

**ADHERENCE TO TREATMENT BY PATIENTS
WITH TYPE 2 DIABETES MELLITUS AT MONZE
MISSION HOSPITAL, MONZE, ZAMBIA**

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**A Dissertation submitted to the University of Zambia in partial
fulfillment of the requirements for the Master of Science Degree
in Clinical Nursing**

The University of Zambia

Lusaka

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DECLARATION

I Sanford Nyirongo, declare that this Dissertation represents my own work and that all the sources I have quoted have been indicated and acknowledged by means of complete reference. I further declare that this Dissertation has not previously been submitted for a Degree or Diploma or other qualifications at this or other University. It has been prepared in accordance with the guidelines for Master Degree in Clinical Nursing Sciences Dissertations of the University of Zambia.

Signed (Candidate) Date

Signed (Supervisor) Date

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I, **Dr. Patricia Mukwato Katowa**, having supervised and read this dissertation is satisfied that this is the original work of the author under whose name it is being presented. I confirm that the work has been completed satisfactorily and approve it for final submission.

Signature..... **Date**.....

Head of Department

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CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation on Adherence to treatment by type 2 Diabetes Mellitus patients at Monze Mission Hospital in Monze district in a partial fulfilment of the Master Degree in Nursing Sciences.

Examiner I

Signature.....

Date.....

Examiner II

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Date.....

Examiner III

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ABSTRACT

Diabetes mellitus is one of the most common non-communicable diseases and one of the leading cause of disability, morbidity and mortality globally (Jackson et al., 2014). The aim of the study was to assess adherence to treatment by type 2 Diabetes mellitus patients aged 20 years and above at Monze Mission Hospital in Monze district. It sought to answer the research questions: (1) What is the level of adherence to treatment by patients with type 2 Diabetes mellitus receiving care from Monze Mission Hospital? (2) What factors influence adherence to treatment by patients with type 2 Diabetes mellitus?

A cross-sectional study design was used at Monze Mission Hospital in Monze district. Simple random sampling method was used to select 138 patients who sought medical services from the Out-patient medical clinic as well as admitted patients in the hospital. A structured interview schedule was used to collect data. Data was entered and analyzed using the IBM® Statistical Package for Social Sciences (SPSS®) for Windows version 22 to predict levels of adherence to treatment as well as to identify factors which influenced adherence among type 2 DM patients. Chi – Square (X²) test was used to test the associations between variables. The binary logistic regression was used for multivariate analysis to determine true predictors of adherence.

The findings showed that, 56.5% patients had poor adherence to treatment while 44.2% had good adherence to treatment. More than half of the patients (55.6%) had knowledge about Diabetes mellitus treatment. About 65.2% of patients indicated that distance to the hospital and financial challenges were a hindrance to seeking regular medical reviews. The study results showed a statistically significant association between adherence and knowledge of type 2 Diabetes mellitus treatment ($p = 0.024$). Distance to the hospital, health care services and attitude to self-care management were statistically insignificant despite influencing adherence to Diabetes mellitus treatment ($p > 0.05$)

The study showed that poor adherence to treatment reduced as knowledge about Diabetes mellitus increased. However, distance to hospital impacted negatively to adherence as

patients' adherence to treatment reduced as distance to the hospital increased. There is need to consider educational programs to strengthen adherence to dietary advice, regular exercise and follow up, to achieve normal glycemic levels as opposed to adhering to either oral hypoglycaemic drugs or insulin or both, to improve the management of type 2 Diabetes mellitus patients at Monze Mission Hospital.

Adherence to type 2 Diabetes mellitus; Treatment; Patients.

DEDICATION

To the Almighty GOD for his unfailing kindness

To my parents for their continued support and encouragement given to me throughout my life.

To my beloved wife Rosalia Mutale Nyirongo for her continued support and love.

To my lovely children, Kluivert, Ruth, Kondwani, Taonga, Mutale and Sanford Jr. for their unwithering love, support and prayers to enable me to complete this study successfully.

To my sibling for their encouragement and continued support and love.

ACKNOWLEDGEMENT

My heartfelt gratitude goes to the following;

My sponsor, Ministry of Health for enabling me to undertake the studies for Master of Science in Clinical Nursing at the School of Nursing Sciences.

My utmost gratitude goes to my research supervisors Supervisors, Dr Mukwato Mr. Musenge and Mrs. Kalusopa for the tireless efforts rendered to me for this study to be a success

Further, I am grateful to Monze Mission Hospital for the permission to conduct the study, Mrs Simaambo and Monze Hospital Outpatient staff and my friends for the unwavering support and encouragement during my studies.

My beloved wife and my children (Kluivert, Ruth, Kondwani, Taonga, Mutale and Sanford Jr) and the entire family members for their encouragement, support and love

Finally, I thank the respondents who participated in this study. Without them this study would not have been possible .

May God bless you all.

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ACRONYMS

ADA.....	American Diabetes Association
ART.....	Antiretroviral Therapy
CCM.....	Chronic Care Model
CI.....	Confidence interval
X ²	Chi-square
CSO.....	Central Statistical Office
DHO.....	.District Health Office
DM.....	Diabetes mellitus
DSME.....	Diabetes Self- Management Education
DSMS.....	Diabetes Self-Management Support
FBG.....	Fasting Blood Glucose
GI.....	Glycaemic Index
GL.....	Glycaemic Load
HbA1c.....	Glycosylated Haemoglobin
IDF.....	International Diabetes Federation
IEC.....	Information Education and Communication
mmol/L.....	Millimoles/Litre
mmol/mol.....	Millimoles/mole
MMAS.....	Morisky Medication Adherence Scale
OHAs.....	Oral Hypoglycemic Agents

SPSS.....Statistical Package for Social Sciences
SSA.....Sub-Saharan Africa
UNZA.....University of Zambia
UNZABREC.....University of Zambia Biomedical Research and Ethics Committee
UTH.....University Teaching Hospital
WHO.....World Health Organization
Zambian Kwacha..... ZMW

CHAPTER ONE

INTRODUCTION

This chapter presents an overview to the topic under study. It outlines the background information to the study problem, the conceptual framework and the model used. It also looks at the statement of the problem, research justification, research objectives, research questions, conceptual and operational definitions used in the study and the research variables of the study.

1.1 Background information

Diabetes mellitus (DM) is a metabolic disorder carbohydrates, proteins and fats characterized by hyperglycemia, polydipsia, polyphagia, polyurea and weight loss due to defects in insulin secretion, insulin action, or both (American Diabetes Association [ADA]., 2010). It is a major public health problem worldwide, which requires continued medical care and ongoing patient self-management, education and support to prevent acute and to reduce the risk of long-term complications (Al-Rasheedi., 2014). It is one of the most common non-communicable diseases and the fifth leading cause of disability, morbidity and mortality globally especially in developing and newly industrialized nations (Jackson et al., 2014; García-Pérez et al., 2013).

There are three main types of DM and these are type 1 DM, type 2 DM and gestational DM (Cho et al., 2013). Type 1 DM is an immune-mediated DM which results from a cellular-mediated autoimmune destruction of the beta cells of the islets of Langerhans of the pancreas leading to absolute deficiency of insulin secretion and accounts for 5–10% of patients (ADA., 2010; Azevedo and Alla., 2008). This type of DM starts early in life and patients with type 1 DM depend on exogenous treatment with insulin. Type 2 DM (the focus of discussion in this study) results from predominantly insulin resistance with relative insulin deficiency to predominantly insulin secretory defect with insulin resistance characterized by

hyperglycemia. It starts late (mostly early 40s) in life and can go unnoticed and undiagnosed for years and those affected are unaware that they have the condition. It accounts for 90–95% of patients with diabetes worldwide. Due to its progressive nature, most patients with type 2 diabetes eventually require insulin to achieve and maintain glycaemic control (Benhalima and Mathieu., 2010). Gestational DM on the other hand appears during second and third trimester of pregnancy. Carbohydrate intolerance results in hyperglycaemia of variable severity with its onset or first recognition during pregnancy (Fraser and Cooper., 2009). The increased oestrogen, progesterone and human placental lactogen (chorionic somatomammotropin) hormone produce resistance to insulin in the maternal tissues therefore blood glucose levels remain raised longer. It can lead to the risk of developing type 2 diabetes later in life though some women may have normal plasma blood level after delivery.

This study focused on type 2 DM, which affects people mostly above 40 years due to insulin resistance causing reduced tissue response towards insulin though it can affect individuals before the age of 40 (Likitha et al., 2012). The major challenges affecting type 2 DM patients are centered on adherence to recommended treatment. Likitha et al (2012) and García-Pérez et al (2013) defined adherence to therapy as the extent to which a person's behavior in taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider. They noted that, several factors influence patients' adherence to treatment, some of which include, long distance to a health facility, low social economic status and lack of knowledge on self-care management.

The prevalence of type 2 DM is rapidly increasing all over the world with the number of adults with the disease rising from 135 million in 1995 and is projected to be 300 million in the year 2025 (Al-Rasheedi., 2014). The most affected people are aged between 40 and 59 years (García-Pérez et al., 2013). Furthermore, the World Health Organization (WHO., (2016) facts sheet shows that the number of people

suffering from type 2 DM was 422 million in 2014 with the global prevalence of 8.5% among adults over 18 years of age in the same year. Most of the literature revealed shows that there is an enormous challenge regarding adherence to type 2 DM management in many countries. This study therefore was conducted to assessed factors influencing adherence to type 2 DM treatment at Monze Mission Hospital.

Poor adherence to type 2 DM treatment recommendations often lead to increased use of healthcare services, poor quality of life and increased healthcare costs due to insufficient glycaemic control and avoidable life-threatening complications. It further results in chronic microvascular and macrovascular complications which leads to heart attack, stroke, blindness, kidney failure and lower limb amputation and deaths (Likitha et al., 2012; Islam et al., 2014 and Omar and San., 2014). These deaths could be attributed to mismanagement of type 2 DM patients.

The ADA (2010), revealed that type 2 DM patients sought treatment due to symptoms of marked hyperglycemia, polyuria, polydipsia, weight loss, polyphagia and blurred vision and sometimes a comatose state despite being on recommended treatment. This may be attributed to patients not adhering to recommended treatment regimen. Benhalima and Mathieu (2010) and the ADA (2010) regard glycaemic control as one of the important strategies for management of type 2 DM. Glycated haemoglobin (HbA1c) is the best measure of glycaemic level over the previous three months because it reflects the glucose levels the cell was exposed to over a period of 8-12 weeks during the life cycle of the red blood cells, thus providing a useful longer-term gauge of blood glucose control. Diabetic patients with a glucose measure of ≤ 48 mmol/mol (6.5%) are said to have good control of their diabetes and it is the set target for monitoring patients with well-controlled glucose levels (Pinidiyapathirage et al. 2013). Benhalima and Mathieu (2010) further stated that HbA1c of ≤ 48 mmol/mol has shown to reduce microvascular complications of DM and if implemented soon after diagnosis, it is associated with long-term reduction in macrovascular disease.

However, the clinical goals for diabetes outcomes are not being routinely achieved in practice due to patients' poor adherence to type 2 DM treatment and lack of equipment to measure HbA1c. On the other hand, challenges such as barriers to accessing treatment from health institutions by patients as well as lack of readily available diagnostic equipment and drugs have also led to many patient's experiencing poor glycaemic control at home. The degree of hyperglycaemia reflects the severity of the underlying metabolic process and its treatment more than the nature of the process itself (ADA.,2010).

A study by Novo Nordisk (2011) showed that in the United Kingdom, there were 150,000 newly diagnosed people with type 2 DM in 2010, bringing the number of people known to have the condition to 2.78 million. About a million more were unaware that they already had diabetes and many were only diagnosed after having the condition for many years, when complications had already set in. Additionally, there has been a global shift in the populations affected with type 2 DM. South-East Asia has become an emerging epicenter of this chronic condition with 138 million of all adults with the condition in the world living in this region (International Diabetes Federation., 2014). The projections depict that the number of people with type 2 DM in the region will increase to 220.9 million of the adult population by 2030. Cho et al (2013) revealed that an overwhelming burden of the disease is found in low and middle-income countries. The IDF (2013) further found that African region, has the highest proportion of undiagnosed type 2 DM which stood at 63% of 19.8 million adults. An estimated 522,600 people in the region died from type 2 DM related causes in the same year representing 8.6% of deaths from all causes in adults. This could be attributed to poor adherence to DM treatment.

The sub-Saharan Africa region consists of countries which are fully or partially located south of the Sahara Desert. Type 2 DM is currently the most common form of diabetes in SSA, similar to other regions of the world (Mbanya et al., 2010). The prevalence of type 2 DM in the region in 2010 was 10.4% and mainly among people

of Northern Sudan and population of mixed Egyptian ancestry (Tuei et al., 2010). The projected increase come with its own challenges related to limited infrastructure and poorly equipped health institutions to manage this epidemic in many countries. This may be due to lack of knowledge on healthy nutrition and better healthy lifestyles which can help to delay the development of the disease.

A study by Beran et al (2005) in Mozambique and Zambia showed that availability of insulin in health institutions in Mozambique was better compared to the Zambian hospitals and health centers in three provinces (Lusaka, Eastern, and Copperbelt) with results showing drug stock out at the time of the study. This could be one of many factors which impede adherence to diabetes type 2 treatment and subsequently exposes patients to diabetic complications and sometimes death.

A report by WHO (2014), revealed that there were 1,839 (1.36%) deaths due to type 2 DM in Zambia with the age adjusted death rate of 35.64% per 100,000 of population. It is evident that type 2 DM is on the rise and control measures to non-adherence related complications can be enhanced through educating patients on the importance of adhering to treatment to prevent complications.

Equally, the number of patients with type 2 DM being attended to, at Monze Mission Hospital in Southern province is equally on a steady increase. In the years, 2013, 2014 and 2015, Monze Mission Hospital had 107, 139 and 198 admissions of new and old type 2 DM patients respectively (Monze Mission Hospital, 2016). Patients records from the institution furthermore revealed that, patients who sought medical treatment presented with elevated plasma blood glucose levels. The reason for elevated glucose levels in these patients despite them being on treatment is not clearly understood. A study by ADA (2010) reported that chronic hyperglycemia leads to long-term complications, hence the need to promote adherence to type 2 DM treatment recommendations. This circumstance compelled the researcher to undertake the study on adherence to type 2 DM treatment.

Evaluation of factors associated with poor adherence to type 2 DM treatment such as economic status, health literacy and diabetes-related distress can help identify challenges related to poor adherence to treatment. The use of Diabetes Self-Management Education (DSME) and Diabetes self-management support (DSMS), co-management with a diabetes team, can improve patients' adherence to type 2 DM management. The DSME facilitates knowledge, skills, and ability necessary for diabetes self-care while DSMS enhances support required for implementing and sustaining coping skills and behaviors needed to self-manage on an ongoing basis (Powers et al., 2015). The ADA (2015) implores the use of these strategies by involving patients in goal setting, integrating evidence-based guidelines and clinical information tools into the process of care and incorporating care management teams to reduce the glycaemia levels to the patients' normal state.

Similarly, Clark (2004); Integrated Diabetes Care (2014) and Powers et al (2015) also stated that high-quality DSME improved patient self-management, satisfaction, and glucose control through an integrated approach like clinical content and skills, behavioral strategies (goal setting and problem solving), and engagement with emotional concerns. This promoted patients' adherence to treatment hence reducing late diabetes related complications. Treatment of type 2 DM comprises of eating healthy diet, regular exercising, adhering OHAs or insulin treatment, self-care management as well as keeping doctor's appointment.

1.2 Statement of the problem

Poor adherence to DM treatment recommendations has been a major challenge in achieving optimal glucose control and self-care management of the disease (Mandewo et al., 2014). It is usually associated with poor glycaemic control, high hospitalization rates, disability and overall premature deaths. In 2013, 2014 and 2015, admissions of new and old cases of type 2 DM patients at Monze Mission Hospital were 189, 231 and 276 respectively (Monze Mission Hospital., 2015). The

trend showed an increase in the number patients with type 2 DM patients who were being attended to due to elevated blood glucose levels despite being on prescribed antidiabetic treatment (Monze Mission Hospital., 2015 and Likitha et al., 2012). It is against this background that this research was embarked on to assess factors influencing adherence to treatment by patients with type 2 DM. Despite type 2 DM being a common chronic illness, adherence to treatment has often been found to be unsatisfactory with less than 50% of patients achieving glycemic goals (Sufiza et al., 2013). In Zambia the national DM prevalence rate in 2013 was 3% and diabetes related deaths in the same year were 7,599 (Cho et al., 2013). The information obtained from this study may benefit patients through advocating for strict treatment adherence discharge planning to enhance self-care management thereby preventing diabetes related complications and premature deaths.

1.2.1 Conceptual Framework

The Conceptual framework used in this study was the Chronic Care Model (CCM). The Model was developed MacColl Center for Health Care Innovation in the early 1990s to provide a basis for managing chronic diseases including DM. It was formulated to promote healthy living and prevent risky behaviors which can lead to development of complications (Ewing., 2013). The Model focused on improving the use of existing resources, create new resources, and promote a new policy of interaction between more enlightened and empowered patients and better prepared and proactive health teams (Baptista et al., 2016). It provides patients with self-management skills and reorganization of medical care systems through partnerships between health systems and communities (Stellefson et al., 2013).

1.2.1.1 Chronic Care Model

The CCM is one of the most widely used models in caring for patients with chronic diseases. It originated from a synthesis of scientific literature reviewed by the MacColl Institute for Healthcare Innovation in the early 1990's. The Model was further refined and published in its current form by the Robert Wood Johnson

Foundation in 1998 (Ewing., 2013). Its use has shown to be an effective framework for improving the quality of diabetes care, for it advocates for evidence-based health care system changes that meet patients' aspirations in management of chronic diseases. The Model requires patients and health care providers to have knowledge on the condition to effectively manage it. Furthermore, Stellefson et al (2013) stated that the Model promotes the creation of more effective health care delivery systems which institute mechanisms for decision support, link health care systems to community resources and policies, deliver comprehensive self-management support services for patients, and operate and manage patient-centered clinical information systems. When enhanced, distance cannot be a factor in relation to accessing health services because of the link between the health facility and the communities.

The six core elements of CCM for the provision of optimal care to patients are:

1. Delivery system design (moving from a reactive to a proactive care delivery system where planned visits are coordinated through a team-based approach)
2. Self-management support
3. Decision support (basing care on evidence-based, effective care guidelines)
4. Clinical information systems (using registries that can provide patient-specific and population-based support to the care team)
5. Community resources and policies (identifying or developing resources to support healthy lifestyles)
6. Health systems (to create a quality-oriented culture)

1.2.2 Application of the CCM in this study

In this study, the researcher utilized the CCM to understand how the six elements of the Model influence adherence to antidiabetic treatment.

1. **Delivery system design;** This element is concerned with the patient and the health care providers to be equally involved in the management of the disease. They should both move from a reactive to a more proactive care delivery system

where planned visits are coordinated through a team-based approach without which the patients' adherence to diabetes treatment is in jeopardy. For example, patients and health care providers engage one another through telephone reminders or short message services to effectively meet the treatment goals.

2. **Self-management support;** This involves active participation of the patient in their own care by ensuring that they take their medication as prescribed to prevent complications that may arise due to missing medication. Family members are equally encouraged to take a leading role in ensuring DSME and DSMS are followed. For example, diabetic patients should be in the forefront to apply self- management support by avoiding risk behaviours such as seeking abrupt treatment of any ailment which can worsen their condition. Since patients with diabetes are at great risk of cardiovascular disease, a patient-centered approach should include a comprehensive plan to reduce cardiovascular risk by addressing blood pressure and lipid control, smoking cessation, weight management, and healthy lifestyle changes that include adequate physical activity.
3. **Decision support;** It involves basing care on evidence-based, effective care guidelines by providing guidance for implementation of care to patients by the health care providers. For example, the health care providers support the patient with adequate discharge plan information on management of their condition at home. This must include the types of food to be eaten, times of taking medication and exercises to be performed as well as regular blood glucose checking.
4. **Clinical information systems;** it involves the use of patients' records (registries) by the health care team to provide patients with specific support to facilitate patients' self-management. Emphasis on review dates is discussed with the patients; posters, media to disseminate information and best practice updates to prevent complications.
5. **Community resources and policies;** It involves identifying or developing resources to support diabetic patients, to promote healthy lifestyles to reduce

development of type 2 DM related complications. This is achieved through policies such as non-payment of user fees by encouraging partnerships between health and community organizations. For instance, patients are encouraged by family members to go for regular reviews to prevent or delay onset of complications.

6. **Health systems;** This involves the organization of health care system by providing leadership for securing resources and removing barriers of care to patients, thereby providing quality care to patients. It also calls for collaborative, multidisciplinary team work to provide care for people with chronic conditions. There must be departmental communication in the care of the type 2 DM patients. For example, the health system should expand the roles of the health care providers implementing more intensive disease management strategies through redesigning the care process, educating patients on self-monitoring of blood glucose and removing financial barriers by making community follow up for those missing their review dates.

The sum total of CCM component create an effective health care delivery system that institute mechanisms for decision support, link health care systems to community resources and policies, deliver comprehensive self-management support services to patients, and operate and manage patient-centered clinical information systems. According to the ADA (2015), redefining the roles of the clinic staff and promoting self-management on the part of the patient is fundamental to the successful implementation of the CCM Model. Therefore, people with chronic conditions such as diabetes must be actively involved in their care to facilitate patients' self-management.

The Chronic Care Model (Original model)

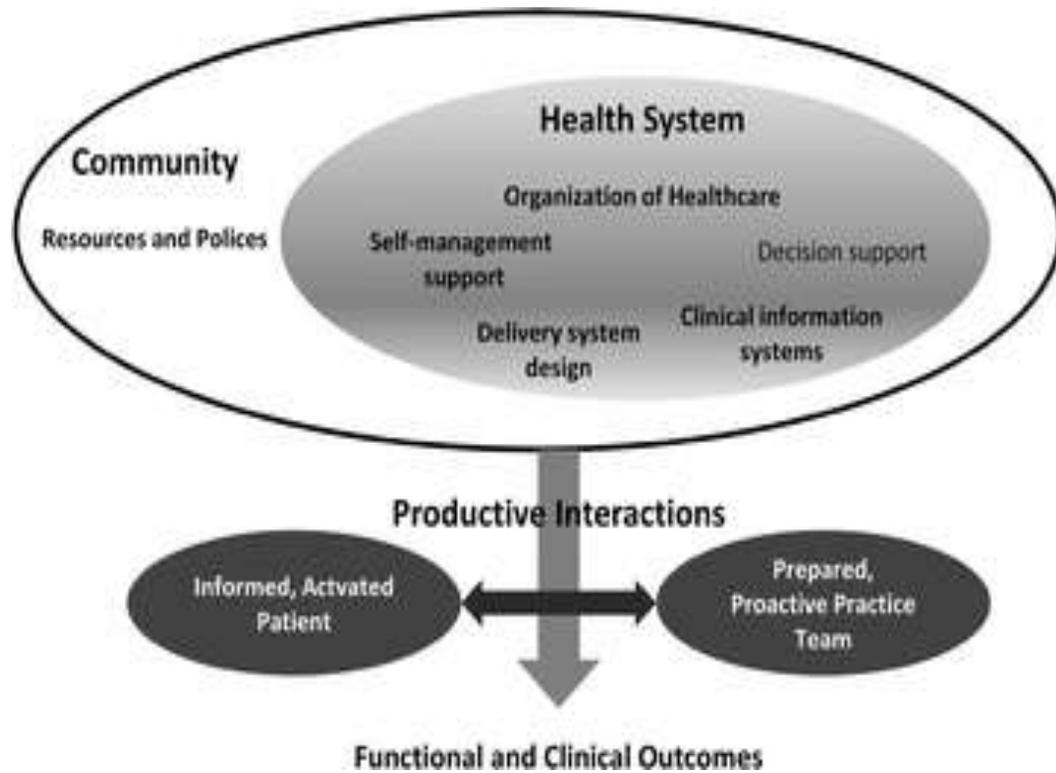


Figure 1: The Chronic Care Model (Baptista et al. 2016)

THE MODIFIED CHRONIC CARE MODEL

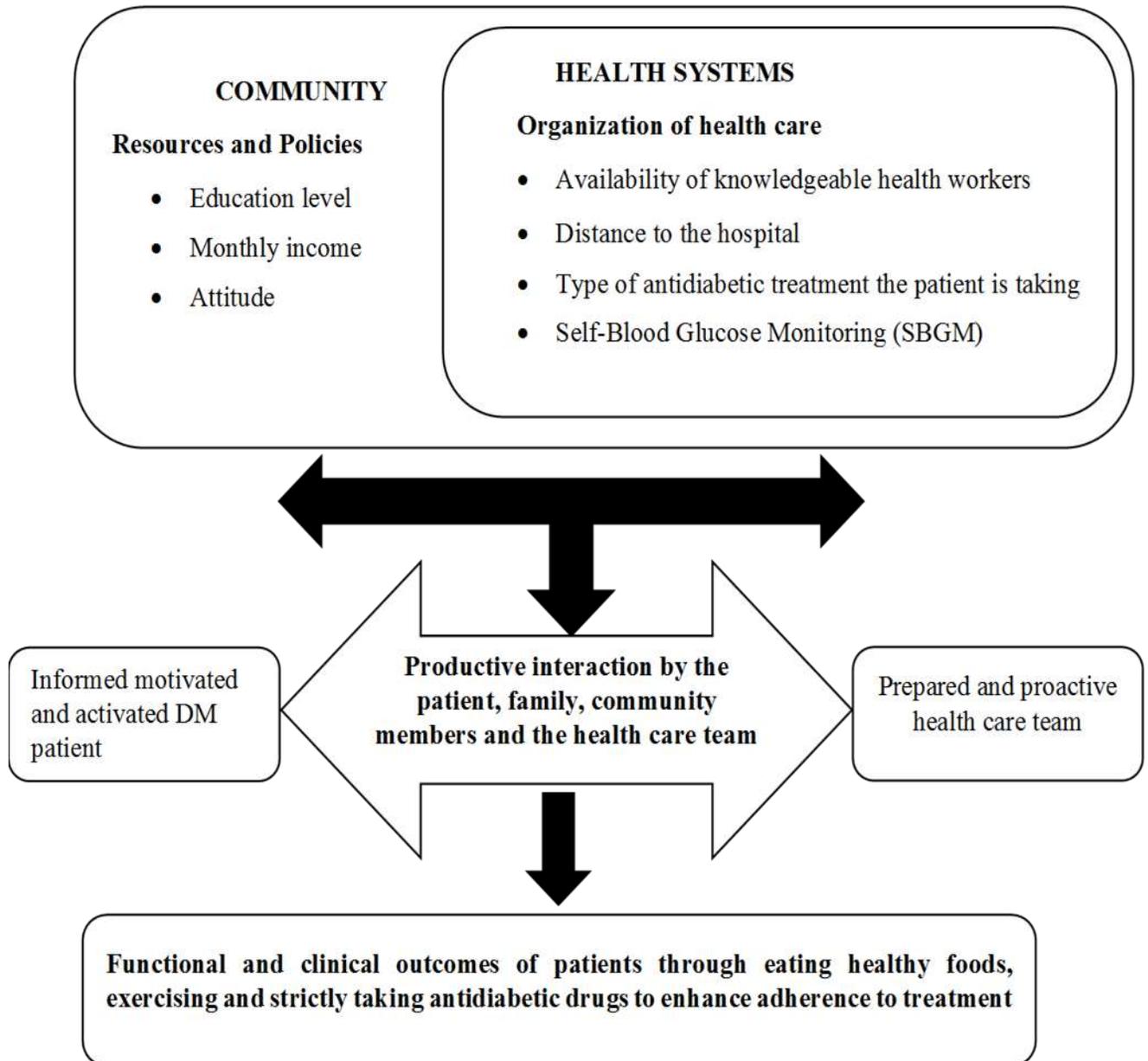


Figure 2: The Modified Chronic Care Model

(By Author., 2017)

The CCM focus on creating culture and mechanisms that promote quality patient care. Health services are organized in a network and structured manner to achieve better results in terms of completeness and resolution. The focus of the model is to improve the use of existing resources, create new resources and promote a new policy of interaction between the more enlightened and empowered patients and better prepared and proactive health teams. This results in improved interaction between and among patients, family, community members and the health care team to promote functional and clinical outcomes through effective communication and flow of information between managers, service providers as well as patients thereby preventing early onset of DM complications.

The model's six interdependent variables enhance adherence to promote quality of life of DM patients. The patients' self-management support to maintain the normal blood glycaemic levels are appreciated through a well-established health delivery system which supports productive interaction among the patient, family and community members and health care providers. Patients are given clinical information by the health care team to enhance knowledge on adherence to treatment recommendations.

1.3 Justification

This study assessed factors influencing adherence to treatment by type 2 DM patients. It elicited information and added to the board of knowledge for use for future studies on management of type 2 DM. The study further revealed the treatment challenges patients encounter as they sought medical care in health institutions. The patients' challenges provided a platform for designing strategies for improving the management of type 2 DM. It is hoped that the information obtained from this study influenced policy makers to formulate effective and lifesaving treatment protocols of DM through patient, family, community and health care provider collaboration.

1.4 Research objective

1.4.1 General objective

To assess factors influencing adherence to treatment by patients with type 2 DM at Monze mission hospital.

1.4.2 Specific objectives

1. To determine levels of adherence to treatment by patients with Type 2 DM
2. To identify factors related to adherence to treatment by patients with type 2 DM

1.5 Research questions

1. What is the level of adherence to treatment by patients with Type 2 DM receiving care from Monze Mission Hospital?
2. What factors influence to adherence to treatment by patients with type 2 DM?

1.6 Conceptual definitions

1. **Adherence:** Adherence to therapy is defined as the extent to which a person's behavior in taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider (García-Pérez et al., 2013).
2. **Antidiabetic treatment:** Patient maintained on a healthy diet and exercise regimen, followed by early medication that generally includes one or more oral antidiabetic drugs and later may include an injectable treatment (García-Pérez et al., 2013).
3. **Diabetes self-management Support:** The ongoing process of managing diabetes, which includes meal planning, planned physical activity, blood glucose monitoring, taking diabetes medicines, handling episodes of illness and managing diabetes when traveling (ADA., 2016)
4. **Diabetic diet:** A diet with low dietary glycemic load rich in cereal fiber and polyunsaturated fat (Hu., 2011)

5. **Glycaemic control:** Maintenance of the plasma glucose levels within the normal ranges of up to 8.6 mmol/L in a person with DM (Mandewo et al., 2014)
6. **Lifestyle:** An intensive weight loss in obese and overweight subjects through lifestyle modifications, medications, and/or bariatric surgery to reduce the risk of suffering from cardiovascular or metabolic disorders (Chhabra et al., 2013).
7. **Type 2 diabetes:** A condition characterized by high blood glucose levels caused by either a lack of insulin or the body's inability to use insulin efficiently (ADA., 2016).

1.7 Operational definitions

1. **Adherence:** Strictly following health care providers' recommended treatment plan for type 2 DM such as eating healthy diets, taking medication, performing regular exercises, self-care management and keeping appointment dates.
2. **Antidiabetic treatment:** A combination of anti-diabetic medications, healthy diets, and lifestyle changes required for type 2 DM patients such as exercises and cessation of smoking.
3. **Diabetes self-management support:** Self-care, support, coping skills and behavioral changes in managing one-self on an ongoing basis to prevent diabetic complications.
4. **Diabetic diet:** This is diet rich in fiber but low in fat and glucose content.
5. **Glycaemic control:** Maintenance of the plasma glucose levels up to 8.6 mmol/L in a person with diabetes mellitus.
6. **Lifestyle:** Engaging in regular aerobic exercise and diet modification leading to weight loss for the sake of maintaining the normal plasma glucose levels.

7. **Type 2 diabetes:** A metabolic disorder characterized by relative deficiency of insulin production and a decreased insulin action or increased insulin resistance managed by control of weight, exercising and eating healthy foods.

1.8 Variables and cut-off points

Dependent variable

- i. Adherence to type 2 DM treatment

Independent variables

- i. Knowledge of type 2 DM treatment
- ii. Health care system
- iii. Distance to the hospital
- iv. Social economic status
- v. Patients' attitude

Table 1: Research Variables and Cut-off Points

DEPENDENT VARIABLES	INDICATOR	CUT-OFF POINT	QUESTION NUMBERS
Adherence to type 2 DM treatment.	Good	If patient scores < 3 on adherence	Question No 20 – 25
	Poor	If patient scores ≥ 3 on adherence	
INDEPENDENT VARIABLES			
Knowledge on type 2 DM treatment	High	Patients who score between 3 – 4 on knowledge on type 2 DM	Question No 11, 12, 13, 14.
	Low	Patients who score between 1 – 2 on knowledge on type 2 DM	
Health care system	Good	If the health facility has equipment, drugs and qualified health care providers	Question No 15, 16, 17, 18 and 19.
	Poor	If the health facility has inadequate equipment, drugs and qualified health care providers	
Distance to the hospital	Far	Distance of more than 5 KM to the health facility	Question No 7, 8, 9 and 10
	Near	Distance of less than 5 KM to the health facility	
Attitude of patients towards their own care	Good	If patients score between 4 and 6 of treatment recommendations	Question No 26 - 31
	Poor	If patients score less than 4 of treatment recommendations	

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviewed literature on type 2 DM and referred to other researchers who conducted similar studies on adherence to treatment by patients with type 2 diabetes mellitus. The review also helped the researcher explore the different best practice treatment recommendations adopted in other parts of the world, to prevent morbidity and mortality related to DM. The data search was conducted on various published and unpublished articles, journals published between 2010 and 2016 in relation to the topic of study using *Zambian Medical Journal*, *google scholar*, *PubMed* *East African Medical Journal* and *American Medical Journals* as data bases. The literature enabled the researcher to have an extensive source of information regarding adherence to treatment by patients with type 2 DM. The chapter looked at adherence to treatment by type 2 DM patients and factors influencing adherence which included Knowledge about DM, the health care system, distance to the hospital and attitude of patients towards treatment.

2.2 Adherence to type 2 DM treatment by patients

Globalization and economic development have stimulated nutrition transitions in many developing nations. The nutritional shift has increased consumption of animal fat and energy- dense foods, decreased fiber, and more frequent intake of fast foods (Renzaho., 2015 and Hu., 2011). Results from the Shanghai Women’s Health Study indicated that high intake of foods with a high glycemic index (GI) or glycemic load (GL), especially white rice, is associated with increased risk of DM (Hu., 2011).

Globally about 15% of national budgets are spent on diagnosis and treatment of patients with DM in developed countries. Lack of resources such as patients’ inability to afford transport costs for clinic visits and prescribed healthy food has led to poor adherence to treatment recommendations of DM (Steyl and Phillips., 2014).

Several studies have reported that type 2 DM mostly affect the low- and middle-income countries' populations because they can afford to buy foods which can predispose them to type 2 DM. Sharma et al (2014); Mandewo et al (2014) and Ssajith et al (2014) defined adherence as the extent to which patients take medications as prescribed by their health care providers. Sharma et al (2014) further revealed that the health care systems in many countries have been designed in such a way that acute diseases are taken care of in a better way than chronic diseases. Adherence rates are usually good among patients with acute conditions compared to those with chronic conditions. Multiplicity of therapeutic components of DM and the need for lifelong adherence to the prescription makes management of type 2 DM a immense challenge to accomplish.

A study which was conducted in the eastern Caribbean by Mcguire et al., (2013) on the review of DM treatment adherence interventions revealed that, successful adherence based on five domains (diet, exercise, medication, self-monitoring, and keeping appointment) in thirteen most developed countries representing Asia, Australia, Europe, and North America was poor. Type 2 DM patients need to eat healthy diets, take their drugs daily to prevent elevation increase in plasma glucose levels. They also need to perform exercises 3 to 4 time in a week for 30 minutes to burn off excessive fat and they similarly need to carry out self-blood glucose monitoring and honor appointments with the health care providers check if their plasma glucose levels are under control. If all the five domains targets are met, the patient is said to adhere to type 2 DM treatment recommendations. Chatt and Roberts (2010) revealed developed countries have good diabetic education program with specialized physicians in endocrinology, a diabetic nurse, a diabetic educator, a diabetic counsellor and a dietician which all lack in developing countries. This situation makes adherence in most developing countries a challenge and ultimately results in poor adherence to DM management. The study further showed that only 39% of type 2 DM patients adhered to at least two-thirds of the domains, with

significantly lower adherence for lifestyle domains compared to other self-care mechanisms. However, Germany, the Netherlands, and the United Kingdom reported higher percentage of adherence in European compared to India and United States despite that adherence across all countries was less than ideal. In the United Kingdom, adherence is relatively high with only one out of ten type 2 DM patients show poor adherence treatment (Mcguire et al., 2013).

Further, Brown and Bussell (2011) reported that between one-third and two-thirds of all medication related hospitalizations which occur in the United States, are as a result of poor adherence. Despite successful management of DM being a challenge, frequent self-monitoring of blood glucose (SMBG), dietary modifications, exercise, and administration of medications as recommended can help patients to attain normal glycaemic control. On the other hand, Al-Rasheedi (2014), in his study on role of educational level in Glycemic control among patients with type 2 DM and Sharma et al (2014) in a study entitled medication adherence WHO Cares, revealed that patients would adhere to drug therapy but not to regular physical exercise and dietary advice. This results in incomplete adherence to type 2 MD treatment. A study which was conducted in Malaysia by Sufiza et al (2013) on medication adherence in patients with type 2 DM treated at primary health clinics showed that adherence to antidiabetic medicines has often been found to be unsatisfactory. In a study of 557 patients aged between 30 and 84 years of age 295 (53%) subjects were categorized as non-adherent and the most common reason for non-adherence was forgetting to take medication. Furthermore, a study which was conducted at a diabetes clinic of Doon Government Hospital Dehradun, Uttarakhnad, India, showed that out of 600 patients enrolled with type 2 DM in the study, only 17% (102) of them adhered to diabetic treatment recommendations, while 83% (498) did not. Several literature reviewed points to poor adherence as a major challenge to DM management.

Brown and Bussell (2011) indicated that poor adherence to medication led to increased morbidity and death and an estimated cost of approximately \$100 billion

per year on treatment of complicated cases. This was in agreement with a study which was conducted in Ethiopia by Abebaw et al (2016) on adherence and associated factors towards anti diuretic medication among type 2 DM patients on follow-up. The results showed that the problem of non-adherence was a challenge for the medical professionals. It resulted, in significant number of patients not adequately benefiting from medical treatment, which caused poor health outcomes, lower quality of life, and increased health care costs. However, on the contrary, a study on adherence to treatment among type 2 DM patients visiting a tertiary care hospital in Mangalore, Egypt conducted by Banu et al., (2014) showed that out of 300 participants, 214 were adherent to the medication treatment while 86 were non.

In sub-Saharan African countries, DM is posing a threat to the social, economic, and different cultural beliefs across its populations. Its prevalence in the region varies from 1% in rural areas of Uganda to 12% in urban South Africa, Kenya, and Seychelles (Renzaho 2015). Musenge et al. (2016) revealed that in a six sub-Saharan African countries study only 29% of the patients type 2 DM had good glycaemic control. However, a study conducted by Steyl and Phillips, (2014) in Western Cape, South Africa on management of type 2 DM mellitus adherence challenges in environments of low socio-economic status showed that fewer than 50% of patients with type 2 DMs globally meet glycaemic targets, even in developed countries. More disturbingly, less than 10% achieve blood pressure, cholesterol and glycaemic targets, even with multifactorial interventions.

A study by Mandewo et al (2014) which was conducted in Zimbabwe indicated that patient nonadherence to DM treatment recommendations are influenced by factors such as healthcare services, socio-economic and social support. The study further showed that individuals with poor DM management are at a greater risk of developing long-term micro-vascular and macro-vascular complications that lead to the damage of end organs such as kidneys, heart, brain and eyes. Poor DM

management also affects the direct and indirect health care costs and overall quality of life.

Musenge et al (2014) in a study on glycaemic control in diabetic patients conducted in Zambia at the University Teaching Hospital (UTH) showed that the monitoring of blood glucose levels by using glycosylated haemoglobin (HbA_{1c}) to analyze patients' glycaemic control status, to ensure the optimal care was poor. The HbA_{1c} is used to monitor the effects of diet, exercise, and drug therapy on glycaemia in diabetic patients and observed at regular intervals of 8 to 12 weeks to check the blood glucose levels for quality management of patients' condition. However, the study showed that HbA_{1c} monitoring was not done at UTH due to expensive testing reagents, though patients' glycaemic controls were monitored using FBG which is not reliable because it is subjective.

2.3 Factors influencing adherence to Diabetes mellitus treatment

Nonadherence to medical treatment severely compromises patient outcomes and increases patient mortality (Brown and Bussell, 2011). The efficacy of treatment for clients with DM is highly dependent on the individual's ability to manage the condition. Despite the extensive therapy options available for various stages of type 2 DM, studies have indicated that less than 50% of patients achieve the glycemic goals of HbA_{1c} ≤ 42mmol/mol as recommended by the ADA and approximately two-thirds die prematurely of cardiovascular disease (García-Pérez et al., 2013 and Sharma et al., 2014).

2.3.1 Knowledge about Diabetes mellitus

Knowledge is an understanding of or information about a subject that you get by experience or study, either known by one person or by people generally (Cambridge Dictionaries online, 2016). The patients' knowledge about treatment influences their impetus greatly and makes them attach extreme importance to treatment recommendations. A study which was conducted in Brazil by de Oliveira and Zanetti

(2011) showed that the goals of diabetes education were to improve metabolic control, to prevent acute and chronic complications, and to improve quality of life at reasonable costs. However, the multidisciplinary healthcare team was not teaching patients on the effective strategies of managing their condition. It resulted in patients' poor quality of health and premature deaths in 50 to 80% of DM patients due to significant knowledge deficit and self-care management skills.

Similarly, a study which was conducted in the Saudi Arabia by Al-Rasheedi (2014) on the role of education in glycemic control among patients with type 2 DM revealed that in almost all surveys, only a small fraction of individuals with diabetes met treatment targets. The study furthermore showed that, the prevalence of poor glycemic control ($A1c \geq 7$) was 67.9% and 65.1% in Kingdom of Saudi Arabia and Jordan, respectively. A study by Omar and San (2014) conducted in Kuala Lumpur Malaysia on diabetes knowledge and medication adherence among geriatric patient with type 2 DM revealed that the disease was very common among the elderly and that they had a high rate of poor glycaemic control. On the contrary, a study which was conducted by Sufiza et al (2013) in the United Kingdom showed that patients with low educational level had better compliance signifying that patients with low educational level had more trust in the physicians' advice.

A study which was conducted in Cologne, Germany by, Antoine et al (2014), revealed that hindrances to adherence was compounded with complex treatment regimens often along with long-term multi-therapies, side effects due to the medication, as well as insufficient or confusing information provided by the health care provider. Furthermore, Dmso et al (2012) in their study on medication adherence in patients with DM along with hypertension stated that strict medication adherence was required in the management of DM to significantly prevent complications.

In another study conducted by Zulkowski and Coon (2002) on adherence to ADA standards of care by rural health care providers it was shown that, rural areas of the United States, had limited health services available. Half of older rural seniors felt that they did not have readily available information about DM and other chronic disorders due to refusal by health care providers to be recruited and retained in rural areas related to decreased remunerations. However, patients who sought services from urban clinics benefited immensely because the clinics had health care providers, adequate drugs and glucose test kits. The results were supported by a study which was conducted by de Oliveira and Zanetti (2011) in a rural setting in Brazil which revealed that 64 % of their patients had unsatisfactorily low knowledge about DM self-care due to lack of health care providers.

Jackson et al (2014) in a study on knowledge of self-care among type 2 DM patients in two states of Nigeria revealed that patients with higher academic level had a greater chance of obtaining knowledge from the mass media, books and the internet and had fewer barriers in communicating with the health care team. Patients duration of having DM was also found to be significantly associated with improved self-care knowledge and more opportunities for exposure to information regarding management of the condition. It required performance of many complex self-care behaviours including lifestyle modifications (such as dietary control, regular exercise and psychosocial coping skills) and medical self-care (medication use and self-monitoring of blood glucose) without which, patients would not be able to care for themselves at home, predisposing them to complications. Similarly, a study by Bagonza et al (2015) on adherence to antidiabetic medication among patients with diabetes in eastern Uganda showed that there was good adherence where four out of every five patients adhered to anti-diabetic medication in a rural setting.

However, patients with no formal education were the least knowledgeable hence they were unable to control blood glucose to the required target. However, Musenge et al (2016) in a study on glycaemic control and associated self-management

behaviour in diabetic outpatients conducted at the UTH Lusaka, Zambia found that 61.3% type 2 DM patients had poor adherence to medication use among those who regularly attended medical review at the diabetic clinic. Education level and age had no influence on adherence to treatment.

2.3.2. Health care system

A study by Brown and Bussell (2011) showed that fragmented health care systems created barriers to medication adherence by limiting the health care coordination and the patient's access to care. Lack of health information technology hindered physicians from easily accessing information from different patient care-related venues, thereby compromising patient care, timely medication refills, and patient - physician communication, leading to poor adherence.

This is supported by a study which was conducted by Azevedo and Alla (2008) at Kenyatta national hospital in Tanzania, which revealed that patients can have adequate knowledge on diabetes medication and adherence, but the health care providers may not have the required drugs and diagnostic testing tools to assess the patients' glucose levels. The study showed that diabetic ketoacidosis occurred in 8% of the hospitalized diabetic patients, and 29.8% and 50% of the patients who died within 48 hours of admission respectively required insulin.

In another study by Hall et al (2011) it was found that low levels of adequate glucose control in diagnosed diabetics were reported in several prevalence studies. Only 27% of diagnosed type 2 diabetics receiving treatment in the Cameroon study had adequately controlled glucose levels. Out of 99 patients with type 1 DM in the Tanzanian survey, only one person achieved good glucose control and none of the 99 type 1 DM patients had the resources to monitor their glucose levels at home, and hospitals were unable to routinely do this. The study further, revealed that the availability of diagnostic testing tools in the sampled healthcare settings in three countries, found that in Mozambique urine glucose strips were available in just 18%

of health facilities surveyed, ketone testing strips in 8% and blood glucose meters in 21%, whilst availability in Mali was 54%, 43% and 13% and in Zambia 61%, 54%, 49% respectively. This is one of the factors which attributes to poor adherence to diabetes treatment emanating from service delivery.

2.3.3 Distance to the health facility

Patients' adherence to doctor's advice on medical interventions influences clinical outcomes of medical care, improves the quality of care and has measurable economic benefits (Petek et al., 2010). World Health Organisation (2003) showed that long distance from treatment center, high cost of transport has made some diabetic patients to ignore the importance of adhering to treatment because they do not just have the means to access treatment. Similarly, a study which was conducted in India by Likitha et al (2012), showed that long distance from treatment center and high cost of transport made some diabetic patients to ignore the importance of adhering to treatment. However, a study which was conducted in Ethiopia by Teklay et al (2013) revealed that patients travelled long distances to the nearest medical center to access medical care. This was contrary to a study which was conducted in Zimbabwe by Mandewo et al (2014), which showed that diabetic patients did not adhere to treatment recommendations due to travel costs particularly those who travel long distances to the health care facilities.

In Zambia, while great advances have been made in the cities many rural areas remain undeveloped. Physical accessibility of healthcare providers is a hustle to many people due to distance and lack of money for use on public transport. The majority of people in rural areas walk long distances, up to 30 kilometers to reach the nearest rural health center (Chatt and Roberts., 2010). This affects adherence negatively as patients may choose to stay home than going to the health institution for treatment

2.3.4. Socioeconomic status

Adherence to antidiabetic treatment recommendation is a primary determinant of effective treatment because poor adherence decreases optimum clinical benefit. Islam et al (2014) in the study conducted in Bangladesh on mobile phone intervention for increasing adherence to treatment for type 2 DM in urban areas found that non-adherence led to increased use of healthcare services, poor quality of life and increased healthcare costs. Hu (2011) in the study on globalization of diabetes; the role of diet, lifestyle, and genes cited rapid economic and social developmental activities in many developing nations to be associated with shifts in lifestyle habits and dietary structure. These changes promote over nutrition and positive energy balance leading to obesity.

Similarly, the IDF (2011) revealed that economic development and urbanization has led to changing lifestyles characterized by reduced physical activity, and increased obesity. Obesity is a fast-growing health problem which is reaching epidemic proportions worldwide due to an imbalance between energy intake and expenditure and is characterized by increased body fat stores (Tuei., 2010). Furthermore, Chhabra et al (2013) found that in the United States, more than 64% of the population is overweight (BMI \geq 25) kg/m²), and more than 33% of the adult population are obese. This poses a significant risk for development of many chronic diseases including type 2 diabetes, high blood pressure, high cholesterol and stroke. However, studies by Manusha et al (2014); Antoine et al (2014) and Mandewo et al (2014) revealed that adherence to treatment was poor due to poverty, lack of knowledge, poor follow ups and complexity of treatment regimen. The socioeconomic status has not consistently been found to be an independent predictor of adherence. Low socioeconomic status in developing countries places patients in a position of having to choose between competing priorities such as demands to direct the limited resources available to meet the needs of other family members to seeking medical care (WHO., 2003). Mostly family problems are considered first hence

making adherence to treatment look less important. This is in agreement with the study by Brown and Bussell (2011) which found that low socioeconomic status in many countries are barriers to medication adherence among the inner-city patients.

On the contrary, a study conducted in Nepal, India by Parajuli et al (2014) revealed that 80% of people with DM live in low and middle-income countries where the rapid socioeconomic development, urbanization, globalization, and an expanding number of fast food outlets, led to unusual food consumption. These factors negatively influence adherence to lifestyle modification recommendations amongst type 2 DM patients making dietary adjustment and lifestyle modification problematic in DM management.

Another study by Shams and Barakat (2010) on measuring the rate of therapeutic adherence among Outpatients with type 2 DM in Egypt found that the DM occurs in developing countries and results from population ageing, unhealthy diet, obesity and a sedentary lifestyle. However, a current research study by the same author revealed poor adherence to treatment recommendations with only 38.9%, 21.1% and 18.4% of all patients belonging to categories of adherence to drug, dietary/exercise and to the appointment for regular follow up, respectively. This is in agreement with a study which was conducted by Twei (2010) on type 2 DM and obesity in sub-Saharan Africa. The study revealed that globalization has brought about a rapid urbanization pattern with the adaptation of the high-calorie 'western diet', and reduced physical activity, which is negatively impacting on health and increases the risks of developing non-communicable diseases, such as type 2 DM.

However, a study which was conducted by Steyl and Phillips (2014) in south Africa, showed that despite improved management of diabetes in the Western Cape, in the past decade, a recent review found that only 48% of patients with type 2 DM had an HbA1c test done in the previous year, whilst only 35% reached glycaemic control (HbA1c < 7%). Most of the patients cited lack of money as a key challenge in the

management of type 2 DM, as it was difficult for the participants to buy healthy foods and go to the community health centers for regular check-ups.

In a study conducted by Musenge et al (2014) at the UTH in Zambia, showed that the majority of diabetes patients in the OPD had poor glycaemic control status because they were unable to monitor and maintain to near- normal glycaemic levels. It was further justified by a countrywide diabetes treatment management needs assessment, which was carried out by the Zambian government for the non-communicable disease program, which showed that there were immense inadequacies in drugs and laboratory reagents, diagnostic facilities, expertise in disease management and community awareness for this disease. The study opened new opportunities for health care providers to review how diabetic patients would be managed to ensure good glycaemic control to promote quality of life.

2. 3.5. Attitude of patients towards treatment of DM

Type 2 DM is a common and serious global health problem, which, for most countries, is associated with rapid cultural and social changes, ageing populations, increasing urbanization, dietary changes, reduced physical activity, and other unhealthy behaviors (Abebaw et al., 2016). On the contrary a behavioral risk factor surveillance system study which was conducted in North Carolina by Berhe et al (2013) revealed that 83% of patients with type 2 DM performed blood glucose monitoring. Furthermore, Berhe et al (2013) suggested that self-care activities varied extensively with taking of medication often occurring as recommended and exercise frequently falling below recommended levels.

Omar and San (2014) in a study which was conducted in Malaysia examined the influence of patient beliefs on the medication taking behavior among DM patients and found that concerns about beliefs on side effect of medication and changes to daily routine were the principal factors which led to poor adherence. The study further revealed that 193 (51.1 %) had negative attitude towards adherence while 185

(48.9 %) of the patients had positive attitude. However, a study by Brown and Bussell (2011) on adherence revealed that a good physician-patient relationship is effective communication which in return enhances adherence to medication. The leading strategy that physicians can use to increase medication adherence is to follow a patient-centered approach to care that promotes active patient involvement in the medical decision-making process.

A study which was conducted by Nadia et al. (2013) in Omanon, on doctors' and nurses' views on patient care for type 2 DM in primary health care, showed that changing lifestyle towards less physical activity and less healthy dietary habits with consumption of a lot of fast foods, high refined sugar and saturated fat, contributed to high prevalence of type 2 DM patients to up to 12.3% in 1.9 million Omani citizens. The study further revealed that physicians considered DM to be more difficult to manage than other chronic diseases because it required extra monitoring and medication adjustment to achieve treatment goals. However, doctors and nurses blamed DM patients for lack of understanding on the importance of adherence to antidiabetic treatment recommendations. In addition, patients' attitudes, beliefs, knowledge of the disease, financial resources as well as social and family support negatively influenced adherence to management protocols.

However, on the contrary, the ADA (2014), showed that type 2 DM patients can control their blood glucose by following a healthy meal plan, regular physical activity program, losing excess weight, learning coping skills, adhering to medications and monitoring blood glucose through self-management education and self-care behaviors. Patients with a positive attitude to healthy living can attain the normal glucose levels. This was supported by a study which was conducted in Belgium by Benhalima and Mathieu (2010) which revealed that sustained exercise (walking, swimming, cycling) for limited amounts of time (30 minutes per day) has spectacular effects on one of the pathogenic pillars of type 2 DM insulin resistance. These lifestyle interventions do not only positively affect glucose uptake, but also

reduces cardiovascular risk factors, such as blood pressure and lipids. When healthy lifestyles are followed, HbA1c drops of 1- 2% may be expected and lifestyle measures are cheap and have no long-term side effect.

Additionally, Lee et al (2013) in their study on reliability and validity of a self-reported measure of medication adherence in patients with type 2 DM in Korea found that non-adherence to medical regimens is still a major behavioural problem in the management of patient with type 2 DM, despite the availability of effective oral hypoglycaemic agents and insulin. This was because adherence to treatment did not merely mean taking the right prescribed drugs as instructed. It included healthy eating habits, regular exercises and regular blood glucose checkups. Furthermore, Steyl and Phillips (2014) found that effective treatment of type 2 diabetes mellitus was highly dependent on the patients' ability to manage the disease. But due to several constraints, such as poverty, illiteracy and insufficient resources especially in communities of low socio-economic status, patient could hardly manage their disease.

Parajuli et al (2014) in a study on factors associated with non-adherence to diet and physical activity among type 2 DM found that only 2.2% of the patients adhered to dietary regimen while no one reported regular compliance with exercise regimen despite lifestyle modification lessening the disease burden and reducing the morbidity and mortality associated with type 2 diabetic complications. Another study which was conducted by Jackson et al (2014) in Nigeria revealed that negative attitude towards DM was shown to affect knowledge of the patient. The negative attitude of the perceived seriousness of DM was identified as a factor affecting knowledge of self-care. However, a positive attitude towards the disease, drove the patient to seek information concerning their condition.

A study which was conducted in Zambia and Mozambique by Beran et al (2005) on access to care for patients with insulin dependent DM in developing countries

showed that insulin was not available on an uninterrupted basis in many parts of the developing world, subjecting patients to non-adherence to treatment. In Mozambique, insulin was always available at only 20% of five hospitals studied, but at none of six the health centers. In Zambia, insulin was available in all the 13 hospitals investigated, but only at some referral health centers. Though it was available in private health facilities, many patients could not access it due to cost implications. Further, lack of diagnostic tools in many health facilities meant that DM patients were likely to be missed or misdiagnosed. Diabetes mellitus in patients presenting with coma may be misdiagnosed as cerebral malaria. The non-availability of glucometers meant that patients were treated without measuring their glucose levels.

The former United States of America President Bill Clinton once said that, “Until we build the human and physical infrastructure needed to deliver effective treatment, programs will not succeed” (Beran, Yudkin, and de Courten, 2005). This was in apparent reference to HIV/AIDS, although the same is true for DM management through creation of organized systems for continued supply of drugs, diagnostic facilities, training and retention of health workers, and patient education in the management of DM.

2.4 Conclusion

The literature reviewed in this study has shown that several research studies conducted, reported that adherence to type 2 DM treatment is an enormous challenge which cannot be blamed on either patients or healthcare providers alone. Fifty percent of type 2 DM patients have poor adherence to treatment recommendations due to multiple factors which include, long distance to the health facility, low social economic status and lack of knowledge on self-care management and glucose monitoring, multiple drug prescription, and sometimes lack of antidiabetic drugs. On the other hand, the shift from the healthy traditional diet to diets high in refined carbohydrates, saturated fats, and cholesterol, and low in fiber foods have increased the risk of developing obesity and consequently type 2 DM. This is coupled with reduced physical activity associated with sedentary urban lifestyle changes brought about by industrialization and urbanization.

Despite a lot of studies having been conducted on adherence to type 2 DM in many countries, not much has been done in Zambia. It is for this reason that the researcher conducted a study on adherence to treatment by type 2 DM patients at Monze Mission Hospital. It is hoped that this study will identify treatment recommendation lacunae on type 2 DM and help relevant policy makers to formulate optimal patient treatment recommendations for patients with type 2 DM to prevent premature deaths while promoting quality of life.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology used in this study. It comprises of the research design, research setting, and study population, sample selection, sample size, data collection tool, validity, reliability, pilot study and ethical considerations for this study.

3.2 Study Design

The researcher used a cross-sectional study design because it helped to answer the research question within the stipulated time of conducting the study. It involved a systematic collection and presentation of data to describe the relationship among variables without attempting to infer causal connections on adherence to treatment by patients with type 2 DM.

3.3 Study Setting

The study was undertaken at Monze Mission Hospital in Monze district. The hospital is 178 km south of Lusaka, and it is 200 meters on the western part of Lusaka road. It is a general hospital with a bed capacity of 267 and offers second level health services such as medical, surgical, obstetrics and gynaecology services. Other services are cervical cancer screening, as well as a well-established an Antiretroviral Therapy (ART) clinic. The hospital also offers training services for nurses, medical licentiates' internship and medical students. It services a population of 214,557, though other districts in the province refer their patients to the institution (Monze DHO., 2016). The hospital holds a medical clinic every Friday to review patients with medical conditions including DM. The study population in this study were type 2 DM patients seen at the medical Out-patient department clinic. Monze Mission Hospital was chosen as a study site because the researcher has worked there and observed the increase in the number of type 2 DM patients. Further, the hospital is

situated in the urban area where people are slowly adopting the affluent way of lifestyle, lead a sedentary lifestyle, consume fast foods and do not regularly exercise making them prone to developing type 2 DM.

3.4 Study Population

The study population were all men and women with type 2 DM aged 20 years and above who accessed medical treatment at Monze Mission Hospital.

3.4.1 Target Population

The target population in the study included men and women suffering from type 2 DM aged 20 years and above who accessed medical treatment at Monze Mission Hospital during study period.

3.4.2 Accessible Population

The accessible population involved men and women suffering from type 2 DM and met the criteria and was willing to participate in the study.

3.5 Sample Selection

The researcher used a simple random sampling method to choose patients using a sampling frame for eligible type 2 DM patients who sought medical care from the Out-patient medical clinic and those admitted. The sampling frame comprised of 216 type 2 DM patients who accessed health care services during the three months of data collection. Identical pieces of paper with numbers written on them, representing the number of patients on that day were put in a box after folding them. The numbers represented the patients as listed on the sampling frame. The pieces of paper were thoroughly mixed together by shaking the box. Then one piece of paper was blindfold picked at a time without replacement until the patients were selected per day and finally the required sample size for the study was reached. This gave the patients with type 2 DM an equal chance of participating in the study. To eliminate

selection biases, patients were identified and recruited consecutively for three months.

3.5.1 Inclusion Criteria

- i. Admitted and outpatients with type 2 DM patients aged 20 years and above, on treatment for type 2 DM for more one year.
- ii. Consent to participating in the study.
- iii. Attended the diabetic clinic during the study period.

3.5.2 Exclusion Criteria

- i. Very ill DM patients.

3.6 Sample Size

A sample size of patients was calculated using Krejcie and Morgan (1970) formula for calculating sample size of a finite population. A total sample size of 138 patients were recruited to the study.

$S = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2P(1-P)}$. Where:

S = Required Sample size

X = Z value (e.g. 1.96 for 95% confidence level)

N = Accessible study population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%))

d = Degree of accuracy (5%), expressed as a proportion (0.05); It is margin of error.

Application of the formula

X = 1.96

N = 216

P = 0.5

d = 0.05

$S = \frac{1.96^2 \times 216 \times 0.5(1-0.5)}{0.05^2(216-1) + 1.96^2 \times 0.5(1-0.5)}$

$S = \frac{3.84 \times 216 \times 0.5(0.5)}{0.0025 \times 215 + 3.84 \times 0.5 \times 0.5}$.

S = 138.

3.7 Data Collection Tool

A structured interview schedule was used to collect data. The instrument comprised a series of questions which were closed ended. The schedule had five sections. Section A had demographic data; section B assessed the health care system, Section C assessed patients' knowledge on DM. Section D assessed the patients' adherence to treatment using a modified Morisky Medication Adherence Scale and section E assessed the attitude of patients on self-management. The tool was convenient for both the literate and the illiterate patients and increased objectivity of data collection.

3.8 Validity

To ensure validity of the research tool, the researcher conducted an exhaustive literature search to have adequate content coverage. External validity was sustained by ensuring that the required number of patients was interviewed. The validity of the instrument was further achieved through making simple, concise and brief questions. Internal validity was achieved by testing the data collecting tool. Research experts on DM were consulted to evaluate the contents of the tool through a pilot study that was conducted at Mazabuka general hospital. The hospital offered similar health services as those offered at Monze mission hospital. The pilot study helped the researcher to adjust questions which were either be difficult or confusing to the patients.

3.9 Reliability

Reliability focused on two aspects, which were stability and equivalence. The same interview schedule and method of collecting data was used on all the patients during the actual study.

3.10 Data Collection Technique

Data was collected by the researcher and the two research assistants from the OPD medical clinic and from the wards from May to July 2017. The research assistants were oriented to the data collection tool and the technique through a one-day course. Each patient was assured of confidentiality and anonymity and serial numbers were used instead of participants' names. After explaining to patients and upon their

willingness to participate in the study, each participant was given a consent form to sign. Those who were unable to sign were asked to make a thumb print. During the interview process, the researcher and the research assistants read out the questions in the interview schedule and clarified for those who had difficulties in understanding the questions. At the end of each interview, the researcher and research assistants thanked each participant. The interview took 30 to 35 minutes with each respondent.

3.11 Pilot study

The pilot study was used to determine the relevance and practicability of the data collection tool. Pretesting of the data collection tool was conducted from Mazabuka general hospital on 14 patients with type 2 DM. The pilot study enabled the researcher to pretest the data collecting tool to elicit flaws and amend some questions such as; how patients felt when they were in hyperglycaemia or hypoglycaemia. This was because the questions were subjective and patients gave different responses which were not measurable and were confusing.

3.12 Ethical consideration

Ethical clearance was sought from the University of Zambia Biomedical Research Ethics Committee (UNZABREC). Permission to conduct the study was further obtained from Monze mission hospital management. The purpose and nature of the study was explained to each participant. Those who declined to participate were reassured that no privileges would be taken away from them. Those who agreed to take part in the study were requested to sign a consent form for legal purposes and to authorize participation in the study. Participants were assured of anonymity and confidentiality by interviewing them in privacy individually as well as ensuring that participants' names did not appear on the interview schedules. No other person apart from the researcher and research assistants were allowed to have access to the research data.

3.12.1 Beneficence

The patients' decisions were respected and efforts made to ensure their wellbeing throughout the data collection.

3.12.2 Justice

In the study justice was upheld, by ensuring that all participants were treated equally and given an equal opportunity to make individual decisions on whether to participate in the study or not. Selection was conducted using a simple random sampling method which gave each respondent an equal chance to participate in the study.

3.12.3 Maleficence

Patients were not subjected to any harm as the research did not involve any invasive procedures. They were protected from psychological harm by letting them answer the questions in a natural setting which provided privacy with no public interference.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter analysed and presented the findings of the study which was collected using the structured interview schedule. The results were presented in frequency tables, and figures and cross-tabulations following the sequence of sections in the interview schedule.

4.2 Data analysis

Data were collected, coded, entered and analyzed using the IBM[®] Statistical Package for Social Sciences (SPSS[®]) for Windows version 22. A Chi-square test was used to test associations between predictor and outcome variables. The Confidence Interval (CI) of 95% was set and a p-value of < 0.05 was considered statistically significant. The binary logistic regression was used for multivariate analysis to determine true predictors of adherence to DM treatment recommendation. The omnibus test of model coefficients ($X^2 = 5.742$; $P = 0.219$) and Regression Model were used to determine prediction accuracy of the independent variable. The predictors considered statistically significant were computed into the Regression Model to control for confounders.

4.3 Presentation of results

The results of the study were presented according to the sections of the interview schedule. Data were grouped together according to the variables under discussion. The results were presented using the frequency tables, figures and cross-tabulations to explain the research results. The cross-tabulations were furthermore used to show the relationship between variables.

4.4 Dissemination of the results

The results of the study were presented to the School of Nursing Sciences, School of Medicine, University of Zambia (UNZA). They were later presented at the postgraduate seminar week at UNZA main campus. Five copies of the bound research report were printed and submitted to the School of Nursing Sciences, UNZA Medical Library and Main Library, Ministry of Health, Monze Mission Hospital and a copy for the researcher. The research findings were further shared with the diabetes clinic staff, patients and the general public through health education and sensitization in the district.

4.4 Demographic data

Table 2: Demographic characteristics of the patients (n=138)

Characteristics	Frequency	Percent
Sex		
Male	57	41.3
Female	81	58.7
Total	138	100.0
Age		
20 - 29 Years	14	10.1
30 - 39 Years	15	10.9
40 - 49 Years	38	27.5
50 – 59	31	22.5
60 Years and above	40	29
Total	138	100.0
Marital status		
Single	18	13
Married	87	63
Widowed	30	21.7
Divorced	3	2.3
Total	138	100.0
Education level		
No formal education	8	5.8
Primary school	50	36.2
Secondary	66	47.9
Tertiary	14	10.1
Total	138	100.0
Occupation		
Civil servant	40	29.0
Self-employed/ Businessman	56	40.6
Retired	25	18.1
Un employed	17	12.3
Total	138	100.0

Table 2 shows that the majority (81%) of the patients in the study, were females. The findings were expected as currently, there are slightly more females than males and the prevalence of DM is higher among females than males (CSO., 2014). The

age range was between 20 and 68 years and 38% of the respondents were aged between 40 – 49 years while 29% of patients were aged 60 years and above. Slightly less than half of the patients (63%) were married and 21.7% were widowed. Less than half of the patients (47.9%) had secondary education and the remaining had primary (32.6%) and tertiary (10.1%) education respectively. Further, 40.6% of the patients were self-employed / Businessmen and only 29 % were civil servants.

4.5 Adherence to diabetes mellitus treatment by patients

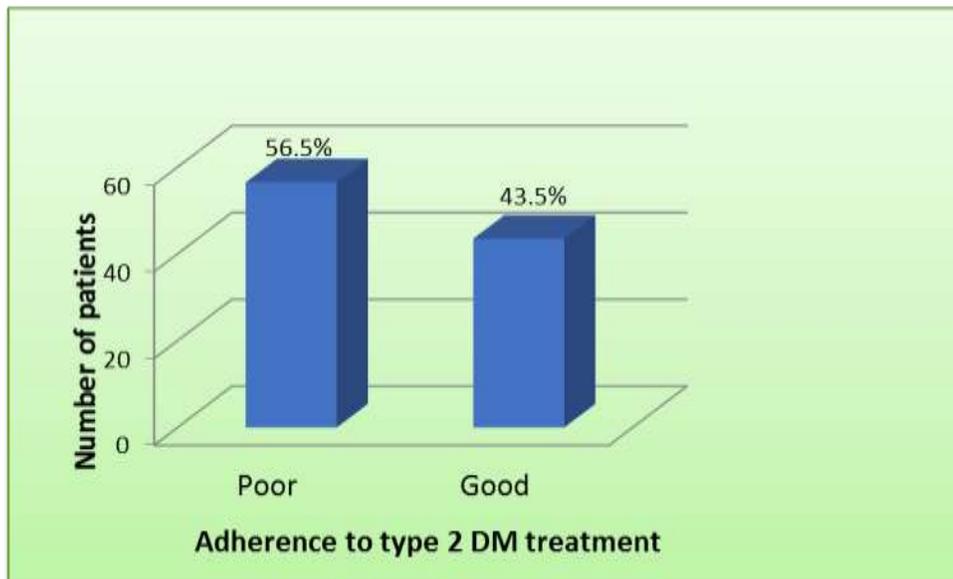


Figure 3: Patients' adherence to type 2 DM treatment (n=138)

Figure 3 shows that the majority (56.6%) of the patients reported poor adherence to type 2 DM treatment while slightly less than half (43.5%) revealed good adherences to 2 DM treatment.

Table 3: Patients' adherence to type 2 DM treatment by patients (n=138)

Characteristics	Frequency	Percent
Forget to take your medication		
Yes	91	65.9
No	47	34.1
Total	138	100.0
Had stopped taking medicine without telling the doctor		
Yes	81	58.7
No	47	34.3
Total	138	100.0
Forget to carry medicine when going away from home		
Yes	77	55.8
No	61	44.2
Total	138	100.0
Feel distressed about sticking to your treatment plan		
Yes	76	55.1
No	62	44.9
Total	138	100.0

Table 3 shows that the majority of the patients (65.9%) forget to take their medication and only 34.1% did not. More than half of the patients (58.7%) reported stopping taking their medications without informing the doctor because they felt worse when they took the drugs and 55.8% of the patients also forgot to carry along their medicine when they travelled or left home. Slightly more than half of the patients (55.1%) felt distressed about sticking to their treatment plan while 44.9% followed their treatment plan.

4.6 Patients' knowledge about type 2 DM treatment

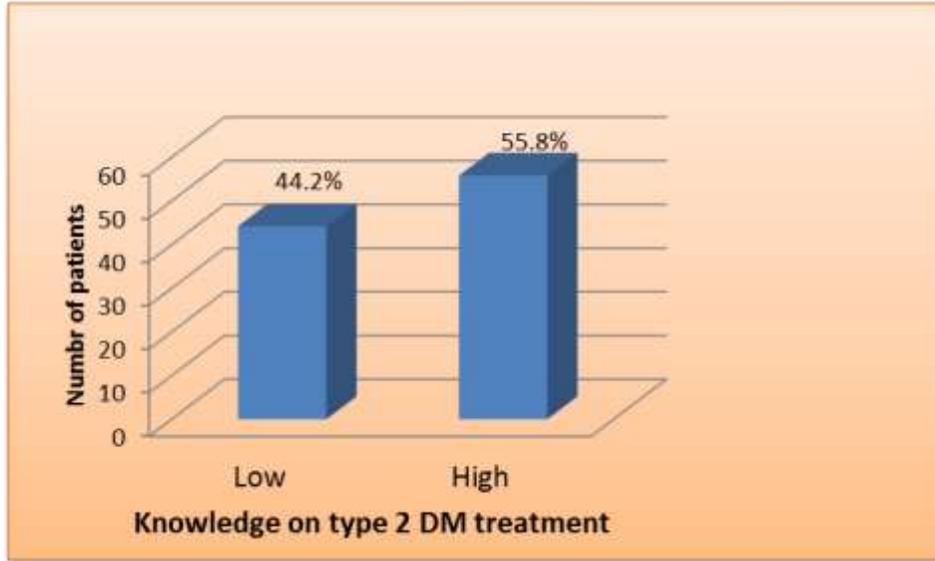


Figure 4: Knowledge about type 2 DM treatment (N=138)

Figure 4 shows that the majority (55.8%) of the patients had high knowledge while 44.2% had low knowledge on type 2 DM treatment.

Table 4: Patients' knowledge about type 2 DM (n=138)

Characteristics	Frequency	Percent
Diabetes mellitus duration		
More than one year	24	17.4
Between 2 and 5 years	45	32.6
More than 6 years	69	50.0
Total	138	100.0
Relatives suffering from DM		
Yes	81	58.7
No	57	41.3
Total	138	100
Know antidiabetic drugs patient is taking		
Yes	33	23.9
No	105	76.1
Total	138	100.0
Patients' anti-diabetic treatment regimen		
Diet modification	33	23.9
Oral hypoglycemic only	61	44.2
Insulin therapy only	36	26.1
A combination of oral and insulin	8	5.8
Total	138	100.0

Table 4 shows that, half (50%) of the patients reported that they have been living with DM for 6 years and above while 32.6 % have been living with DM for 2 to 5 years. The majority (58.7%) of patients in the study, have relatives suffering from DM. Most of the patients (76.1%) did not know the antidiabetic drugs they were taking. Less than half (44.2%) of the patients were on oral antidiabetic drugs, 26.1% were on insulin and 23.9% were on diet modification.

4.7 Table 5:Patients' characteristics on health care system (n=138)

Characteristics	Frequency	Percent
Health care system		
Poor	71	51.5
Good	67	48.8
Patients review		
Once every month	19	13.8
Every two months	90	65.2
Every quarter	29	21.0
Total	138	100.0
Availability of antidiabetic drugs		
Yes	51	37.0
No	87	63.0
Total	138	100.0
Owns a glucometer		
Yes	63	45.7
No	75	54.3
Total	138	100.0
Distance to the hospital		
Less than 5KM	55	39.9
More than 5KM	75	60.1
Total	138	100.0
Mode of transport		
By foot	57	41.3
By bicycles	14	10.1
By public transport	67	48.6
Total	138	100.0

Table 5 shows that slightly more than half (51.4%) of the patients reported that the health care system was poor while 48.6% reported that it was good. Most of the patients (65.2%) indicated that they were reviewed every two months while 23% were reviewed after three months. The majority (63%) of the patients reported frequent stock out of anti-diabetic drugs at the hospital. The study also showed that more than half (56.5%) of the patients were not monitoring their blood glucose on daily basis because they do not have glucometers. Many patients (63%) monitored their blood glucose at public hospitals while only 7% of them monitored form

private hospitals at fee. Many of the patients (60.1%) live more than 5 km away from the hospital and use public transport to travel to the hospital, while 39.9% others cycled or walked to the hospital.

4.8 Patients' attitude towards self-care management



Figure 5: Patients' attitude to self-care management (n = 138).

Figure 5 shows that most of the patients (59.4%) had poor attitude to self-care management will (40.6%) reported good attitude.

Table 6: Patients' characteristics on attitude to self-care management (n =138)

characteristics	Frequency	Percentage
I check and record blood sugar levels to achieve optimal glucose levels		
Applies to me very much	48	34.8
Does not apply to me	90	65.3
Total	138	100.0
I choose food to eat to achieve optimal blood glucose levels		
Applies to me very much	82	59.4
Does not apply to me	56	40.6
Total	138	100.0
I keep all doctors' appointments recommended for DM treatment		
Applies to me very much	69	50
Does not apply to me	69	50
Total	138	100.0
I take my DM medicines as prescribed		
Applies to me very much	56	40.6
Does not apply to me	82	59.4
Total	138	100.0
I do regular physical activities to achieve optimal blood sugar levels		
Applies to me very much	66	47.8
Does not apply to me	72	52.2
Total	138	100.0
I strictly follow the dietary recommendation by the doctor		
Applies to me very much	63	46
Does not apply to me	74	54
Total	138	100.0

Table 6 shows that most of the patients (65.3%) were not checking and recording their blood glucose levels regularly while (59.4%) of the patients chose food to eat. Additionally, 54% of patients were not strictly following dietary recommendations by the doctor. However, half of the patients (50%) kept doctor's appointment recommendations for DM treatment though the majority (59.4%) of the patients were

not taking medication as prescribed. More than half (52.2%) of the patients were not performing regular physical activities to achieve optimal blood sugar levels.

4.9 Table 7: Relationship between adherence to type 2 DM treatment and demographic characteristics (n=138)

Characteristics		Adherence to type 2 DM Treatment		P-value
		Poor	Good	
Gender	Male	30 (52.6%)	27 (47.4%)	0.439
	Female	48 (59.3%)	33 (40.7%)	
Age	20 - 29	9 (64.3%)	5 (35.7%)	0.171
	30 - 39	6 (40.0%)	9 (60.0%)	
	40 - 49	17 (44.7%)	21 (55.3%)	
	50 - 59	19 (61.3%)	12 (38.7%)	
	60 and above	27 (67.5%)	13 (32.5%)	
Marital Status	Single	10 (55.6%)	8 (44.4%)	0.428
	Married	48 (55.2%)	39 (44.8%)	
	Widowed	18 (60.0%)	12 (40.0%)	
	Divorced	2 (66.7%)	1 (33.3%)	
Education Level	No formal education	5 (62.5%)	3 (37.5%)	0.343
	Primary	32 (64.0%)	18 (36.0%)	
	Secondary	32 (48.5%)	34 (51.5%)	
	Tertiary	9 (64.3%)	5 (35.7%)	
Occupation	Civil Servant	25 (62.5%)	15 (37.5%)	0.528
	Self-employed/Businessman	32 (57.1%)	24 (42.9%)	
	Retired	14 (56.0%)	11 (44.0%)	
	Unemployed	7 (41.2%)	10 (58.8%)	

Table 7 shows that demographic characteristics (gender, age, marital Status, education level and occupation) had no statistically significant association to adherence to type 2 DM treatment ($p > 0.05$).

4.10 Table 8: Relationship between adherence type 2 DM treatment with associated factors (n=138)

Variables		Adherence to type 2 DM treatment		Total	p-Value
		Poor	Good		
Knowledge about type 2 DM treatment	Low	41 (67.2%)	20 (32.8%)	61 (100%)	.024
	High	37 (48.1%)	40 (51.9%)	77 (100%)	
Distance to the hospital	Less than 5 KM	29 (52.7)	26 (47.3)	55 (100.0)	.464
	More than 5 KM	49 (59.0%)	34 (41.0%)	83 (100%)	
Health care system	Poor	41 (57.7%)	30 (42.3%)	71 (100%)	.765
	Good	37 (55.2%)	30 (44.8%)	68 (100%)	
Attitude to self-care management	Poor	48 (58.5%)	34 (41.5)	82 (100%)	.563
	Good	30 (53.6%)	26 (46.4%)	56 (100%)	

Table 8 shows that there was a statistically significant association between adherence to type 2 DM treatment and knowledge about type 2 DM treatment. However, there was no statistically significant association between adherence to type 2 DM treatment and distance to the hospital, health care system and attitude to self-care management ($p > 0.05$).

4.11 Table 9: Binary Logistic Regression determining factors associated with adherence to type 2 DM treatment

Variable Level	P-Value	Odd Ratio (EXP (B))	95% C.I. for EXP(B)	
			Lower	Upper
Gender (1)	.972	.985	.432	2.248
Gender	0.00			
Age	.439			
Age (1) 30 - 39 Years	.349	2.325	.397	13.603
Age (2) 40 - 49 Years	.569	1.614	.311	8.366
Age (3) 50 – 59 Years	.991	1.010	.182	5.594
Age (4) 60 Years and above	.665	.676	.115	3.982
Marital status	.959			
Marital status (1) Married	.592	.699	.189	2.583
Marital status (2) Widowed	.728	.776	.186	3.239
Marital status (3) Divorced	.789	.654	.029	14.657
Education level	.346			
Education level (1) Primary	.896	.884	.138	5.663
Education level (2) Secondary	.476	1.971	.305	12.724
Education level (3) Tertiary	.908	1.137	.128	10.079
Occupation	.532			
Occupation (1) Civil servant	.582	1.307	.504	3.388
Occupation (2) Self-employed/ Businessman	.809	1.155	.358	3.724
Occupation (3) Retired	.148	2.721	.702	10.543
Distance to the hospital (1) > 5KM	.713	.854	.370	1.975
Knowledge (1) Low	.037	2.324	1.050	5.143
HealthCare (1) Poor	.624	1.224	.546	2.746
Attitude (1) Poor	.747	1.139	.517	2.512
Constant	.537	.423		

Table 9 shows a binary logistic regression test which was used to determine the impact of (predictor variables) distance to the hospital, health care system, attitude towards self-care management and knowledge about DM treatment on (outcome

variable) adherence to treatment patients. The results revealed that changes in patients' knowledge on diabetes treatment would contribute significantly to the regression model while changes in all other variables would contribute insignificantly. The model could only account for 5.5% variation in the outcome variable and had a 78.2% accurate in predicting poor adherence and 40% accurate in predicting good adherence to diabetes treatment.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter discussed the results of the study on adherence to treatment by type 2 DM patients. Management of DM is very cardinal in maintaining normal or close to normal blood glucose levels. Patients' adherence to type 2 DM treatment recommendations remains a major challenge at Monze Mission Hospital. This study assessed adherence to treatment by patients with type 2 DM in the outpatient medical clinic and in patients at Monze Mission Hospital, in Monze district.

5.2 Demographic Characteristics of the patients

The results in Table 2 showed that more than half of the patients (58.7%) were females while 41.3% were males. The results were similar to the studies conducted by de Oliveria (2011) and Jackson et al. (2014) on knowledge and attitudes of patients with type 2 DM which also reported that there were more women being treated for DM than men. This could be attributed to good health seeking behaviours of women as opposed to men hence the increase in the number of females being treated for DM. Furthermore, culturally men are viewed as strong human beings hence if a man frequents the hospital, he is considered to be weak.

This study in Table 2 further, revealed that 29% of the patients were aged 60 years and above. Those aged between 40 and 49 years and 50 and 59 years were 27.5% and 22.5% respectively. This is incongruent by the IDF study which reported that the greatest number of people with type 2 DM are aged between 40-59 years (de Oliveria.2011). Furthermore, the study by Jackson (2014) showed that that many of the patients with type 2 DM were in the age group of between 50-59 years. This explains that the average peak age of type 2 DM is between 40 and 59 years which could be attributed to unstoppable decline in beta cell function that characterizes type 2 DM due to alterations in physiological activities where there is loss of first-phase

insulin release (Benhalima & Mathieu. 2010). More than half of the patients (63%) were married, while (21.7%) were widowed. This could be attributed to gestational DM which in most cases progresses to types 2 DM hence the increase in the number of women seeking medical attention (Sharma et al. 2014).

The study also showed that 47.8% had secondary education while 36.2% of the patients had primary education. However, the results of this study revealed that high level of education had no influence on adherence to type 2 DM treatment as figure three showed that the majority of the patients (56.5%) reported poor adherence to DM treatment. This finding was in conformity with the study conducted by Al-Rasheedi (2014) on adherence to treatment, which reported that educational level had no impact on glycemic control. This is because management of type 2 DM is greatly influenced by lifestyle and health education can play a major role in influencing patients' attitude in DM treatment (Ganiyu et al., 2013). Concerning occupation, the study showed that 40.6% of the patients were self-employed and 29% were civil servants. This could be attributed to a high cost of living in Zambia where the little money patients got was channeled to apparently more important family needs as opposed to individual health care needs (CSO., 2014). Sharma et al (2014) and Philips and Steyl (2014) reported similar findings that patients who missed their drugs very often were from the lower socio- economic strata who also were self-employed and earned low-income. This is because the money they earned was not enough to enable them to buy the prescribed meals and honor doctors' appointments for regular check-ups hence subjecting patients to poor adherence to treatment. The results of the study in Table 8 showed that patients' knowledge was statistically significant with the p value of 0.024. However, gender, age education level and occupation were not statistically significant as their p values were > 0.05 .

5.3 Adherence to type 2 DM treatment by the patients

The results of this study in Table 3 and Figure 3 revealed that more than half of the patients (56.5%) exhibited poor adherence while (43.5%) exhibited good adherence to type 2 diabetes treatment. Most of the patients (56.5%) in this study scored more than 3 using the Morisky Medication Adherence Scale. The results were similar to studies by Banu et al., 2014; However., 2014; Musenge et al.,2014; Mukherjee et al.,2013; Brown and Bussell.,2011 and Prado-Aguilar et al., 2009 on adherence to treatment among type 2 DM patients which reported that poor adherence to DM treatment was due to lack of glucose monitoring equipment, complex treatment regimens and confusing instructions provided by the health care providers. Other reasons were adoption of Western diet in place of more healthy "traditional" diets for those in the developing world, as well as living a more sedentary lifestyle. Bogner et al (2012) reported that adherence rates are typically higher among patients with acute conditions as compared to those with chronic conditions. This is attributed to discomfort and pain patients with acute conditions experience as opposed to silent but destructive effects of many chronic conditions such as DM which would not compel an individual to seek medical attention as many DM patients live without knowing that they have the condition (Novo Nordisk., 2011). On the contrary, Abebaw et al (2016) in a study on adherence, which was conducted in Ethiopia reported good adherence by majority of patients (245 out of 288 patients were adhering to treatment). This could be explained by the similarity of the socio-demographic, healthcare system and inadequate knowledge on DM treatment and self-care.

This study in table four also showed that, more than half of the patients (58%) did not know the OHAs they were taking. This could be attributed to poor communication between the health care providers and the patients leading to inadequate DM education sessions and/or awareness among patients. The health care providers are overwhelmed with increased workload during DM clinics. This

hindered effective health education discussions between health care provider and patient, hence patients lack knowledge on adherence to DM treatment and self-care management. The results were similar to a study by Twei (2010). The results in Table 4 further showed that patients who were on diet modification, (23.9%) reported challenges of not having a choice on the type of food they were eating because they had to eat whatever was available in their homes. This is despite various studies showing strong positive clinical outcomes for individuals with DM adopting healthier lifestyle on recommended diet (Ganiyu et al., 2013; Bagonza et al., 2015 and Powers et al., 2015). The findings of this study were similar to the study by Steyl and Philips (2014) on management of type 2 DM which showed that, most DM patients ate any available food at home because they could not afford to buy the prescribed diet and most of the patients were just kept and had no choice on what to eat. This was attributed to poor socioeconomic status of many patients in the study and ultimately predisposed them to elevated blood glucose levels and poor adherence to treatment. On the contrary, a study by Ganiyu et al (2013) on Non-adherence to diet and exercise recommendations amongst patients with type 2 DM attending Extension II Clinic in Botswana, showed that poor self-discipline, lack of information on a healthy diet, eating out in restaurants and financial constraints in accessing the recommended diet by health care practitioners influence adherence to treatment.

Concerning DM medication, OHAs and insulin are the most effective therapies which maintain adequate glycaemic control in type 2 DM patients (Alkhaifi et al.,2015). Various studies have shown that pharmacist interventions positively influence health outcomes and patient satisfaction, which are crucial indicators for quality of health care and a key factor for medication adherence. However, health professionals do not prioritize collaborative care management where prescribers, pharmacists and nurses become partners with health care system users (Baptista et al., 2016; and García-Pérez et al., 2013).

Nevertheless, the results of this study in Table 4 showed that 44.2% of patients who were on OHAs had very few challenges because drugs were readily available, although patients cited forgetfulness as one of the causes of poor adherence to treatment. The results were in line with the studies by Abebaw et al (2016) and However (2014) on improving the adherence of type 2 DM patients. Poor adherence to treatment could be attributed to respondents' busy schedules, leading to forgetfulness.

Additionally, the same table revealed that, slightly more than quarter of the patients (26.1%) were on insulin only. Out of 36 patients who were on insulin, 66.6% reported skipping injections due to drugs stock out. These results were similar to the study by Hall et al (2011) who also reported erratic supply of insulin in most Sub-Saharan Africa hospitals where in one of five hospitals and none of six health centers surveyed had a regular insulin supply. Drug stock outs worsens patients' poor adherence and they end up with poor health outcomes, lower quality of life, increased health care costs, complications and increased mortality (Bagonza et al., 2015) and Abebaw et al., 2016).

Nevertheless a study by Wabe et al (2011) on medication adherence in DM and self-management practices among type-2 DM patients reported that the most common reasons for patients not adhering to treatment were forgetfulness, being busy and others including bad feeling of side effects of drugs, disappearance of the symptoms and perceived inefficacy of the prescribed anti diabetic drugs. Another study by Shams and Barakat, (2010) on measuring the rate of therapeutic adherence among outpatients with type 2 DM also ultimately demonstrated unsatisfactory adherence to the three domains of DM treatment (OHAs, dietary/exercise and keeping appointment for the scheduled checkup). Adherence to treatment can be achieved through extensive collaborative partnership between patients and the health care providers through continued patient education on modified life style, monitoring blood glucose level regularly and simplifying drug regimen (Musenge et al., 2016).

5.4 Factors related to adherence to treatment

5.4.1 Patients' knowledge about type 2 diabetes mellitus

This study in Table 4 and Figure 4 showed that more than half of the patients (55.8%) had high knowledge of DM despite poor adherence to treatment. The result was similar to that of Parajuli et al (2014) which showed that DM knowledge was associated with level of education and duration of diabetes. Patients with a higher academic level have a greater chance of obtaining knowledge from mass media, books and internet, making it easy for them to adhere to treatment. In addition, they have fewer barriers in communicating with the health care providers because they grasp information easily (Jackson et al., 2014). A study by de Oliveira et al (2011) showed that involvement of health care providers in all phases of the educational process enables patients to assume responsibility of therapeutic role and master knowledge and develop skills in self-care. The educational programs should be based on dialogue and exchange of knowledge, promoting the exchange between scientific and popular knowledge, which both professionals and patients have much to teach and learn from each other. The multidisciplinary team should recognize the need to update and seek innovative strategies to care for DM patients and develop communication skills to increase adherence to type 2 DM treatment. Contrary to the results of this study, Al-Rasheedi et al (2014) argued that educational level had no impact on glycemic control, though patients with high educational level had better awareness of the complications and a high rate of adherence to treatment.

This study in Table 4 further showed that half of the patients (50%) reported having been living with DM for 6 years and above, 32.6% having been living with the disease between 2 to 5 years. The results are supported by the studies which were conducted by Bagonza et al (2015) and Berhe et al (2013) which revealed duration of the disease, influenced adherence to DM treatment positively. Patients who have been on treatment for 6 years and more had good adherence to treatment than those who have been on treatment for less than two years. The study further revealed that

58.7% of patients who adhered to treatment had a positive family history of DM and had awareness of the disease. This could be attributed to exposure to DM treatment through helping relatives with the disease and thus when diagnosed with the same condition, the patients would use the knowledge they acquired when there taking care of the relatives to take care of themselves.

However, on the contrary, a study by Parajuli et al.(2014) showed that with increasing duration of disease, levels of adherence to treatment decreased due to fear of drugs side effects. This explains why patients who have been on DM treatment for a long time get fed up with the treatment and dietary regimen and stop adhering to treatment recommendations.

5.4.2 Health care system

Table 5 and Figure 5 of this study showed that slightly more than half of the patients (51.4%) reported poor health care services and 63% of reported that oral hypoglycaemic drugs were not always available at the hospital. This was in an apparent reference to the poor attitude of the health care providers towards the patients and non-availability of OHAs. The majority of patients (65.2%) complained of poor patient health care provider relationship, non-availability of drugs and blood monitoring equipment. The findings were consistent with the study by García-Pérez et al. (2013), which revealed that a poor relationship between the patient and health care provider adversely influenced adherence to treatment. When there is a poor relationship between the patient and health care provider, patients would not be compelled to freely ask and learn on how best they can take care of themselves. Further, a studies by Alkhaifi et al (2015) reported that lack of qualified and skilled health care providers influenced adherence to treatment. Some physicians, pharmacists and nurses did not have the knowledge and competences to initiate patients on the right treatment regimen. Lack of knowledge on the part of the health care provider creates a barrier to initiating and monitoring adherence to treatment.

Table 5 of this study showed that less than half of the patients (45.7%) were monitoring their blood glucose levels on daily basis and slightly more than half of the patients (54.3%) reported that they monitored their blood glucose from public hospitals. Two thirds of the patients (67%) who did not own glucometers monitored their blood glucose from the public hospitals. Seventy five percent of patients who monitored their blood glucose from public hospitals reported that they were not monitoring it regularly due to lack of testing kits and reagents in the laboratory. This also contributed to poor adherence to poor treatment. These results were in line with Hall et al (2011) which revealed that many hospitals lacked glucose monitoring equipment. Patients took medicines without monitoring their blood glucose levels, thereby adversely affecting adherence.

5.4.3 Patients' attitude to self-care management

The findings of this study in Table 6 and Figure 6 showed the patients' attitude to self-care management. In this study, attitude to self-care management was assessed using a verified but modified self-care management questionnaire. The study results showed that, most of the patients (59.4%) had poor attitude towards self-care management, while slightly less than half patients (40.6%) reported good attitude. Despite poor adherence to treatment showed by most patients, those who had lived with the disease longer (three years and more), had more and better opportunities for exposure to information regarding DM self-care management.

The result was similar to studies by Berhe et al.(2013), García-Pérez et al.(2013) and Cho et al.(2013), which reported that poor adherence to treatment was due to negative attitude to the condition by many patients. Nevertheless, on the contrary, Powers et al (2015) and Jackson et al (2014) reported that patients who are repeatedly exposed to DM information and lessons about self-care, eventually adjust and learn to effectively control blood glucose to recommended levels, thereby influencing their attitude positively and adhered to treatment. Another study by Mcguire et al (2013) reported fear of needles, as well as side effects of medication

such as fatigue and impotence as factors which led to poor attitude to adherence. It is therefore, imperative to intensify trainings on self-care management for old and newly diagnosed DM patients to prevent the development or reduce the progression of diabetes complications by health care providers. Effective DM self-care management requires an integrated approach involving the patient, family and community members taking an active supportive role to influence positive attitude to DM care (Steyl and Phillips., 2014). This therefore means that, self-care management behaviors to control blood sugar levels hugely depend on patients and health care providers' collaboration.

5.4.4 Distance to the hospital

Physical accessibility of healthcare providers due to distance is another single major challenge to adherence to DM treatment. Table 5 of this study showed that, most of the patients (60.1%) lived more than 5km away from the hospital while only 39.9% lived less than 5km from the hospital. Among the respondent who live more than 5 kilometers from the hospital, most of the patients (48.6%) used public transport to travel, while 41.3% walked on foot to the hospital. The study showed that most of the patients who lived more than 5 km from the hospital failed to go to the hospital for regular follow ups thereby negatively influencing adherence to treatment. The results were consistent with the studies, which were conducted in Zambia by Chatt and Robert (2010) and in Zimbabwe by Mandewo et al (2014). They reported that diabetic patients might not adhere to treatment due to travel costs particularly those who travelled long distances to the health care facilities. On the contrary however, a study by Mcguire et al (2013) reported that distance barrier in many European countries and in the Eastern Caribbean is no longer a physical hindrance due to improved technology. These countries have implemented telemedicine system as a means of improving physician-specialist communications and improve service delivery. This has improved adherence to DM treatment and has lessened long term complications of the disease. In Zambia, the use of telemedicine is not fully

operational. However, mobile hospital services help in curbing long distances patients covered to access health services. Nevertheless, mobile hospitals have not been used of late making adherence a major problem for those who cannot manage to fund themselves to access health services.

5.5 Adherence to type 2 DM treatment by associated factors.

5.5.1 Relationship between knowledge of type 2 DM to adherence to treatment

The current study in Table 8 showed that there was a positive correlation between knowledge of type 2 DM and adherence to treatment. Despite the results of this study indicating poor adherence to treatment (56.5%), the cross-tabulation between knowledge and adherence showed that, adherence to treatment increased as knowledge increased. Good adherence increased from 32.8% to 51.9% and, subsequently, poor adherence dropped from 67.2% to 48.1% as knowledge on treatment increased from low to high. This is also supported by other previous studies on DM, which showed that an increase in patient education and adherence has been associated with adherence (good glycaemic control). In addition, patients with relatives suffering from DM showed awareness of the disease and acquisition of information about the DM, hence adhering to treatment. Reasons for non-adherence to dietary recommendations were poor self-discipline, lack of information on a healthy diet and financial constraints in accessing the recommended diet by health care practitioners (Ganiyu et al., 2013).

The observed trend was statistically significant as the Chi-square test yielded a p-value of 0.024, which is less than the threshold of 0.05. Hence, we reject the null hypothesis and conclude that there is an association between knowledge and adherence to treatment among patients with type 2 DM ($X^2 = 5.085$, $N=138$, $p < 0.05$, 2-tailed).

5.5.2 Relationship between distance and adherence to type 2 DM treatment

This study in Table 8 also showed that distance influenced adherence to type 2 DM treatment negatively. The cross-tabulation between distance and adherence showed that adherence to treatment reduced as distance to the hospital increased. Good adherence dropped from 47.3% to 41.0% and, subsequently, poor adherence increased from 52.7% to 59% as distance to the hospital changed from less than 5km to more than 5km. In this study, the majority of the patients reported financial constraints as the major reason for not adhering to treatment. This is because patients could not honor the follow up schedules and thus they skipped/stopped taking drugs once the drugs finished. The study by Banu et al (2014) and Mandewo et al (2014) reported similar results of poor adherence to treatment recommendations due to travel costs.

However, the observed trend in this study was found not to be statistically significant as the Chi-square test yielded a p-value of 0.464, which is greater than the threshold of 0.05. Hence, we fail to reject the null hypothesis and conclude that there was no sufficient evidence to prove that there is an association between distance to the hospital and adherence to treatment among patients with type 2 diabetes ($X^2 = 0.464$, $N=138$, $p > 0.05$, 2-tailed).

5.5.3 Relationship between adherence to type 2 DM treatment by health care service

Table 8 demonstrated an association between adherence to type 2 DM treatment with health care service. From the cross-tabulation, it was observed that adherence to treatment increased as the health care services increased. For the patients who reported poor quality of health care, good adherence stood at 42.3% and poor adherence at 57.7%. In patients who reported good health care quality, good adherence increased to 44.8% while poor adherence reduced to 55.2%. Steyl and Phillips (2013) reported that several studies have shown that effective partnership between patients and healthcare providers can improve adherence to treatment. Poor

adherence increases mortality and disability as well as healthcare costs. In addition, patients' attitudes and beliefs, knowledge of the disease, and family support have been identified as influencing adherence to management protocols.

A study by WHO (2003) reported that patients got frustrated if their preferences in treatment-related decisions were not considered because they feel less empowered. A less empowered patient in relation to treatment decisions can have more negative attitudes towards treatment. The Chi-square test results yielded a p-value greater than 0.05, indicating that the observed association was not statistically significant. Hence, we failed to reject the null hypothesis and concluded that there was no sufficient evidence to prove that there is an association between distance to the hospital and adherence to treatment among patients with type 2 DM ($X^2 = 0.765$, $N=138$, $p > 0.05$, 2-tailed).

5.5.4 Relationship between attitude to self-care management by Adherence to type 2 DM Treatment

These findings of this study in Table 8 showed that adherence to treatment increased as the attitude of patients towards self-care management improved. In patients with poor attitude, good adherence stood at 41.5% and poor adherence at 58.5%. In patients with good attitude, good adherence increased to 46.4% while poor adherence reduced to 53.6%. The study results were in line with a study by Stelfox et al. (2013) which reported that DSME generally improved psychosocial and clinical outcomes in patients with DM. This implies that positive attitude towards self-care helps to achieve required glycaemic control. This study showed $X^2 = 0.563$, with p value > 0.05 , indicating that the observed association was not statistically significant. Hence, we fail to reject the null hypothesis and conclude that there was no sufficient evidence to prove that there is an association between attitude towards self-care management and adherence to treatment among patients with type 2 diabetes. ($X^2 = 0.563$, $N=138$, $p > 0.05$, 2-tailed).

Martínez et al (2008) also showed that the combination of knowledge and attitude improved adherence to treatment where patients displayed both strong knowledge and positive attitude. This could be attributed to continuous health education patients receive whenever they go to seek medical care. Health care providers must therefore be at the patients' disposal for any information needed in order to improve the disease outcome. This can prevent long term complications and promote quality of life with less health cost.

5.6 Binary logistic regression

Table 9 shows the binary logistic regression test which was used to analyze the combined impact of dependent (Adherence to type 2 DM treatment) and independent variables (distance to the hospital, health care services, attitude towards self-care management and knowledge about adherence to DM treatment). All variables (dependent and independent variables) were coded. The results showed that changes in patients' knowledge on diabetes treatment could contribute significantly to the regression model while changes in all other variables would contribute insignificantly.

The results revealed that the regression model was not significant as the Chi-square value of 5.742 and a p-value of 0.219 was yielded. Furthermore, the model could only account for 5.5% variation in the outcome variable and had a prediction accuracy of 78.2% in predicting poor adherence and 40% in predicting good adherence to diabetes treatment. The study also showed that there was an impact of changes of predictor variables on the outcome variable and their odds of causing changes to adherence to treatment.

Changes in knowledge from low to high impacted significantly on the model, with a p-value of 0.031 (OR = 2.180, 95% CI: 1.07, 4.43). However, other variables were not statistically significant, with p-values ranging from 0.461 to 0.972. Changes in knowledge from low to high increased the odds of adhering to treatment 2.324 times,

(Patients with high knowledge were twice as likely to adhere to treatment as those with low knowledge).

Changes in the health care system from poor to good increased the odds of adhering to treatment by a factor of 1.067 while changes in the attitude of patients towards self-care management from poor to good changed the odds of adhering to treatment by a factor of 1.077 times. A change in the distance to the hospital from less than 5km to more than 5 km reduced the odds of adhering to treatment by a factor of 0.768.

5.7 Limitations of the study

The following were the limitations of this study:

- i. The structured interview schedule is a closed tool which could not be exhaustive in bringing out the required information from the patient, it might have had some gaps in eliciting the required information from the patient. Hence the need to use a semi structured questionnaire.
- ii. The study was conducted on a limited sample size (n=138) thus the results should be generalized with caution as it only represented views of patients from who accessed medical services from Monze Mission hospital.
- iii. The sample size comprised of patients from the rural and peri-urban settings hence the result may not be generalized for the rest of Zambia.

5.8 Significance of the study to Nursing

5.8.1 Nursing Practice

Nurses constitute the largest workforce in the health care system in Zambia. They play a leading role in the delivery of quality health care. The study results showed that (55.5%) of patients had high knowledge of DM though most (78%) of the patients exhibited poor adherence to DM management. Further, various studies have

reported that many DM patients lack knowledge on DM self-care management leading to poor glycemic control. The disparity needs to be harmonized through health education among nurses, patients and family members. This implies that there is need to strengthen in-house workshops for nurses to effectively disseminate DM management information to patients, family members and the community at large. Health education, counseling and advocating for better health care services for patients must be on top of the DM management plans in the medical clinic at Monze Mission hospital to improve the disease outcome. This entails that nurses working in the medical clinics must read/study widely to acquire new DM management information and be able to impart that knowledge clearly to patients in order to promote DM adherence and help prevent complications.

5.8.2 Nursing Administration

This study has revealed that 87% of patients reported erratic supply of drugs and that nurses in the medical clinic were overwhelmed with an ever-increasing patient workload. The nursing administrators should therefore, advocate for adequate supply of drugs and improved on staffing of nurses in the clinic to improve patient care. Further, they need to intensify on training of nurses in the management of non-communicable diseases including DM to improve on the disease outcomes. They must also strengthen health education sessions given to patients, family members and the community to promote healthy living and cut on costs which come with poor adherence to treatment.

5.8.3 Nursing Education

The study showed that patients had good knowledge about type 2 DM despite poor adherence (78%) to treatment. There is therefore need by the General Nursing Council of Zambia (GNC) to include management of non-communicable diseases in the curriculum for nurses. The current curriculum does not cover non-communicable diseases such as DM in health promotion and prevent their occurrence. The conditions are taught under general medicine and medical nursing units where the

emphasis is premised on medical management of the disease as opposed to preventing the prevalence. Health promotion lessons can help to inculcate students with knowledge and competences they need to prevent and manage non-communicable diseases in an event they occurred

5.8.4 Research

Literature reviewed in this study showed that a lot of research has been conducted on DM in the neighboring countries and overseas. Not much research has been conducted on adherence to type 2 DM treatment in Zambia. It is therefore important that further research is carried out on a large scale to investigate effects of individual domains to DM adherence to treatment recommendations. This will help to determine the most difficulty domain to manage. The studies will then help to mitigate effects of microvascular and macrovascular long-term complications and on the huge health care costs patients' experience.

5.9 Conclusions

The objective of the study was to assess factors influencing adherence to treatment by type 2 DM patients at Monze Mission Hospital in Monze district. The results of the study showed that the majority type 2 DM patients (56.5%) had poor adherence to treatment despite having high knowledge (55.8%) about the disease. Poor adherence to treatment recommendations was attributed to an interplay of many, varied and multifaceted factors such as distance to the hospital, poor attitude towards self-care management and the health care system. Most of the patients (63%) reported drug stock out, financial constraints and poor health habits as the major barriers to adherence to treatment. Therefore, there is need to come up with deliberate strategies to improve adherence among patients attending outpatient medical diabetic clinic such as collaboration between the patients, families and community members and the health care providers to enhance adherence.

In addition, more human resource capacity building must be embarked on to provide patient education and counselling, promote patients' self-care management behaviour and facilitate the identification and self-care management skills on medication administration, dietary modification and exercise management. There is also need to widen the network of health care facilities through decentralizing the stocking and dispensing of diabetes drugs which must include rural health centers to help serve patients in the peripheral areas. This will help reduce on transport costs thereby enhancing adherence to treatment.

5.10 Recommendations

Based on the study findings, in order to strengthen adherence to DM treatment the following recommendations were made:

- i. The Ministry of Health to improve the supply of antidiabetic drugs both OHAs and insulin, diagnostic and glucose monitoring equipment to all health institutions.
- ii. Health care providers to be strictly following DM treatment guidelines to prevent patients from experiencing diabetes related complications.
- iii. Members of staff managing type 2 DM patients should strength the provision of information Education and Communication (IEC) sessions during the follow-up visit to patients. The IEC should include eating healthy diets, performing regular exercises, adherence to drugs, frequent monitoring of blood glucose levels and self-care management and keeping appointment schedules.
- iv. Support groups should be formed in the community in collaboration with the non-governmental organizations, health care providers and family members to assist type 2 DM patients.
- v. To have this study replicated using a larger sample.

5.11 Utilization and dissemination of results

The results of the study will be used to influence policy formulation at Ministry of Health to strengthen the existing DM treatment protocols to promote adherence hence preventing DM related complications. The results will also be used at various health care provision for to:

- i. Sensitization patients on the importance of achieving normal glycaemic levels.
- ii. Enhance life style modifications.
- iii. Promote adherence to treatment.
- iv. Emphasis on the importance of regular reviews.

Results of the study were presented to the post-graduate seminar week on 11th August 2017 at the University of Zambia, main campus. Further the results will be presented to stakeholders involved in the management of DM at various settings to promote adherence to DM treatment.

The results will be published in recognized journals such as; the *Zambian Medical Journal* and the *E-Journal of Zambia (UNZA)*.

In addition, the researcher will disseminate the results of the study by submitting bound copies of the study documents and submit to the following:

- University of Zambia Medical library and the main campus Library
- School of Nursing Sciences
- Ministry of Health
- Monze Mission Hospital management team
- Monze Mission Hospital medical clinic

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1. APPENDIX I: Patient information sheet

1. Self-introduction

My name is Sanford Nyirongo, a student of Master of Science in Nursing at the University of Zambia who is kindly requesting for your participation in the above-mentioned research study, to assess adherence to treatment by patients with type 2 DM. Your participation in this study is purely voluntary. If you are not interested in participating in this study, you are free to do so. Even after you have joined the study you are free to withdraw as you wish, and that will not affect your access to health services from this institution.

If you are willing to participate, you will be asked to sign consent to indicate that you agree to participate. Please ask where you do not understand and you will be explained to in simpler terms.

2. Title of study

Adherence to treatment by patients with type 2 DM at Monze Mission Hospital

3. Purpose of the study

The study will assess patients' adherence to treatment of diabetes mellitus type 2 at Monze Mission Hospital. The information obtained will help the policy makers and implementers of the programme in the MOH to strengthen treatment protocols of diabetes patients in Zambia.

4. Procedure

The study involves a face-to-face interview with the research assistants who will ask you a set of questions using a schedule. After signing the consent form, the research assistant will proceed to ask you relevant questions and your responses will be recorded on the questionnaire. The interview will take about 30-35 minutes.

5. Voluntariness

Your participation in this research is entirely voluntary. You will not be forced to participate if you do not wish to do so. You are assured that your refusal to take part will not in any way result in loss of health services to which you are entitled

to. If you decide to take part, you will still be free to withdraw at any time without giving without giving prior reason for your withdrawal. You will further, have the right to end the interview at any time, and to choose not to answer questions that are asked in the study.

6. Data management and storage

The research records and any information will be confidential to the extent permitted by law. The data will be kept under key and lock. Patients will be identified by a number, and personal information will not be released without their written permission. The Ministry of Health, the University of Zambia Research Ethics Committee or the School of Medicine may review the records if need be, but this will be done with confidentiality.

7. Risks and discomforts

There is no risk involved in this research though part of your time will be utilized to answer some questions. If you will need further discussion, it will be offered to help you understand the topic more.

8. Benefits

There is no direct benefit to you by participating in this study, but the information which will be obtained will help the policy makers to take measures that will benefit you in future to prevent diabetes mellitus related complications. No monetary favours will be given in exchange for information obtained, but education will be given on benefits diabetes treatment adherence.

9. Compensation/reimbursement

Patients in this study will have no provision for compensation/reimbursement as such patients' free will and voluntary participation will be the enrollment criteria.

10. Consequences of inquiry

The study will be a non-invasive and will not cause any physical harm or jeopardize the patients' lives. However, the patients will be explained to and a consent form obtained to prepare them psychologically for them to participate in the study.

Contact Details of Principal Investigator

Persons to contact for problems or questions

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The University of Zambia,
School of Nursing sciences,
P.O. Box 50110,
Lusaka.
Cell: 0977786852.
Email address: nyirongosanford@yahoo.co.uk

Contact Details of Ethics Committee

The chairperson,
The University of Zambia,
School of Medicine
University of Zambia Biomedical Research Ethics Committee,
Ridgway Campus
P.O. Box 50110,
Telephone: 260-1-256067
Lusaka
E-mail: unzarec@zamtel.zm

APPENDIX II: Translated participant information sheet

1. Kulipandulula

Mebo mazyina angu ndime Sanford Nyirongo, sicikolo ku University of Zambia ciyisya ma nasi. Ndilamulomba kwaamba kuti mutole lubazu mukuvuntazuzigwa kwaku tobelela malailile mukusilikwa kubulwazi bwa chukela.

Kutola lubazu kwenu mukuvuntauzicwa oku takuli kwakusinikizigwa, nkwakulisungula nyolike. Na tamuyandi kutola lubazu kuvuntaizigwa oku inga mwachito obo. Nokuba kuti watola lubazu mukuvuntauzigwa oku, ulakozya kucileka kutola lubazu kufumbwa biyo mpowayandila mwini kakunyina kupezyegwa kupa bupanduluzi bwa ncholekela alimwi tachikozyi kukuletela biyumuyumu ciindi noyanda kusilikwa kuchibbadela.

Na ulazumina kutola lubazu kuvuntauzigwa oku, ulalombwa kuti usaine chizuminano kutondezya kwamba kuti wazumina.

Na kuli nkomwatamva kabotu, muliangulukide kubuzya kwamab kuti ndipandulule kabotu.

2. Mutwe wa buvuntauzyi

Kutobela malailile akusilikwa bulwazi bwachukela abalwazi basilikilwa kuchibbadela chaku Monze Mission Hospital

3. Muzezo wakuvuntauzya

Oku kuvuntauzya kulanga kutobela malailile akusilikwa bulwazi bwachukela abalwazi basilikilwa kuchibbadela chaku Monze Mission Hospital. Bwinguzi butijanwe kuzwa kuvuntauzigwa oku kuyogwashilizya basikubamba milao abalnganya nseba zyabantu kwaamba kuti bajane nzila mbotu yakusilika bulwazi bwachukela mucisi ca Zambia.

4. Machililanwa ambociocitika

Oku kuvuntauzya kula citwa kwiinda kubuziyana mibuzyo akati ka mulwazi wachukela a sikuvuntauzya kwiinda kubelesya cipepa chamibuzyo. Kwamana kusainana cizuminano, zikuvuntauzya ulamubuzya mibuzyo. Kuvwila kweenu kulalembwa a cipepa chamibuzyo. Eci inga catola tuzuzumina makumi yotatwe.

5. Kulisungula

Kutola lubazu kwenu mukuvuntauzicwa oku takuli kwakusinikizigwa, nkwakulisungula nyolike. Na tamuyandi kutola lubazu kuvuntaizigwa oku inga mwachito obo. Nokuba kuti watola lubazu mukuvuntauzigwa oku, ulakozya kucileka kutola lubazu kufumbwa biyo mpowayandila mwini kakunyina kupezyegwa kupa bupanduluzi bwa ncholekela alimwi tachikozyi kukuletela biyumuyumu ciindi noyanda kusilikwa kuchibbadela.

Na ulazumina kutola lubazu kuvuntauzigwa oku, uljisi nguzu yaku leka kwiingula mibuzyo kufumbwa ciindi alimwi inga wasala mibuzyo njoyanda kwiingula.

6. Kubamba twaambo

Mapepa abuvuntauzyi alabambwa chakwasisa kabotu kwiinda kwakomena a loko. Izina yasikuvuntauzigwa aceecho cinga capa kuti azibike takoyobikwa acipepa camibizyo. Chita biyo balanganya nseba, ba cikolo chipati ca University of Zambia Research Ethics Committee aba School of Medicine inga balanga mapepa aya na kuli ncobayanda kubona. Pesi eci inga cachitika kwiinda kusoseka twambo tujanwa mu mapepa amibuzyo.

7. Tenda akucisa

Takwe ntenda ilangilwa kucitika iciindi mulwazi navuntauzigwa kunze aciindi ncotuyobeleshya ciindi nendivuntauzya. Na kuli mibuzyo inga wabuzya kutegwa upegwe bupanduluzi buzulide kutegwa uteletesye.

8. Bubotu bwakutola lubazu mukuvuntauzigwa

Takwe bubotu bukugeme mbojana kwiinda kuatola lubazu mukuvuntauzigwa oku, peele twambo tuojanwa kuzwa mukuvuntauzigwa inga kulakonzya kugwashilizya babamva milao kujana nzila mbotu yakykwabilila bubi bwakutalibamba kabotu kumuntu uciswa bulwazi bwachukela. Kunyina bulumbu bwakupegwa mali bunga bwajanwa kwiinda mukutola lubazu mukuvuntauzigwa peele mulaishigwa bubotu bwakutobela malailile akusilika na ulabulwazi bwa chukela.

9. **Kubbadelwa**

Sikuvuntauzigwa takwe nakoozya kubbadelwa atola lubazu. Ulatola lubazu kwiinda kulisugula alike chakutasinisigwa.

10. **Bulangizi**

Oku kuvuntauzigwa takuli kwakwandulwa alimwi takukonzyi kuleta ntenda ku muntu uvuntauzingwa. Nokubaboobo, sikuvuntauzigwa ulapaduulidwa ankusaina cipepa cimuzumuzya kuti atole lubazu kwaamba kuti alibambile kabotu natola lubazu mukuvuntauzigwa oku.

Inamba yamagwalo yangu nde muvuntauzya njeii

Sanford Nyirongo,

The University of Zambia,

School of Nursing sciences,

P.O. Box 50110,

Lusaka.

Cell: 0977786852.

Email address: nyirongosanford@yahoo.co.uk

Inamba yakabungwe katulanganya njeii

The chairperson,

The University of Zambia,

University of Zambia Biomedical Research Ethics Committee,

Ridgway Campus

P.O. Box 50110,

Telephone: 260-1-256067

E-mail: unzarec@zamtel.zm,

Lusaka.

APPENDIX III: Informed voluntary consent form

I have read (been explained to) the purpose of this study. I understand, the benefits, discomforts and confidentiality of the study. I further understand that, if I agree to take part in this study, I can withdraw at any time without having to give an explanation and that taking part in this study is purely voluntary.

I _____(Names) agree
to take part in this study.

Signed: _____ (Participant).

Date: _____

Participant's signature or **thumb print**

Signed: _____(Researcher)

Date: _____

APPENDIX IV: Translated informed voluntary consent form

Kupa kuzumizya kutola lubazu mukuvuntauziga mukutasinikizigwa

Ndabala (ndapandulwidawa) akutelela muzeezo wabuvuntauzyi obu. Ndatelela bubotu akukwabililwa kupegwa oyo sikutola lubazu. Alimwi ndatelela kuti oyo utola lubazu ulakozya kuleka kutola lubazu kufumbwa biyo mpayandila mwini kakunyina kupezyegwa kupa bupanduluzi bwa nchalekela.

Mebo nendaba _____ (Maazina angu) ndazumia kubweza lubazu mu ciiyo echi cakutobela malailile akulibamba kabotu abulwazi bwa Sugar.

Kusaina: _____ (sikutola lubazu).

Buzuba: _____

Kudyoba munwe wakululyo wasikutola lubazu _____

Kusaina: _____ (Sikuhuntauzya)

Buzuba: _____

APPENDIX V: Data collection tool

THE UNIVERSITY OF ZAMBIA

SCHOOL OF NURSING SCIENCES

**SEMI-STRUCTURED INTERVIEW SCHEDULE: PATIENTS’
ADHERENCE TO TREATMENT OF DIABETES MELLITUS TYPE 2 AT
MONZE MISSION HOSPITAL**

DATE OF INTERVIEW: _____

PLACE OF INTERVIEW: _____

NAME OF INTERVIEWER: _____

SERIAL NUMBER: _____

INSTRUCTIONS FOR THE INTERVIEWER

1. Introduce yourself to the respondent.
2. Explain the reason for the interview.
3. Assure the respondent of confidentiality and anonymity
4. Do not write the name of the respondent on the interview schedule.
5. Fill in the most appropriate response to the question on the space provided.
6. Provide time for the respondent to ask questions at the end of the interview.
7. Refer the patients to a person who can answer the questions you are not sure of.
8. Thank the respondent at the end of each interview.

SECTION A: DEMOGRAPHIC DATA

FOR OFFICIAL

USE ONLY

1. What is your gender?
 - 1) Male
 - 2) Female
2. How old are you?
 - 1) 20 – 29
 - 2) 30-39
 - 3) 40-49
 - 4) 50-59
 - 5) 60 and above
3. What is your marital status?
 - 1) Single
 - 2) Married
 - 3) Widowed
 - 4) Divorced
4. What is your level of education?
 - 1) No formal education
 - 2) Primary
 - 3) Secondary
 - 4) Tertiary
5. What is your occupation?
 - 1) Civil Servant
 - 2) Self-employed/Business
 - 3) Retired
 - 4) Unemployed
6. What is your denomination?
 - 1) Catholic

- 2) Seventh Day Adventist
- 3) Jehovah witness
- 4) Pentecostal churches
- 5) Others (Specify).....

FOR OFFICIAL
USE ONLY

SECTION B: HEALTH CARE SYSTEM

- 7. How far do you live from the hospital?
 - 1) Less than 5km
 - 2) More than 5km
- 8. If you live more than 5km, what mode of transport do you use to travel to the hospital?
 - 1) By foot
 - 2) Bicycle
 - 3) Public transport
- 9. If it is by public transport, how much do you pay?
Specify K.....
- 10. How often do you go for reviews to the hospital?
Specify.....

SECTION C: KNOWLEDGE ON DIABETES MELLITUS

- 11. For how long have you lived with Diabetes Mellitus?
 - 1) More than 1 year but less than 2 years
 - 2) Between 2 and 5 years
 - 3) More than 6 years
- 12. Do you have relatives suffering from diabetes mellitus?
 - 1) Yes
 - 2) No
- 13. Do you know the anti-diabetic drug/s which you are on?
 - 1) Yes
 - 2) No

14. What type of anti-diabetic treatment regimen are you on?

- 1) Diet modification
- 2) Oral Hypoglycemic agent only
- 3) Insulin therapy only
- 4) A combination of oral and insulin

15. Are anti diabetic drugs (oral or injectable) always available at the hospital?

- 1) Yes
- 2) No

16. If your answer to question 15 is **NO**,
specify what you are told to do by the health care provider for your treatment

.....
.....

17. Do you measure your blood glucose levels on daily basis?

- 1) Yes
- 2) No

18. Do you have your own glucometer for measuring your blood glucose levels?

- 1) Yes
- 2) No

19. If your answer to question 18 **NO**, specify how do you measure your blood
glucose levels

- 1) At public health facility
- 2) At private health facility
- 3) Not applicable

**SECTION D: ADHERENCE USING A MODIFIED MORISKY
MEDICATION ADHERENCE SCALE**

QUESTIONS	YES	NO
20. Do you ever forget to take your medication?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
21. In the past two weeks, were there any days when you did not take your medicine?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
22. Have you ever stopped taking your medicine without telling your doctor because you felt worse when you took it?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
23. When you travel or leave home, do you sometimes forget to bring along your medicine?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
24. Did you take all your medicine yesterday?	<input type="checkbox"/> 1	<input type="checkbox"/> 2
25. Do you ever feel distressed about sticking to your treatment plan?	<input type="checkbox"/> 1	<input type="checkbox"/> 2

**SECTION E: ATTITUDE ON SELF-MANAGEMENT USING A MODIFIED
DIABETES SELF-MANAGEMENT QUESTIONNAIRE (DSMQ)
DEVELOPED AT THE RESEARCH INSTITUTE OF THE DIABETES
ACADEMY MERGENTHEIM, GERMAN.**

	THE FOLLOWING STATEMENTS DESCRIBE MODIFIABLE SELF-CARE LIFESTYLE ACTIVITIES RELATED TO DIABETES IN THE LAST 8 WEEKS.	APPLIES TO ME VERY MUCH	DOES NOT APPLY TO ME
26.	I check and record my blood sugar levels with care and attention to achieve optimal blood glucose levels.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
27.	The food I choose to eat makes it easy to achieve optimal blood glucose levels.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
28.	I keep all doctors' appointments recommended for my diabetes treatment.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
29.	I take my diabetes medication (e. g. insulin, tablets) as prescribed.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
30.	I do regular physical activity to achieve optimal blood sugar levels.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
31.	I strictly follow the dietary recommendations given to me by the doctor or diabetes specialist.	<input type="checkbox"/> 2	<input type="checkbox"/> 1

End of the interview and I thank you for your co-operation.

APPENDIX VI: Translated data collection tool

CIKOLO CHA UNIVERSITY OF ZAMBIA

CHIPEPA CHAMIBUZYO: Kutobelezya malailile a kusilikwa bulwazi bwa cukela abalwazi basilikilwa kucibbadela cha Monze Mission Hospital.

BUZUBA BWAKUBIZYIGWA: _____

BUSENA : _____

ZINA YA UBUZYA: _____

NAMBA YACHIPEPA ECHI: _____

MALAILILE AMUNTU UVUNAUZYA

1. Kolipandulula
2. Kopandulula kaambo ka mibuzyo
3. Izina lyamuntu uvuntaizigwa taliko lembwa achipepa echi
4. Amwingule mibizyo muzyibaka zipedwe muchipepa echi
5. Mulapegwa ciindi chakubuzya mibuzyo kumamanino a kubuhuntaizyigwa
6. Na mibizyo yenu tiyahwilwa mboeelede, mulatumwa kuli muntu uti ihwiile kabotu
7. Kolumba sikuvuntauzigwa kumamanino a kubuzigwa

CHIBELA CHAKUSANGUNA: MAKANI ABUBE BWAKO

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USE ONLY

1. Sena ulimuntu nzi?

1) Musankwa

2) Mukaintu

2. Ujisi myaka yongaye yakuzyalwa?

1) 20 – 29

2) 30-39

3) 40-49

4) 50-59

5) 60 kuunka ajulu

3. Sena ulikwete na ulikwetwe?

1) Tandikwete

2) Ndilikwete

3) Ndakafwidwa

4) Twakalekana

4. Mwakagolela mubbuku nzi?

1) Tindakaiya

2) Lya kusaanguna

3) Sekondali

4) Kucikolo cipati

5. Mubeleka mulimo nzi?

1) Mumfulumende

2) Ndilalibelekela/busambazi

3) Ndakalitaya

4) Tandibeleki

6. Ino mupaila ku cikombelo nzi?

1) katolika

2) Nsabata

- 3) Kamboni wa Jehova
- 4) Pente
- 5) Zyimbi (kamupandulula).....

CIBEELA CHABILI: CHIBELA CANSEBA CHIPEGWA

- 7. Ino kkomukkala kkule buti acibbadela?
 - 1) Taisiki 5km
 - 2) Ilaindilila a 5km
- 8. Na mukkala kule, kwindilila 5km, mweenda buti kuunka ku cibbadela?
 - 1) Amaulu
 - 2) Anchinga
 - 3) Amyotokala ya kubbadela
- 9. Na mweenda amyotokala ya kubbadela, mabbadela mali nzi?
Kamupandulula K.....
- 10. Ino ku cibbadela mwiinka zyiindi zynji buti kukupimwa nchukela?
kamupandulula.....
.....
.....

CIBEELA CATATU: LUZYIBO KU BULWAZI BWA CHUKELA

- 11. Ino mwakkala kwa ciindi cilamfu buti abulwazi bwa chukela?
 - 1) wainda mwaaka omwe pesi taindilili ku myaaka yobile
 - 2) Akatikati ka myaaka yobile a myaaka yosanwe
 - 3) Yainda myaaka cisambomwe
- 12. Sena mu mukwashi wenu kuli baciswa bulwazi bwa chukela?
 - 1) Inzya
 - 2) Peepe
- 13. Sena muluzyi zina musamu wachukela ngomunya?
 - 1) Inzya
 - 2) Peepe

14. Bapegwa musamu wabuti wa chukela?

- 1) Kulya zyakulya zitapi chukela kuti ivule mumubili []
- 2) Mapilusi achesya chukela mumubuli []
- 3) Inyeleti ya Insulin []
- 4) Mapilusi a nyeleti antome []

15. Sena musamu wachukela ngomunywa wa mapilusi na wanyeleti ulajanwa lyoonse kuchibadeela?

- 1) Inzya []
- 2) Peepe []

16. Na bwinguzi bwenu ngu peepe ku mubuzyo wa 15, mwakalaililwa kuti kamulibamba buti abamupa musamu kuchibadela?

Amupandulule

17. Sena nchukela yenu mulaipima buzuba abuzuba?

- 1) Inzya []
- 2) Peepe []

18. Sena mulijisi kanchini kakupimina nchukela?

- 1) Inzya []
- 2) Peepe []

19. Na bwinguzi bwenu ngu peepe ku mubuzyo wa 20 mulipimina yii chukela yamumubili wanu?

- 1) Kuchbadela cha mfulumende []
- 2) Kuchbadela cha muntu buyo []
- 3) Taakwe []

**CHIBEELA CHATATU: KUTOBELEZYA MALAILILE AKUSILIKWA
KWIINDA KUBELESHSY CIKEELO CHAKABAMBULULWA CHA
MORISKY**

MIBUZYO	INZYA	PEEPE
20. Sena kuli nomulaluba kunywa musamu wenu?	<input type="checkbox"/> 2	<input type="checkbox"/> 1
21. Inhwiki zybilo zyainda kuli mazuba ngomwakaluba kunywa musamu wenu?	<input type="checkbox"/> 2	<input type="checkbox"/> 1
22. Sena kuli nemwakalekede kunyawa musamu wenu nkambo musamu umupa kotalivwa kabotu mwaunya, kamutamwambili dokota wenu.	<input type="checkbox"/> 2	<input type="checkbox"/> 1
23. Nomuzwa amanda kutola musinzo mulamfu sena kuli ziindi ziomuluba kubweezelezya musamu wenu?	<input type="checkbox"/> 2	<input type="checkbox"/> 1
24. Sena mwakanya musamu wenu jilo?	<input type="checkbox"/> 2	<input type="checkbox"/> 1
25. Kuli nomulivwa kupengesegwa nkaambo kakusilikwa bulwazi bwachukela?	<input type="checkbox"/> 2	<input type="checkbox"/> 1

CHIBEELA CHANE: BUBE BWAKULIBAMBA KABOTU NOLIKE KWIINDA KUBELESHYA MIBUZYO YAKABAMBULULWA YA KULIBAMBA KABOTU OLIKE KUZWA KUCHIKOLO CHIVUNTAUZYA MALWAZI ACHUKELA CHA KU GERMAN.

	MALAILILE AKULIBAMBA KABOTU OLIKE KWIINDA MUBUKALE BWBUUMI BWENU MUVWIKI ZILI LUSELE ZYAINDA	CHILAND IGAMA KAPATI MEBO	TACHINDIGA MI NOKUBA ASHYONTO MEBO
26.	Ndilalilingula aku lemba kabotu mbondajana chukela mumubili wangu kutegwa ndibone na iliachelelo chibotu.	<input type="checkbox"/> 1	<input type="checkbox"/> 0
27.	Ndilasala zyakulya zendilya kutegwa ndibe a chelelo cibotu cha chukela mumubili wangu.	<input type="checkbox"/> 1	<input type="checkbox"/> 0
28.	Ndilabamba malailile akubonana aba dokota kweendelana akusilikwa bulwazi bwa chukela.	<input type="checkbox"/> 1	<input type="checkbox"/> 0
29.	Ndilanywa na kulyasa nyeleti yamusamu wachukela kutobela malailile oonse ngondipegwa aba dokota.	<input type="checkbox"/> 1	<input type="checkbox"/> 0
30.	Ndilabalisha maubili ciindi aciindi tutegwas kuti chukela mumubili iske ambakini iyelede.	<input type="checkbox"/> 1	<input type="checkbox"/> 0
31.	Ndilatabela kabotu malailile a cakulya cibotu candambila ba dokota.	<input type="checkbox"/> 1	<input type="checkbox"/> 0

Ndalumba kapati kubikilila kwenu. Ndaman kuvuntauzya.