This implied that physical activity could significantly account for 19.1% of the cases of depression ($R^2 = 0.191$, $F = 48.477$, $p = 0.000$), 15.7 % cases of anxiety ($R^2 = 0.157$, $F = 38.543$, $p = 0.000$) and 12.6% of the cases of stress ($R^2 = 0.126$, $F = 29.933$, $p = 0.000$). From the above results, physical activity had the greatest impact on depression. The results are as shown on Table 4.6 below.

Table 4.6: Association between physical activity and psychological well-being of Type II diabetics

Psychological well being	R square	Adjusted R square	F-test	P-value
Depression	0.195	0.191	48.477	.000
Anxiety	0.162	0.157	38.543	.000
Stress	0.130	0.126	29.933	.000

Attempt was made to display the visual correlation between physical activity and psychosocial well-being indicators. The visual correlation between physical activity and

depression anxiety and stress is as illustrated by scatter plots complete with regression line as shown below. In the scatter plot, also it can be seen that the correlation between physical activity and psychological well-being is negative implying an inverse correlation.

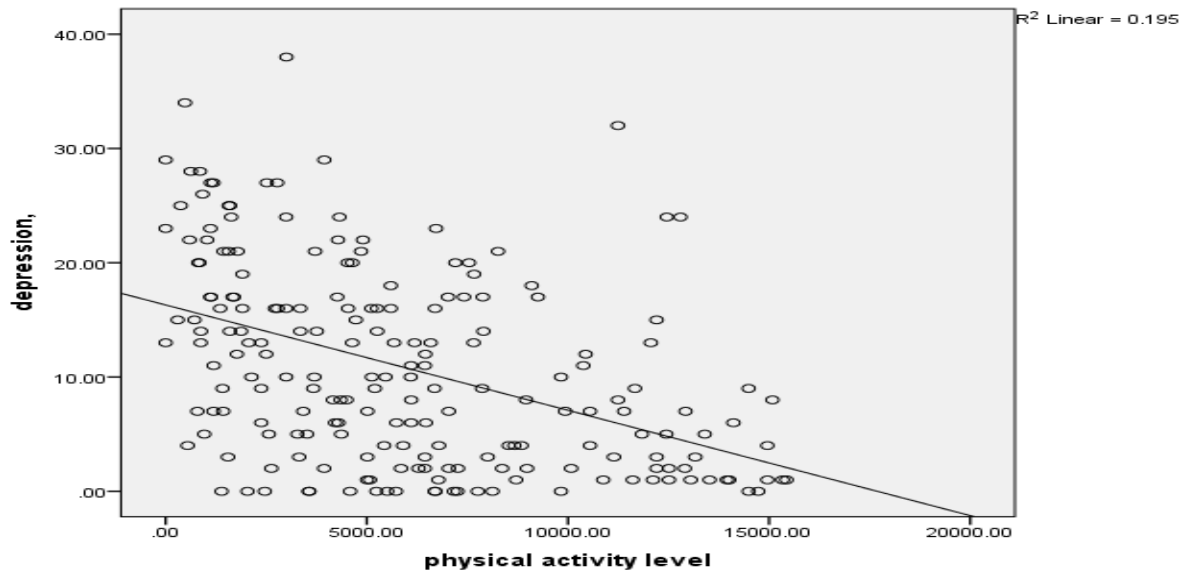


Figure 4.5: Scatter plot of depression and physical activity level

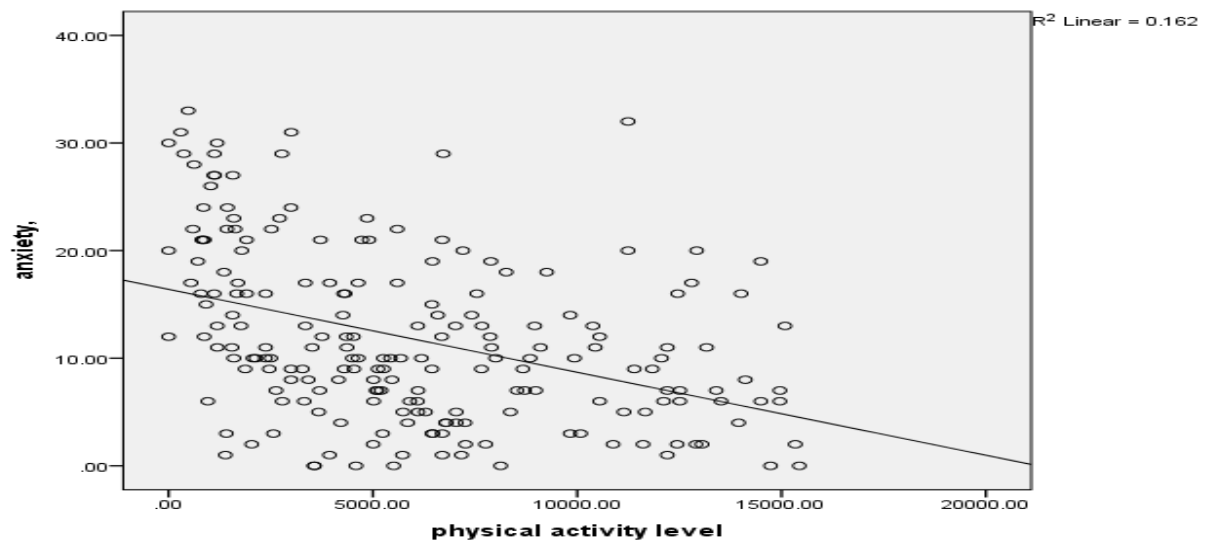


Figure 4.6: Scatter plot of anxiety and physical activity level

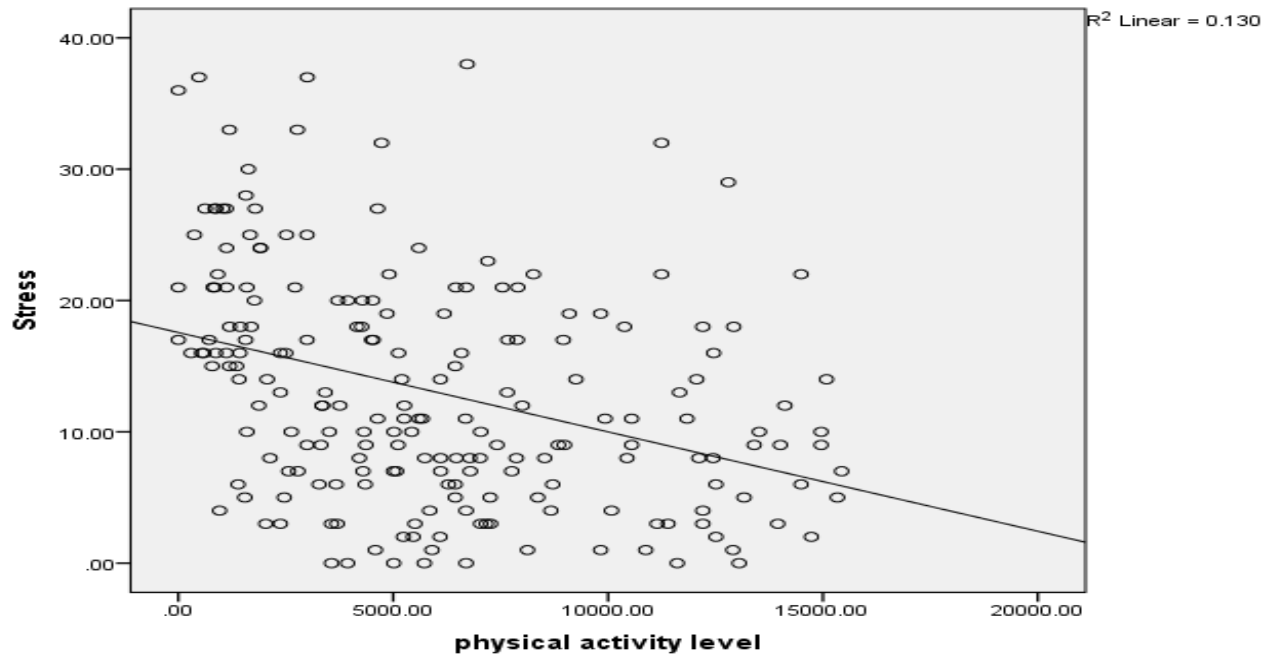


Figure 4.7: Scatter plot of stress and physical activity level

From the above graphs, it can be seen that the association between physical activity and psychological well-being is inverse implying that increase in physical activity lead to reducing in depression, anxiety and stress as can be seen on figures 4.5, 4.6 and 4.7 respectively.

4.4 Socio-demographic and diabetic profile of the study participants

A sample of 202 patients was interviewed. 108 (53.5%) were male and 94 (46.5%) females. Most of the patients interviewed were married 86.6%, 5% unmarried and 8.4% were widows/widowers. 104 (51.5%) of the participant had been on treatment for between 1-5 years, for 6-10 (25.2%) and greater than 10 years 23.3%. Most of those interviewed had no complications 75.7%. Table 4.1 summarizes the socio-demographic profile; duration lived with diabetes and complications due to the condition.

Table 4.7: Socio-demographic and diabetic profile of the study participants

Variable	Frequency n (%)	Variable	Frequency n (%)
Gender		Age	
Male	108(53.5)	30 – 39	39(19.3)
Female	94(46.5)	40 – 49	47(23.3)
		50 -59	69(34.2)
		60-69	48(23)
Educational level		Marital Status	
Primary incomplete	36(17.8)	Not married	10(5.0)
Primary complete	48(23.8)	Married	175(86.6)
Secondary complete	72(36.6)	Widow/Widower	17(8.4)
Tertiary	45(22.8)		
Duration lived with diabetes (yrs)		Complications experienced	
1 – 5	104(51.5)	No complication	153(75.7)
5 – 10	51(25.2)	Erectile dysfunction	4(2.0)
>10	47(23.3)	Eye problems	30(14.9)
		Hypertension	11(5.4)
		Liver problem	2(1.0)
		Psiatric pain	1(0.5)
		Dental problems	1(0.5)

4.5.1 Association between Physical Activity, Socio-demographic variables and Psychological Well-being

Further analysis involved use of binary regression establish the relationship between psychological variables (depression, anxiety and stress) and the levels of physical activity and the socio- demographic variables as gender, age, sex, marital status, level of education and duration lived with diabetes. Employing a 0.05 criterion of statistical significance, all the socio- demographic variables had no significant difference on depression. Increasing levels of physical activity was able to reduce the chances of being depressed (OR=0.201, C. I=.104-.386, p= 0.000). This implies that one-unit increase in physical activity reduces the level of

depression by 0.201. The Tables 4.8 give P value and odds ratio for each of the predictors (crude and adjusted)

Table 4.8: Regression Coefficients for the association between physical activity and psychological well being

Psychosocial well-being predictors	P value	Crude OR	95% C.I.	P value	Adjusted OR	95% C.I.
Depression						
PA*	.000	.202	.107-0.384	.000	.201	.104-.386
Sex	.409	1.263	.726-2.198	.856	1.061	.561-2.005
Age	.132	1.227	.940-1.602	.234	1.205	.8861.637-
Education level	.081	.784	.596-1.030	.195	.814	.597-1.111
Marital status	.287	1.300	.802-2.106	.610	1.155	.664-2.009
Duration of living with diabetes	.872	1.028	.734-1.441	.862	1.035	.703-1.524
Anxiety						
PA*	.000	.166	.072-.379	.000	.161	.070-.372
Sex	.547	1.195	.669-2.137	.959	.983	.510-1.897
Age	.809	.967	.733-1.274	.405	.873	.634-1.202
Education level	.114	.792	.593-1.058	.177	.798	.5751.108-
Marital status	.263	1.366	.791-2.358	.383	1.306	.717-2.379
Duration of living with diabetes	.593	1.102	.772-1.574	.261	1.254	.845-1.860
Stress						
PA*	.000	.138	.072-.267	.000	.136	.070-.267
Sex	.210	.433	.816-2.517	.864	1.061	.536-2.100
Age	.975	1.004	.768-1.313	.566	.909	.6571.258-
Education level	.030	.735	.556-.971	.066	.732	.525-1.021
Marital status	.095	1.508	.931-2.441	.226	1.419	.805-2.504
Duration of living with diabetes	.782	.953	.676-1.344	.783	1.061	.695-1.619

PA=Physical Activity; * p<0.05

Again, all the socio- demographic variables had no significant difference on anxiety. Increase in the level of physical activity reduced the chances of being anxious (Adjusted OR= 0.161, C. I.=.070-.372, p=0.000). One-unit increase in the level of physical activity decreases anxiety 0.161 times.

With stress both physical activity and level of education had significant difference before including the other predictors (crude OR=.138 C. I=.072-.267, $p= 0.000$) and crude OR=.735 C. I=.556-.971, $p= 0.030$ respectively). Physical activity and increase in the level of education reduced stress. When the other variables were controlled for; only increased level of physical activity was able to reduce stress (Adjusted OR=.136 C. I=.070-.267, $p= 0.000$). One-unit increase in the level of physical activity decreased stress 0.136 times. Generally, increase in the level of physical activity reduced depression anxiety and stress before and after adjustments. The greatest impact of increased level of physical activity was in depression followed by anxiety then stress.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This section discusses results obtained in the current study and compares it with the studies previously done on the influence of physical activity on depression, anxiety and stress. The section discusses level of physical activity among diabetics, prevalence of depression, anxiety and stress and the association between physical activity and psychological well-being. Association between socio-demographic factors and well-being of diabetics is also discussed.

5.2 Psychological Wellbeing

In the current study, the prevalence depression (mild to very severe depression) was found to be 49%, anxiety 64.9% and stress 41.1%. The finding on depression is in line with the study conducted by Li and colleagues which revealed a high prevalence of depression, 45% of all diabetes patients had undiagnosed depression (Li *et al.*, 2008). In a study conducted by Khawaja *et al.*, (2010) in which Hospital Anxiety and Depression Scale (HADS) was used to screen anxiety and depression among study participants as well, high proportions of patients with Type II diabetes were found positive for anxiety and depression, 58% and 44% respectively. Prevalence of depression was found to be 41% among patients with Type II diabetes in a previous work from a tertiary care hospital in India (Raval *et al.*, 2010). The study conducted among the old diabetic patients in Tunisia in 2013 revealed the prevalence of anxiety and depression to be 40.3% and 22.6% respectively (Masmoudi *et al.*, 2013). The

above findings confirm the high prevalence of depression, anxiety and stress symptoms in Type II diabetic patients as found in the current study.

In matched case-control study using surveys which was performed at the Primary Health Care (PHC) centers of the State of Qatar from September 2009 to August 2010 among 889 diabetic patients and 889 control participants, the prevalence of severe depression was found to be 13.6%, severe anxiety 35.3% and severe stress 23.4% among the diabetic patients (Bener *et al.*, 2011). In the above study DASS-21 was used to score depression anxiety and stress. The participants were categorized to be having severe depression if scored 21+, severe anxiety if they scored 15+ and severe stress if they scored 26+. The above score corresponds to the scores for severe and very severe cases of depression, anxiety and stress in the current study, which were estimated to be 16.4%, 32.2% and 8.9% for depression, anxiety and stress respectively which are lower compared to the findings in the study above. The prevalence of generalized depression, anxiety and stress in the Qatar study were relative higher than in the present study, 52.5%, 73%, and 70% respectively.

Generally, the studies from the western countries have found the prevalence of both depression and anxiety to be relatively lower (Collins *et al.*, 2009). Anxiety symptoms have been found to be more prevalent than depression and stress symptoms in Type II diabetes patients in the previous studies and even in the current study irrespective of the scoring scale used. In the present study, the prevalence of severe and very severe anxiety was 32.2%, almost twice the prevalence of severe and very severe depression. Friedman *et al* reported that 48.6% of its sample of 69 outpatients had anxiety symptoms and that two thirds had at

least one episode of anxiety (Friedman *et al.*, 1998). Another study of 1,458 attendees of a diabetes education program determined that 49% of its sample reported anxiety symptoms (Peyrot & Rubin, 1997). The present study revealed that all the diabetic patients who had stress were also anxious (41.1%). Studies estimating the prevalence of stress among the diabetic patients are limited in the literature. The differences in the above finding on prevalence of depression, anxiety and stress among the diabetic population could be due to differences in the scoring scales used.

Even though most of the participants interviewed had no complications of diabetes (75.7%) there seems to be high prevalence of stress, anxiety and depression. There are some possible explanations reported about the high levels of anxiety and depression and even stress in developing countries compared to developed countries like higher level of gender inequities, social insecurity, lower level of education, greater level of poverty, financial difficulties and other forms of economic stressors (Mirza & Jenkins, 2004). The high prevalence of these psychological problems in persons with no diabetes complications is in line with another study in which psychiatry morbidity was not associated with the presence of complications of diabetes (Wilkinson *et al.*, 1988). Bener *et al.*, (2011) also noted no significant association between the diabetic complications and psychiatric symptoms. It appears that there is evidence of high co-morbidity of diabetes and depression, anxiety and stress symptoms in Kisii Teaching and Referral Hospital. This is similar to a study done in Qatar, which examined the prevalence of depression, anxiety and stress with diabetes mellitus and found a positive contribution of Type II diabetes mellitus to increased depression, anxiety and stress disorders among diabetic patient (Bener *et al.*, 2011).

5.3 Physical Activity Level

Activity level has been estimated to be higher in developing countries such as Kenya than in developed countries. In this study, 69.3% of the participants were very active, 27.2% moderately active and 3.5% inactive. A study conducted by Sobngwi *et al.*, (2002) also revealed that physical activity levels are much higher in Africa than in the Western world, especially in populations living in rural areas and that physical activity levels decrease with urbanization in African populations. The study conducted in the United Arab Emirates among the diabetic population revealed that the levels of physical activity are low, with only 3% of participants (11 patients) meeting the recommended guidelines for physical activity (Al-Kaabi *et al.*, 2007). The level of physical activity among the diabetic patient seeking treatment at Kisii Teaching and Referral Hospital can therefore be said to be adequate because with their condition one would expect them to involve in less activity due to fear of injury and other complications associated with the disease.

5.4 Relationship between Physical Activity Levels, Socio-demographic characteristics and Psychological Wellbeing

5.4.1 Association between Physical Activity and Psychological Wellbeing

The evidence for the benefits of physical activity on psychological problems as depression, anxiety and stress is not universal. According to Krogh *et al* 2011, effectiveness of physical activity as a treatment for depression may vary according to the severity of the depression a person has (Krogh *et al.*, 2011). Research testing the stress-buffering effect of physical activity has also showed mixed results. A review of 31 studies found 16 reported physical activity did have a stress-buffering effect whereas 15 found it did not (Gerber & Puhse,

2009). In present study, there was an association between the psychological well-being of the diabetics and their physical activities. This study agrees with the study conducted by Reid *et al.*, (2010), where SF-36 and WBQ questionnaire were used for measuring well-being. In the study the participant performed aerobic, resistant exercise, both or none. The finding of the study revealed that aerobic, resistance or both have significant effect on well-being status, while resistant exercise better than aerobics or no exercise for improving physical health (Reid *et al.*, 2010). The current study also is in line with the study conducted by Arora and Colleagues, (2009) in which Bradley and Lewis questionnaire were used and showed that general well-being was improved in Type II diabetes after 8 weeks of supervised exercise training.

Morgan in 2012 showed that increasing levels of physical activity among adults over 50 years has the potential to improve mental health (Morgan *et al.*, 2012). In a study conducted by Katzir *et al.*, (2012), physical activity level did have a significant association with depressive mood. Those with low levels of physical activity had 1.46 (95% CI 1.45, 1.46) greater odds of depressed mood as did those with high levels of exercise. Moderate exercisers had 1.56 (95% CI 1.55, 1.56) greater odds of depressed mood. Khuwaja *et al.*, identified that physical activity was inversely associated with the presence of anxiety and depression among various groups of diabetic population (Khuwaja *et al.*, 2010). Kucukurslan *et al.*, (2009) obtained improvement in the SF-36 mental component scores after an exercise program including resistance training and home-based walking in diabetic.

Another study that focused on the benefits of various types of exercise to improve the psychological problems and general well-being in diabetes also demonstrated an

improvement in psychological parameters by a culturally focused exercise program in these patients (Praet & van Loon (2007)). But in a study conducted by McTeer & Curtis (1990) among the general population where 62% of the sample were adequately active, 16% were minimally active, and the remaining 22 % were sedentary, there was no a significant relationship between physical activity and well-being. Physical activity apparently had limited impact upon well-being.

The result from this study demonstrates that increased level of physical activity is associated with reduction in depression, anxiety and stress. These complications of diabetes have been shown to worsen other complications of diabetes as cardiovascular disease. However, the association between cardiovascular disease, diabetes and depression and anxiety disorders is bilateral, i.e. patients with anxiety and depression experience cardiovascular events more frequently, and the patients with Type II diabetes and cardiovascular diseases suffer more frequently from anxious-depressive disorder (Knapen & Vancampfort, 2013). An increase in physical activity levels has the potential to provide many health benefits. In addition to improving psychological well-being, regular physical activity among the diabetic improves glycemic control through increased insulin sensitivity and improve glucose tolerance, change lipid profile and improved cardiovascular risk factors and cause reduction in long term complications of diabetes, delayed progression of existing problems and enhanced quality of life (Hayes *et al.*, 2007) and therefore should be encouraged among this population.

Although exercise generally has positive psychological effects, under some circumstances it can actually lead to psychological problems. Overtraining has been shown to affect blood

levels of important neurotransmitters such as glutamine, dopamine and 5-HTP, which can lead to feelings of depression and chronic fatigue. The stress caused by intense, excessive exercise can negatively affect the hypothalamic-pituitary axis, possibly causing conditions such as hypothyroidism. Hypothyroidism is known to cause depression, weight gain, and digestive dysfunction along with a variety of other symptoms. High stress in general also can cause symptoms of hypothyroidism, and the stress caused by excessive, intense exercise is no exception.

Another major effect that extreme exercise has on our bodies is an immediate increase in cortisol, the hormone that is released when the body is under stress (Kresser, 2012). In some cases exercise-associated bodily sensations may trigger panic attacks, despite an anxiolytic activity of acute (Stroble *et al.*, 2005) and long-term exercise (Broocks *et al.*, 1998), and that this increase of symptoms may be regarded as a form of exposure. Exercising too much lead to a state of fatigue characterized by anxiety or depression, insomnia, and a loss of interest in personal life (Holistic online.com). Therefore, level of exercise among the diabetics should be regulated.

5.4.2 Association between Socio-demographic Variables and Psychological Well-being

Socio-economic and socio-demographic variables such as activity environment, region, language, age, marital status, occupation, education and income have been shown to be stronger predictor of well-being in the general population (McTeer & Curtis 1990) and even among the diabetics. Duration of diabetes has been found to be associated with a higher prevalence of depression, anxiety and stress. However, no such association was observed

between depression/anxiety and stress and duration of diabetes in the current study. Similar results were found by Raval *et al.*, who failed to find any significant association between duration of diabetes and depression (Raval *et al.*, 2010). In elderly patents in Tunisia, again there was no link between depression and the different socio-demographic variables and the study also did not note a statistically significant correlation between duration of diabetes and anxiety (Masmoud *et al.*, 2013).

Traditionally, female sex has been associated with higher rates of depression among the general population as well as those suffering from diabetes. In the current study, there was no significance difference between males and females with depression anxiety and stress. In a study conducted by Balhara & Sagar (2011) in India in which HADS was used, no differences were observed between the males and females on the HADS score and the scores were comparable. Galper and colleagues stratified their cross-sectional analysis of depressive symptoms and regular physical activity by gender and found relative increase in mental well-being associated with fitness level and reported activity, but they also found that the association did not differ for men and women (Galper *et al.*, 2006). Similar result showing associations between physical activity and depression scores equal for men and women had previously been reported in the Alameda County Study (Camacho *et al.*, 1991).

In summary, the current study observed no significant difference between socio-demographic variables and psychological well-being except with the increasing level of education which showed significant difference before controlling for other variables. When the other variables were introduced there was no significant difference. In the general population, Craft *et al.*,

(1998) showed that only the length of the exercise program was a significant moderator of the clinical effects, with programs of at least 9 weeks being associated with larger reductions in depression. Patient characteristics (age, gender, severity of depression) were not significant moderators and when compared with standard treatment of depression (pharmacotherapy, psychotherapy), exercise training has comparable beneficial effects (Craft *et al*, 1998).

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Summary of Findings

This study revealed that the prevalence of depression, anxiety and stress symptoms in Type II diabetic patients seeking treatment at Kisii Teaching and Referral Hospital to be 49%, 64.9% and 41.1% respectively. Anxiety symptoms were more prevalent than depression and stress symptoms in these patients. The findings are in line with other previous studies which have revealed high prevalence of these psychological problems among the diabetics.

Contrary to the expectation that the diabetics do not participate in physical activity due to fear of injury and the other complication associated with the disease that physical activity can worsen, in this study population, the physical activity level was also adequate. Most of the participants were active and only a small percentage remained inactive. 7 (3.5%) were inactive; 55 (27.2%) were moderately active and over two thirds 140 (69.3%) being very active.

The present study revealed that increase in the level of physical activity of diabetic patients seeking treatment in Kisii Teaching and Referral Hospital reduced the occurrence of depression anxiety and stress symptoms among them. This can be helpful in developing and conducting local health prevention strategies that target the diabetics in Kisii and the neighborhood. It is consistent with a growing body of research that supports physical activity as a behavior that improves both physical and mental health.

6.2 Conclusion

1. This study revealed the prevalence of depression, anxiety and stress to be 49%, 64.9% and 41.1 % respectively among Type II diabetic patients seeking treatment at Kisii Teaching and Referral Hospital. Anxiety symptoms were more prevalent than depression and stress symptoms in these patients.
2. In this study population, 7 (3.5%) of the participants were inactive, 55 (27.2%) were moderately active and over two thirds 140 (69.3%) being very active. Only a small percentage remained less active.
3. The present study revealed that increase in the level of physical activity of diabetic patients seeking treatment in Kisii Teaching and Referral Hospital reduced the occurrence of depression anxiety and stress symptoms among them. There was no association between socio-demographic variables and psychological well-being among the Type II diabetics seeking treatment at Kisii Teaching and Referral Hospital.

6.3 Recommendations

1. There is need to keep anxiety, depression and stress levels at minimal through Positive Psychology Interventions (PPI) package which target improvement on happiness.
2. There is need to intensify caching on appropriate Physical activity levels from constant assessments during facility visits followed by caching for Type2 diabetic patients whose level fall below the recommended levels of at least 30 minutes of moderate intense physical activity for five or more days a week.

3. This study has revealed the position of physical activity as a predictor of psychological wellbeing and so there is need to promote physical activity as an intervention tool among Type II diabetes through formalized policy framework at National and County levels through advocacy and lobbying strategies.

6.4 Suggestion for Further Study

The outcome of depression, anxiety and stress was based on responded reported mood and not on official medical assessment and thus cannot be classified as clinical depression, anxiety and stress. The same study therefore, using other psychological (stress, anxiety and depression) measuring scales should be adopted to verify the above findings, preferably scales measuring the above psychological conditions separately. Tools used clinically to identify the condition may also be employed. Again, participants were not followed up and hence the future course of depressive, stress and anxiety symptoms in relation to different variables cannot be commented up on. It would be informative to prospectively follow up these participants in order to assess the time course of the symptoms and outcome.

The physical activity data collection tool used in this study (IPAQ short version) included range of activities of both leisure and occupational. Future research could investigate if specific types of physical activity or exercise have effect on the psychological well-being of people with Type II diabetes. Other possible way to reduced stress, anxiety and depression that have been shown to cause premature death among this population needs to be investigated. Like new research has found the antioxidant vitamin C is not just therapeutic: It can significantly reduce stress and anxiety among Type II diabetic patient.

The study was conducted in Kisii Teaching and Referral Hospital where most of the attendees being reviewed were from Gusii community. Future studies should expand to a nationwide sample to draw conclusion about the influence of physical activity on depression anxiety and stress common complications experienced by people living with diabetes in Kenya.

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APPENDICES

Appendix A: Consolidate questionnaire for physical activity and well being

Thank you for giving up your time to participate in this survey. This questionnaire contains three sections that collect information on your socio-demographic status, diabetic condition, physical activity, and psychological well-being. The information collected from this survey will tell us if physical activity participation by diabetic patients in Kisii affects their psychological well-being. Please try and answer all the questions from the three sections.

Section one: socio-demographic profile and profile of the diabetes condition

In this section tick (✓) the appropriate circle which indicates your sex, marital status, and duration lived with diabetes and educational level. In addition, in the spaces provided indicate the number of years you have received the diabetes treatment, type of treatment (drug) received and the complication experienced due to the condition.

Sex Male Female	Age 30-39 40-49 50-59 60-69
Level of education Primary incomplete Primary complete Secondary complete Tertiary level	Marital status Married Unmarried Widow/widower

Duration lived with diabetes duration of treatment,

1-5 years

5-10 years

> 10 years

Complications due to diabetes

type of treatment being received

Section two: Well-being status

In this section we would like to find out more about your psychological and social situation in the past one week. Some of the sentences describe you better than others. Read each sentence and indicate how much it is like you by putting a cross (x) or a tick (✓) in the column that describes you. There is no right or wrong answer. Do not spend too much time on any one statement. Remember to mark one answer for each sentence. Your answer will be kept secret.

Keys

0= Did not apply to me at all

1 = Applied to me some of the time

2 = Applied to me for a good number of time

3= Applied to me most of the time

Statement	0	1	2	3
I found myself getting upset by quite trivial things.				
I was aware of dryness of mouth.				
I couldn't seem to experience any positive Feelings at all.				
I experienced breathing difficulty(e.g. breathlessness or excessively rapid breathing in the absence of physical exertion				
I just couldn't seem to get going				
I tended to over react to situations				
I had a feeling of shakiness (e.g. legs going to give way)				
I found it difficult to relax				
I found myself in a situations that made me so anxious I was most relieved when they ended				
I felt that I had nothing to look forward to				
I found myself getting upset rather easily.				
I felt that I was using a lot of nervous energy.				
I felt sad and depressed.				
I found myself getting impatient when I was delayed in any way(e.g. lift, traffic light, being kept waiting)				
I had a feeling of faintness.				

I felt that I had lost interest in just about everything				
I felt I was not worth much of a person.				
I felt that I was rather touchy.				
I perspired noticeably (e.g. hands sweaty) in the absence of high temperature or physical exertion.				
I felt scared without any good reason				
I felt that life wasn't worthwhile.				
I found it hard to wind down				
I had difficulty in swallowing				
I couldn't to get enjoyment out of things I did				
I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat.				
I felt down hearted and blue.				
I found that I was very irritable.				
I felt I was close to panic.				
I found it hard to calm down after something upset me				
I feared that I would be thrown by some trivial but unfamiliar task.				
I was unable to become enthusiastic about anything.				
I found it hard to tolerate interruptions to what I was doing.				
I was in a state of nervous tension.				
I felt I was pretty worthless.				

I was intolerant of anything that kept me from getting on with what I was doing.				
I felt terrified.				
I could see nothing in the future to be hopeful about.				
I felt that life was meaningless.				
I found myself getting agitated				
I was worried about situations in which I might panic and make fool of myself				
I experienced trembling (e.g. hands).				
I found it hard to work up the initiative to do things				

Section three: physical activity status

In this section we are interested in finding out about the kinds of activities that diabetics participate in as part of their everyday live. The information will tell us if the activities involved in are adequate to benefit your condition. Think about all the activities that you did in the last 7 days and indicate the number of days you participated in these activities and time spent.

During the last 7 days, on how many days did you do vigorous activities as heavy lifting, digging, aerobics, fast bicycling, slashing, that lasted for at least 10 minutes a time?

----- days per week

No vigorous physical activity-----**skip to question 3**

How many times did you usually spend doing the vigorous activity on one of the days

-----hours per day

-----minutes per day

-----don't know/ not sure

In the last 7 days, on how many days did you do moderate physical activities like carrying light load, scrubbing floor, swimming, painting wall, bicycling at regular pace? Do not include walking.

-----days per week

no moderate activity -----**skip to question 5**

How many times did you usually spend doing moderate activity on one of the days?

-----hours per day

-----minutes per day

Do not know/ not sure

Think about the time spent walking in the last 7 days. This includes at work, at home, walking to travel from place to place and any other walking that you did for sports, exercise or leisure.

-----days

No walking -----**skip to question 7**

How much time did you usually spend walking on one of the days?

-----hours per day

----- minutes per day

Don't know /not sure

During the last seven days how much time did you spend sitting on a week day at work, at home doing course work , during leisure time visiting friends, reading, watching TV/

-----hours per day

-----minutes per day

Don't know/ not sure

Thank you for participating. This is the end of the questionnaire.

Appendix B: informed Consent Letter

STUDY TITLE: Influence of physical activity on psychological well-being of Type II diabetic patients in Kisii Teaching and Referral Hospital, Kenya

INVESTIGATORS: Mary Obuya- Student Maseno University

Dr. David Omondi Okeyo- lecturer Maseno University

Dr. Bernard Omondi Abong'o-lecturer Maseno University

STUDY LOCATION: Kisii Teaching and Referral Hospital.

Dear respondent,

You are invited to participate in a study on influence of physical activity on psychological well-being of Type II diabetic patients. I hope to learn if the physical activity the diabetic involve in has effect on anxiety, depression and stress associated with the disease. You are selected to participate because you have Type II diabetes, aged 34-70 years, regularly come for review in Kisii Teaching and Referral Hospital, and take oral medication.

If you decide to participate, I Mary Obuya will give you a questionnaire which you fill for about 15 minutes. Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will not be disclosed. To help protect your confidentiality, the survey will not contain information that will personally identify you, and I will not ask for your name. Your decision to or not to participate will not prejudice your relationship with Kisii Teaching and Referral Hospital or Maseno university. Your participation is voluntary and there is no penalty if you do not participate. I do not anticipate any risks from participating in this research.

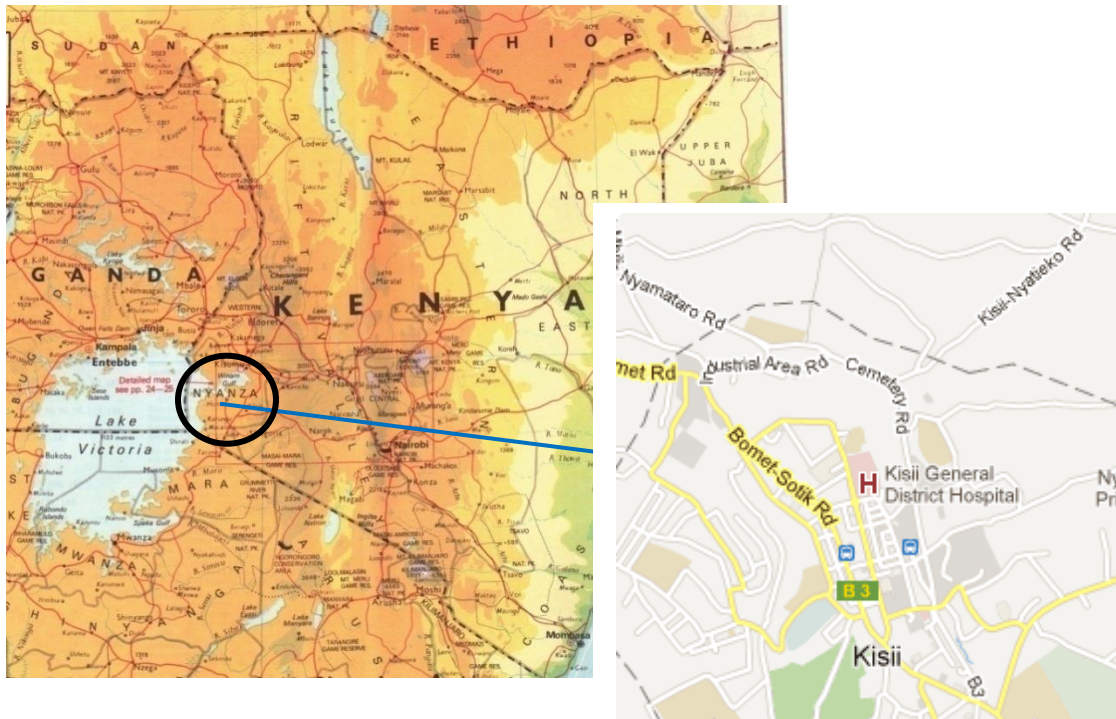
If you have any questions, please ask me. If you have any questions later contact 0722370141. I will be happy to answer them. You are making a decision to participate or not, your signature indicates that you have read the information provided above and you have decided to participate. You may withdraw at any time without prejudice after signing this form should you chose to discontinue participating in this study.

Name

Signature

Date

Appendix C: Map of Kenya and Kisii Teaching and Referral Hospital



Appendix D: Ethical Clearance from Maseno University



MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariat@maseno.ac.ke

FROM: SECRETARY - MUERC

DATE: 12th February, 2014

TO: Mary Obuya,
School of Public Health and Community Development,
PG/MPH/00042/2011,
Maseno University, Maseno, Kenya

REF: MSU/DRPC/MUERC/000043/13

RE: Influence of Physical Activity on Psychological Well Being of Type II Diabetic patients in Kisii Level-5 Hospital, Kenya. **PROPOSAL REFERENCE NO:** MSU/DRPC/MUERC/000043/13

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 12th day of February, 2014 for a period of one (1) year.

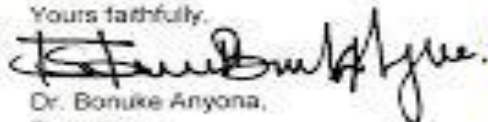
Please note that authorization to conduct this study will automatically expire on 11th February, 2015. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 10th January, 2015.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 10th January, 2015.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advise MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,


Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee



Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED



Appendix E: Ethical Approval from Kisii Teaching and Referral Hospital

KISII COUNTY GOVERNMENT



MINISTRY OF HEALTH

Telegrams:
Telephone:
E mail: dhmtkisiicentral@gmail.com
Ref: KC/REC./14/(VOL.1)
Date: 18th February 2014

DIRECTOR OF HEALTH
KISII COUNTY
P.O. BOX 92
KISII

MARY OBUYA

RE: RESEARCH PROPOSAL: DATA COLLECTION AT KISII LEVEL 5 HOSPITAL

This is to inform you that Hospital Ethical and Research Committee has reviewed your proposal titled: **Influence of Physical activity on Psychology well being of type II Diabetic patients in Kisii Level 5 Hospital, Kenya.** The following are our comments:

1. Your Research protocol is relevant, informative and timely.
2. You are authorized to proceed with data collection on payment of kshs.2000.

Please ensure final Study report is sent to us for information, retention and use

.....
Dr. CRISPUS NYONGESA MBChB (NRB), MPH(Moi), dip.STI (NRB)
Head, Research and continuing Education
Kisii Level 5 Hospital

CC: 1. Dr. Deborah Omeddoh;
2. Medical Superintendent, Kisii Level 5 Hospital