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DETERMINANTS OF POOR GLYCAEMIA CONTROL AMONG TYPE 2 DIABETIC PATIENTS ATTENDING THE OUTPATIENT DIABETIC CLINIC AT VICTORIA CHITEPO PROVINCIAL HOSPITAL

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

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Abstract

Diabetes is a chronic condition which is one of the leading causes of premature mortality. If uncontrolled well, diabetes often causes severe long term complications which compromise quality of life and can cause permanent disability. The incidence of diabetes and its associated complications in Mutare reported through surveillance data has been on the rise, however, since the COVID-19 pandemic there have been a decrease in patients reporting to the diabetic clinic at Victoria Chitepo Provincial Hospital. Amongst those who report for their routine check-ups, there have been an increase in the number of patients with uncontrolled sugar levels. A 1:1 unmatched case control study was carried out. The outcome of interest was glycaemic control. A case was an adult aged 18 years and above, who had type 2 diabetes for at least 6 months with the latest HbA1c greater than 7% attending diabetic clinic at VCPH, 2021. A control was an adult aged 18 years and above, who had type 2 diabetes for at least 6 months with the latest HbA1c less than 7% attending diabetic clinic at VCH, 2021. A total of 300 diabetic patients were enrolled in this study. Interview administered questionnaires, records review and hospital checklist were used to collect data. Epi info version 7.2. software was used to generate means, frequencies, proportions, odds ratios and their corresponding 95% confidence intervals. Stratified analysis was used to identify possible confounding or effect modification. Forward step-wise logistic regression analysis was done to determine the independent factors associated with poor glycaemic control. Multivariate analysis showed poor level of education [AOR = 3.5, 95% CI (1.2 – 3.9) p=0.010], use of out of pocket to buy medications [AOR = 3.9, 95% CI (2.0 – 12.9) p=0.041], type of treatment [AOR = 18.8, 95% CI (3.3 – 21.2) p=0.001], failure to adhere to medications [AOR = 3.2, 95% CI (1.7 –9.5) p=0.021] and failure to travel to the hospital [AOR = 16.1, 95% CI (5.7 – 22.6) p=0.013] to be statistically significant predictors of poor glycaemic control. The study recommended the need to employ the differentiated care approach in providing health care services amongst diabetic patients to meet the differing needs and address the varying barriers to effective glycaemic control, development of diabetic clinics at district levels so as to avoid transportation costs to the province.

Key words: chronic condition; COVID-19; glycosylated haemoglobin; lockdown measures; non-communicable diseases; poor glycaemic control; type 2 diabetes

Declaration

I, Blessing Tatenda Alexander Rukunda, do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. This work has never been submitted, nor will it ever be submitted to another university for the award of a Masters' degree.

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Acknowledgements

Dedication

This study is dedicated to my late father Mr M.T Rukunda who survived with diabetes for over 30 years, my mother Mrs W Rukunda who is also diabetic. My mother's and brother's prayers, unconditional love, support, encouragement, patients and faith in me.

List of acronyms

ADA:	American Diabetic Association
AU:	Africa University
AUREC:	Africa University Research Ethics Committee
CI:	Confidence Interval
DM:	Diabetes Mellitus
FPG:	Fasting Plasma Glucose
GC	Glycaemic Control
HbA1c:	Haemoglobin A1c or Glycosylated Haemoglobin
IDF:	International Diabetes Federation
LFCLS:	Labour Force and Child Labour Survey
LMICs:	Low and Middle-Income Countries
NCDs:	Non-communicable Diseases
T2DM:	Type 2 Diabetes Mellitus
SES	Social Economic Status
SMBG:	Self-Monitoring Blood Glucose
OR:	Odds Ratio
VCPH:	Victoria Chitepo Provincial Hospital
WHO:	World Health Organization
ZDA	Zimbabwe Diabetic Association

Definition of key terms

Adherence Complying to a recommended lifestyle behaviour

Alcohol Recommendations Not consuming alcoholic beverages or consuming them

Blood glucose control According to the Ninth International Diabetic Association (IDA 9) guidelines for diabetic patients to be regarded as controlled, their blood glucose is to be under 7% to be regarded as controlled

Case A diabetic patient who has uncontrolled blood glucose > 7%

Control A diabetic patient who has controlled blood glucose < 7%

Diabetes A chronic condition in which the blood glucose is elevated (>7%)

Medication Adherent Taking antidiabetic medication as instructed by the health worker or doctor, in its right quantities and daily

Physical Activity Movement of the body, in ways which uses energy such as brisk walking, gardening, jogging, running, playing sport or carrying heavy loads

Physical Activity Adherent Complying to conducting moderate to vigorous activity for at least 75 to 150 minutes per week or for at least 30 minutes per day for 3 or more times per week for those who are 18 years and above, according to WHO's Global Recommendations on physical activity (WHO, 2010)

Recommended Lifestyle These are habits which include eating healthy diets,

Behaviours conducting physical activity, not smoking, consuming alcohol in moderation for those who drink and taking antidiabetic medications as instructed

Smoking Recommendation Not smoking cigarettes, cigars or snuff at all

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CHAPTER ONE   INTRODUCTION

1.1   Introduction

Diabetes mellitus (DM) is a chronic non-communicable disease (NCD) characterized by persistent high blood glucose (hyperglycaemia) in which the body cannot produce enough insulin (a hormone that regulates blood glucose) or cannot use it effectively (Wang, Neil, & Home, 2018). There are 3 main types of DM namely type 1, type 2 and gestational diabetes.

An estimated 463 million adults aged 20–79 years are currently living with diabetes globally. This represents 9.3% of the world's population in this age group and the total number is predicted to rise to 578 million (10.2%) by 2030 and to 700 million (10.9%) by 2045 (International Diabetes Federation, 2019). The number of deaths resulting from diabetes and its complications in 2019 was estimated to be 4.2 million globally and the annual global health expenditure on diabetes was estimated to be USD 760 billion and is projected that expenditure will reach USD 825 billion by 2030 and USD 845 billion by 2045 (International Diabetes Federation, 2019).

According to the International Diabetes Federation (IDF), type 2 diabetes mellitus (T2DM) constitutes 90% of all diabetic cases. Type 2 diabetes mellitus is a lifelong disease that keeps your body from using insulin the way it should. People with T2DM are said to have insulin resistance.

The increased prevalence in diabetes, in particular T2DM in Africa, is thought to be due to rapid urbanization, industrialisation and changing diets that marginalize traditional foods in favour of western diets, and are associated with decreased physical activity and increasingly sedentary lifestyles, an increase in the intake of fast foods and increased working hours in the office (Wild & Byrne, 2006).

According to the Zimbabwe Diabetic Association in (ZDA), 10 in every 100 people have diabetes, and currently, diabetes statistics represent over 100 000 visits or consultations at outpatients' departments per year (ZDA, 2017). Zimbabwe DM prevalence among adults aged 20 – 79 is 1.2% with total cases of 103 200 (International Diabetes Federation, 2019). The major challenges faced in the provision of care of diabetics in Zimbabwe are centred on late detection and/or misdiagnosis and exorbitant cost of diabetes management. Poverty, ignorance, attribution of disease symptoms to myths and deities, lack of basic infrastructure and poor access to health care are some of the factors that have increased the risk of misdiagnosis of diabetes, late detection and early onset of complications amongst diabetic patients in Zimbabwe (Mutowo, Gowda, Mangwiro, Lorgelly, Owen & Renzaho, 2015).

Many diabetic patients globally cannot afford to pay for adequate care of their condition due to the expensive nature of managing the disease. The costs of treating diabetes are incurred from travelling to the health facility, treating the disease itself, treating the possible complications, treating comorbid diseases where diabetes is a risk factor and also the dietary requirements (Mutowo et al., 2015). The burden is worsened when reduction in the economic productivity of these patients and the effects this may have in their family is considered with the current working restrictions being experienced globally due to the COVID-19 pandemic.

According to the International Monetary Fund report of 2018 on shadow economies indicated that Zimbabwe has an informal economy of 60.7% of GDP and over 85% of the working class are employed in the informal sector. In Zimbabwe, those who are informally employed were not allowed to work as they are not regarded as essential services during the level 4 lockdown period. Type 2 diabetes mellitus

individuals in the informal sector are unable to have a source of income and were failing to buy medications to manage their condition resulting in poor glycaemic control (American Diabetic Association, 2020).

1.2   Background

Achieving glycaemic control (GC) is a complex task for people with DM as it involves multiple domains of daily functioning. To maintain glucose levels that are as much as possible within range, patients need to pay more attention to meals, medications, exercise regimens, working activities, social relations and psychological stress, as well as exercise self-control. This continuous challenge results in people with DM occasionally deprioritizing GC in favour of other activities.

In December 2019, a new corona virus (CoV) strain that causes severe acute respiratory syndrome emerged in Wuhan (China), ultimately referred to as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19, and rapidly spread throughout the world. Following the precedent set by the lockdown in China in January 2020 and Italy in March to try and reduce the spread of infection, lockdowns continued to be implemented in many countries throughout 2020 as the virus continued spreading. The lockdowns involved stopping all sport and educational activities, commercial activities and most non-essential services. During lockdown, all citizens were requested to 'stay at home with the exception of essential work, food/medicine shopping'(Bonora, Boscari, Avogaro, Bruttomesso, & Fadini, 2020).

Zimbabwe confirmed its first COVID-19 case in March 2020. Since then, the number continued to increase. A national lockdown was first introduced on 30 March 2020 and was gradually extended and another lockdown was imposed on the 4th of

January 2021 and was gradually extended. Apart from limiting human movements, the restrictions resulted in stoppage of non-emergency medical care at health institutions, and disruptions in supply chains of consumables for medical care. Delays in seeking and accessing healthcare by the patients were also noted. Additionally, disruption of essential health services in the areas of maternal and child health, sexual and reproductive health services, care for chronic conditions and access to oncological and other specialist services occurred (Ghosal, Sinha, Majumder, & Misra, 2020).

Zimbabwe suffers from a high burden of communicable and non-communicable diseases. Diabetes and hypertension are among the leading causes of morbidity for chronic non-communicable diseases (NCDs). Chronic care for these conditions was affected by the reduced outpatient attendances which has been worsened with the current pandemic (Ghosal et al., 2020). Schedules for prescription refills and routine laboratory monitoring tests have been disrupted due to the movement restrictions in place. Unfortunately, poorly controlled chronic diseases such as poor glycaemic levels increase the odds of death from COVID-19 infection (Murewanhema & Makurumidze, 2020).

This study was conducted at Victoria Chitepo Provincial Hospital (VCPH) which is located in Mutare City in Manicaland Province of Zimbabwe. There is an operating out-patients' diabetic clinic which is located at the outpatient's department (OPD). The diabetic clinic was initiated as a result of the observation by health care providers that there was an ever-increasing trend of diabetic cases and complications. According to unpublished data at VCPH, diabetes mellitus is among the contributing factors leading to death to patients diagnosed with COVID-19.

1.3   Statement of the Problem

In Manicaland Province, according to statistics obtained from the District Health Information System 2 (DHIS2), there has been an increase in the number of type 2 diabetic cases and follow ups from 2017 to 2019, however, in 2020 there was a decrease in the number of follow ups, new cases and patients registered and regularly attending as shown in figure 1 below.

The decrease in number of follow ups, new diagnosis and patients regularly attending came during the peak of the COVID-19 pandemic and restriction measures put in place. The 2020 annual report sent to the Manicaland Provincial Medical Directorate (PMD), reported that there was an increase in complications that resulted from poor GC. According to unpublished data at VCPH, there have been increasing cases of kidney injuries, diabetic sores and diabetic foot amputations. In a statement given by the Medical officer running the diabetic clinic at VCPH, *"the number of complications resulting from poor glycaemic control has increased tremendously"*. It was against this background that the researcher investigated the factors associated with glycaemic control among adult patients attending VCPH in the context of COVID-19.
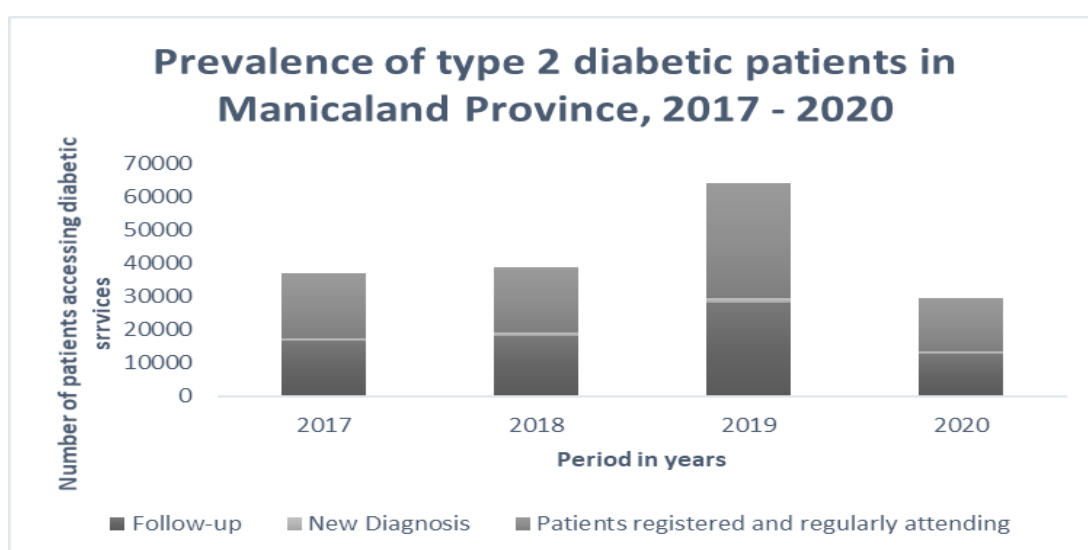
Figure 1:   Prevalence of Type 2 Diabetes in Manicaland Province, 2017 - 2020

1.4   Justification

The findings of the study will help clarify the factors that act as facilitators or barriers to achievement of good GC during the current COVID-19 pandemic. Therefore, these factors will inform policy makers, health workers, communities, families and caregivers as well as patients themselves on what needs strengthening and gaps that need to be addressed.

1.5   Research Question

What were the determinants of poor GC amongst adult type 2 diabetic patients attending the outpatient's diabetic clinic at Victoria Chitepo Hospital in Mutare, Manicaland Province, 2021 during the COVID-19 context?

1.6   Objectives

1.6.1   Broad Objective

To analyse factors associated with poor GC among adult type 2 diabetic patients attending Victoria Chitepo Hospital in Mutare, Manicaland Province, during the COVID-19 context in 2021.

1.6.2   Specific Objectives

- To assess if there is an association between socio-demographic, socio-cultural and socio-economic factors and GC among adult type 2 diabetes patients seen at VCPH in 2021.

- To evaluate if healthcare and treatment factors influences GC among adult type 2 diabetes patients seen at VCPH in 2021.

- To determine the effects of the COVID-19 pandemic and its mitigation measures on achievement of GC among adult type 2 DM patients seen at VCPH in 2021.

1.7   Research questions

- What is the association between socio-demographic, socio-cultural and socio-economic factors and GC among adult type 2 diabetes patients seen at VCPH in 2021?

- What are the healthcare and treatment factors that influences GC among adult type 2 diabetes patients seen at VCPH in 2021?

- What are effects of the COVID-19 pandemic and its mitigation measures on achievement of GC among adult type 2 DM patients seen at VCPH in 2021?

1.8   Delimitations

The research focused more on population residing in Manicaland Province. The participants for the study came from Manicaland Province given that the research period did not allow the researcher to cover the entire nation. The research focused more on the determinants of poor GC among T2DM patients. The participants' age ranged from 18 years and above years.

1.9   Limitations

The major limitation of the study was that of time to conduct an exhaustive study around the research topic and the entire Manicaland Province.

Access to key informants was also a challenge as they were involved with their daily activities. However, the researcher made some appointments and sent some briefing interview guides to reduce the time factor.

1.10 Summary

The chapter has given an introduction to diabetes mellitus, background to the study and the statistics of people affected by the disease globally. The broad objective of the study was to determine factors associated with GC among adult type 2 diabetic patients attending Victoria Chitepo Hospital in Mutare, Manicaland Province, 2021. Justification and the need for the study was specified within the chapter.

CHAPTER TWO   REVIEW OF RELATED LITERATURE

2.1   Introduction

Diabetes mellitus has previously been perceived as a disease that affects western countries. Over the years this has changed rapidly and now the disease is common world over. The chapter closely examined the literature on the factors associated with GC such as demographic characteristics, socio-economic, healthcare provider related causes, health system causes, lifestyle/behavioural factors and disease related causes.

2.2   Factors Associated with Glycaemic Control

The factors associated with GC can be broadly classified into socio-demographic, socio-economic and socio- cultural characteristics, healthcare provider related causes, health system causes, (Sciences, 2017). Figure 2 below shows how these factors are related to non-adherence to treatment leading to poor GC.

CONCEPTUAL FRAMEWORK
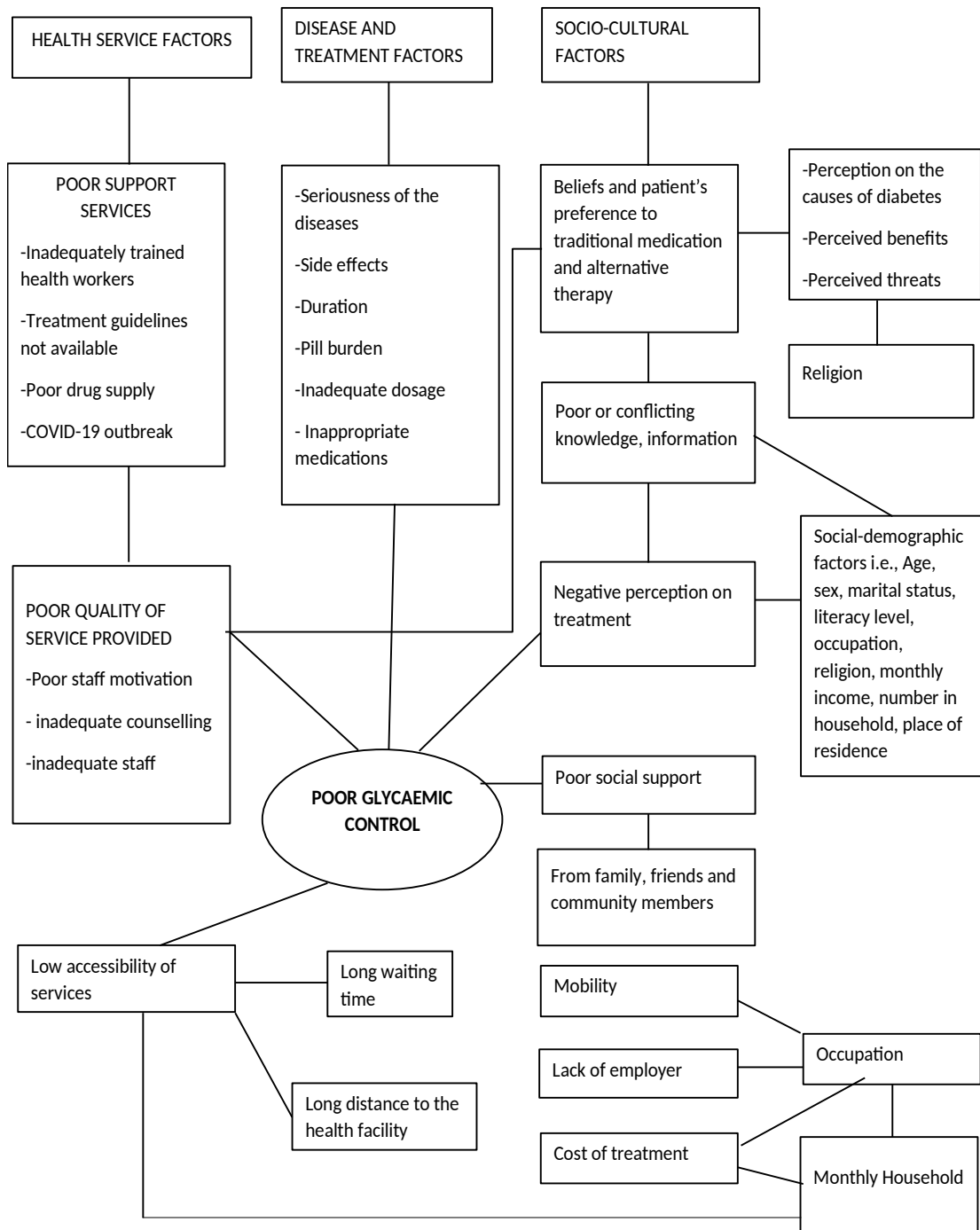
Figure 2:   A Conceptual Framework for factors associated with poor glycaemic

control. Adapted from Mandewo, Dodge, Chideme-Munodawafa & Mandewo, 2014.

2.2.1 Health Service Factors

Poor GC is attributed to a number of health service factors such as poor support services, inadequate health workers, treatment guidelines not available, poor drug supply, poor quality of service provided, poor staff motivation, inadequate counselling. Patients who have to depend on government facilities in Zimbabwe are faced with a crippled health system which is characterized by shortage of health care workers, shortage of drugs and poor support systems.

According to World Bank (2019), the majority of Zimbabweans rely on out-of-pocket financing. Zimstat (2019), notes that over 94.5% of the working class in Zimbabwe are in the informal sector and rely to their day-to-day work for income, with the advent of COVID-19 and the lockdown restrictions means they have no source of income thus there will be no means for them to finance for their health care.

The current economic situation prevailing in Zimbabwe has seen the health workforce employed by the government going on industrial action time and again especially nurses and doctors advocating for better working conditions and remuneration. The interruption in service provision results in poor monitoring of patients such as diabetic clients. Due to the hardships in Zimbabwe, brain drain is occurring as health care personnel are looking for greener pastures resulting in poor service provision and poor service delivery.

Due to poor service provision being offered at health facilities, diabetic patients are turning to traditional medicines such as herbs which would have not been medically proven in terms of pharmacodynamics and pharmacokinetics as well as dosage and frequency (Mabvurira, 2016).

2.2.2 Socio-cultural Factors

In Africa traditional medication is preferred to western medication because it is cheap and ever available. Beliefs and patient's preference to traditional medication has resulted in a number of diabetic patients resorting to traditional medication as opposed to western medication and alternative therapy.

A study carried out in Kenya showed that religious rituals such as fasting influenced diabetes self-monitoring of blood glucose (SMBG.), fasting was described as having both positive and negative impacts on diabetes self-management. Although fasting promoted good control of diabetes and adherence to dietary restrictions during the day, it promoted a "do not care" attitude about consuming high-calorie specialty foods served during meals in the evening.

There are deep-rooted religious and ideological beliefs in the Swahili community that fasting promotes purity, which in turn promotes wellness (Abdulrehman & Gearhart, 2012). In contrast, the lived experience among those with diabetes during fasting highlights the difficulties associated with dehydration during fasting hours, and binge eating at sundown (Abdulrehman, Woith, Jenkins, Kossman, & Hunter, 2016).

In the same study, kinship and religion influenced self-management of diabetes in terms of participants' obligations to their families and their religion, including participating in ritual practices and upholding prescribed gender roles. In terms of family obligations, it was noted that both male and female participants complained of the difficulty of changing the dietary habits of the whole family based on one person's illness. In the Swahili cultural context, family needs are more important than individual needs. Participants also reported that making separate meals for family and self was difficult due to the extra time and cost of food involved.

In Zimbabwe, it was noted that it is difficult to prepare two separate meals so as to cater for diabetic patients because of the economic situation where it becomes expensive (Chopera, 2020). Ritual obligations observed among the Swahili of Lamu town were reported as having an undesirable influence on participants' SMB. Attending events such as wedding feasts, which last for several days in a row, is motivated by an obligation to support the Islamic marriage ritual and to build social ties.

Cultural values and belief that affect SMB include the pervasive use of non-biomedical remedies, fear and mistrust of biomedical therapies, and a defeatist attitude toward diabetes (Abdulrehman et al., 2016). Herbal remedies are more affordable, and some patients believe them to be more effective than pharmaceutical products at lowering blood sugar. In terms of fear and mistrust, some patients avoid oral anti-diabetic medications and/or insulin due to fear of becoming dependent on them and not being able to live without them (Abdulrehman et al., 2016).

The World Health Organization however, estimates that 60% of the world's population depends on traditional medicines; with up to 80% of the population in Africa using traditional medicines to meet their daily healthcare needs (WHO, 2018). In Zimbabwe, majority of the families are extended families. The family is the first point of socialisation and it influences the health seeking behaviour of the individual. Diabetic patients especially the young individuals are influenced by their elderly family members. As such if the family is deep rooted in the traditional beliefs, these individuals will not seek medical attention and rely on unproven medicines thus affecting GC.

According to a study carried out by Mawoza, Nhachi, and Magwali (2019), it shows that Zimbabweans prefer to use both traditional and modern medicines on managing

diabetes. However, this has a negative effect as the traditional medication has been not proven by the responsible authorities as they can potentiate, or inhibit other medication, issues of dosage and how frequent should it be taken will not be proven.

The herbal industry in Zimbabwe on the rise being aired on the national broadcasting stations encouraging individuals to use their products as such it is vital to integrate the two traditional medicines and modern medicines if good GC is to be achieved (Mafuva & Marima-Matarira, 2014).

2.2.3 Sociodemographic Factors

Sociodemographic factors influence GC in diabetic patients globally. Studies have shown that high levels of poor GC are common in women. A study done in Fiji revealed that proportion of T2DM patients with poor GC was greater in females than in males at 45.3% and 31.9% respectively (Pablo, Mohammadnezhad, Wilson & Khan, 2018). Similar studies have been done which also revealed that poor GC is most common in women than in men (Abougalambou, Suleiman & Abougalambou, 2015).

In contrast a study by Noyes, Soto-Pedre, Donnelly and Pearson (2018), found that men with type 2 diabetes had greater odds of having high HbA1c variability. This was also reported in a study carried out by Mellergard, Johnsson and Eek (2020), were men had higher HbA1c variability than women.

A study by Pablo et al. (2018) in Fiji revealed that 52.3 % of males and females with poor GC who participated in the study were less than 60 years of age. T2DM patients below the age of 60 years are twice likely to have poor glycaemic control as compared to their older counter parts. It has been argued that such findings are as a result of older people are easier to follow their dietary requirements and exercise than

their young counter parts. Older people are easier to do all that which they are required to do and maintaining their monthly check-ups than younger T2DM patients. However, other studies noted that poor GC is common among older T2DM patients mainly because of co-morbidities and poor treatment adherence (Abougalambou et al., 2015).

Sex differences in GC probably have a multifactorial explanation, including both differences in biological mechanisms linked to diabetes, as well as differences in self-management, between men and women. Impairment in glucose and lipid metabolism, body composition, and energy metabolism, is to a high degree influenced by sex hormones, and factors influencing the development of obesity, such as health behaviours, income, and education, may differ between men and women (Mellergard et al., 2020).

2.2.4 Socioeconomic Factors

Socio-economic factors play the most significant role in the level of GC amongst diabetic patients (Wah Oo, Nau, & Kyi, 2020). The association between low Social Economic Status (SES)and poor GC is probably as a result of three sets of mediating variables such as adverse health-related behaviours, comorbid conditions, and non-adherence to essential health service-related practices (Rahman, Nakamura, Hasan, Seino & Mostofa, 2020).

Evidence shows that, optimal GC can be attained through rigorous patient self-management of various health-related behaviours, including avoiding tobacco use, taking medication, following a diet, and regular physical activity, corresponding to recommendations from a health care provider which all require money (Rahman et al., 2020).

According to research investigating the relationship between SES and adverse health-related behaviours in both developed and developing countries, results found that low SES is associated with tobacco use, physical inactivity, non-adherence to medication, and an unhealthy diet (Rahman et al., 2020). Families that are economically disadvantaged cannot afford to buy their medications, do their laboratory investigations or keep up with their follow-up appointments as they cannot afford it. They cannot afford healthy diets and often lack the means to visit recreation or sports parks for physical activities. It is therefore more difficult for this group to maintain a good level of GC (Ezegbogu, 2018).

A study carried out in Kenya, showed that economic factors manifested themselves in participants' poverty level, which affected the affordability of oral anti-diabetic medications, food security, access to recommended foods, and to privately owned diabetes monitoring devices (Abdulrehman et al., 2016).

A cross-sectional study carried out in Ghana noted that 34.4% of the respondents identified financial constraints as the major reason for not adhering to their medications (Akpalu, Yorke, Ainuson-Quampah, Balogun & Yeboah 2018). This corresponds to the findings in Zimbabwe were 59% of the diabetic patients were non-adherent to their medications due to lack of finance (Mutowo, 2017). Shortages of diabetic drugs at government hospitals and charging in forex by private pharmacies in Zimbabwe has resulted in high defaulter rates (ZDA, 2019).

Most Zimbabwean DM patients use out-of-pocket to purchase their drugs, pay for laboratory tests and consultation fees. In a country where foreign currency is dominant, with high level of poverty and a minimum wage that cannot provide enough food or shelter, it is clear that health care will definitely be inadequate. The chronic nature of T2DMs further complicates this scenario because these patients

spend their entire lifetime buying drugs, attending follow ups and doing laboratory investigations (Johnson et al., 2020). T2DM patients without insurance for self-monitoring supplies often have significantly worse glycaemic control.

2.2.5 Treatment-Related Factors

Prescribing pattern for diabetic patients is a key determinant of GC. Cost of medicines, route of administration, pill burden, multiple dosing regimens, seriousness of disease and duration are some treatment-related factors that influence GC. Greater pill burden results to less adherence, due to out of pocket funding, expensive drugs will not be afforded (Namba et al., 2018). Patients on fewer tablets, monotherapies, and fewer dosing frequencies tend to adhere better to their medications.

Patients' satisfaction with the quality of health care service provided by the managing hospitals is also an important determinant of the possible outcome of the treatment. One way in which this quality has been assessed is by eliciting the level of patient satisfaction with the services they receive. Souliotis et al. (2020), reported that there is an association between patients' satisfaction and outcome in diabetes-HbA1c. They submitted that steps taken to increase patients' satisfaction improve outcome by increasing compliance and adherence to treatment regimens.

2.2.6 COVID-19 Pandemic

The Covid-19 pandemic which was first discovered in Wuhan, China in 2019 has affected treatment for patients with T2DM, hence compromising their GC. People with pre-existing medical conditions such as diabetes appear to be more vulnerable to becoming severely ill with the COVID-19 virus. With such information, people with diabetes have been encouraged to take precautions to avoid the virus if possible.

For diabetic patients in Zimbabwe visiting local medical facilities for treatment is now scary as hospitals and clinics have become "hubs of infection". Amid a deepening and weakening health care system, COVID-19 has made it worse and fear of being hospitalized or visiting local health facilities has increased to both those with underlying medical conditions and the general population.

People with medical conditions that need treatment are prone to exposure to the virus at local health facilities. This has made some diabetic patients avoid visiting the health facilities for treatment. Diabetic patients who are middle- or high-income earners have resorted to buying their medication at private facilities where exposure to the Covid-19 virus is limited. However, their counterparts who are low-income earners who depend on government health facilities cannot do the same. This has led to some missing their treatment appointments in fear of being exposed to the Covid-19 virus and in turn leading to poor glycaemic control.

In a majority of countries including Zimbabwe, as a response to Covid-19 there has been a reassignment of most health staff in government health facilities to support Covid-19. Health services have been partially disrupted for medical conditions such as treatment for diabetes and diabetes-related complications in many countries and Zimbabwe is no exception. Such scenarios have disrupted the attention which is mostly given to medical conditions such as diabetes. The major focus now has been on Covid-19 and a lot of resources being channelled towards the fight against Covid-19.

As the COVID-19 virus does not select individuals, health professionals are falling ill as well. Majority of health professionals across Zimbabwe are succumbing to the COVID-19 virus and this results in them being placed on 14 days' quarantine, as such health centers are left being short staffed. Shortage of staff has a direct

relationship with the quality of care rendered, therefore, quality of care to diabetic patients is compromised due to the current COVID-19 pandemic. Also, as word gets into the local communities that health professionals are succumbing to the virus, people decide to shun away from health facilities only to appear when their conditions has worsened.

2.3   Summary

The chapter reviews the various factors associated with GC among diabetic patients. These include demographic characteristics, socio-economic, healthcare provider related causes, health system causes, and treatment related factors in association to the current prevailing COVID-19 pandemic. A systematic review of the various factors associated with GC among diabetic patients was conducted globally, regionally and locally.

CHAPTER THREE METHODOLOGY

3.1 Introduction

This chapter focused on the methodological strategies that were utilised in the study. Aspects of the study design, study site, study population, sampling procedure and sample size, data collection methods, reliability, validity and data analysis are addressed. Ethical considerations are also addressed.

3.2 Research Design and its Appropriateness

The study used an unmatched 1:1 case control study.

A case: An adult aged 18 years and above, who had type 2 diabetes for at least 6 months with the latest HbA1c greater than 7% attending diabetic clinic at VCPH, 2021.

A control: An adult aged 18 years and above, who had type 2 diabetes for at least 6 months with the latest HbA1c less than 7% attending diabetic clinic at VCH, 2021.

3.3 Study Setting

Victoria Chitepo Provincial Hospital is a referral hospital located in Mutare serving the whole of Manicaland Province. There is a diabetic clinic at its OPD. The hospital refers on to Central Hospitals as required.

3.4 Study Population

The study included T2DM patients aged between 18 years and above attending outpatient diabetes clinic with a confirmed diagnosis (by a physician) as evidenced in the treatment records. The included patients had at least two HbA1c test done. Only patients who had been on drug treatment or lifestyle modification for at least 6 months were included.

3.5   Sample Size

Using Dobson formula: $n = Z_a^2 \, (p) \, (1-p)/delta^2$

Where Z_a=1.96,

According to the International Diabetic Federation, 2019, T2DM constitutes 90% of the entire diabetic cases therefore;

P =0.9;

Q = 1- 0.9

  = 0.1

Delta= 0.05 at 95%CI

A non-response rate of 10%;

A minimum sample size of 139 participants was calculated;

Therefore, we selected 150 cases and 150 controls

3.6   Inclusion and Exclusion Criteria

3.6.1   Inclusion Criteria

Type 2 diabetic patients who were aged 18 years and above attending VCPH and had been on treatment for at least 6 months with two HbA1c results for at least the last 6 months.

3.6.2   Exclusion Criteria

Type 2 diabetic patients who were very sick or in an emergency situation were excluded from the study. Those who were on treatment for less than six months or did not have HbA1c results were excluded.

3.7 Sampling Procedure

The diabetic clinic is located at the outpatient's department of the VCPH and was purposively selected into the study. Random selection of electronic record for T2DM patients was carried out and every 5th number meeting the selection criteria was selected into the study. The contact details of the selected individuals (cell phone numbers) were obtained and appointments set over a phone call.

3.8 Data Collection Instruments

A questionnaire was used for the research. The questionnaire was administered to patients who attended VCPH outpatient's diabetic clinic 2021 which was both in English and Shona. The research instrument was interviewer-administered and was used during in-depth interviews. An indicator tracker checklist was used on a desk review of reports, meeting minutes, attendance registers and activity schedules to see which activities were conducted and how they were carried out with the motive of achieving the programme's aims. Records for patients were reviewed using a checklist.

3.9 Validity and Reliability

The sample calculation was based on 95% confidence level and 5% margin of error in order to obtain a sample large enough to limit the probability of chance influencing the results. To ensure reliability, experienced data collectors were recruited and were trained for this study in particular. Standard tools of measurement were utilized especially by adopting many questions in the already validated diabetes self-care questionnaire by Toobert, Hampson & Glasgow (2000). Clear operational definitions of the variables were used and the data collectors were conversant with the definitions.

3.10   Data Collection Procedure

In-depth interviews were conducted. Data extraction of GC was done retrospectively. Appointments were made with evaluation participants. Both qualitative and quantitative data, was collected in this study.

3.11   Pretesting of Instruments

Pretesting of the instruments was done at Rusape General Hospital.

3.12   Ethical Considerations

The research proposal was presented to the Africa University Research and Ethics Committee (AUREC) for approval. Permission to conduct the study was sought from the Provincial Medical Director (PMD) Manicaland Province and Medical Superintendent at VCPH. Desk review of patients' records who attended the diabetic clinic was done, noting down those who qualify to take part in the study. The contact details of those who qualified to participate in the study were obtained and the outpatient's diabetic staff contacted those who qualified to participate in the study first and asked them if they are willing to take part in the study. The diabetic clinic staff then handed over the phone numbers of those willing to participate to the researcher.

After receiving the contact numbers, the researcher and research assistants then contacted those who were willing to participate and took them through the consenting process, no one was forced or coerced to take part in the study against their will. Participants were free to opt out of the study at any given time and were allowed not to answer any question during the interview as they please. Participants' names or addresses of participants were not used during the study; unique identifiers were used instead. After notifying the participates on their rights, the interview was

then carried out. All the information concerning the study is being kept in privacy and confidentiality is being maintained.

3.13 Dissemination of Results

Findings from the study were shared with the Provincial Health Team (PHT), the medical superintendent and the diabetic staff at VCPH. Written reports have been given to the PMD Manicaland. A manuscript is also being developed and will be published in a peer reviewed journal.

3.14 Summary

This chapter outlined the study methodology outlining study instruments and looked at how data will be collected for use in the study. Ethical considerations that were observed in the study were also outlined.

CHAPTER FOUR   DATA PRESENTATION AND ANALYSIS

4.0   Introduction

The chapter presented the findings from the data collected and analysed using Epi Info version 7.0 and Microsoft Excel 2019. Univariate, bivariate and multivariate analysis was done for the variables. Below is a presentation of the data analysis describing the data in charts and tables.

4.1   Socio-demographic characteristics associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

The study recruited a total of 150 cases and 150 controls. The following tables and charts showed the composition of the study sample.
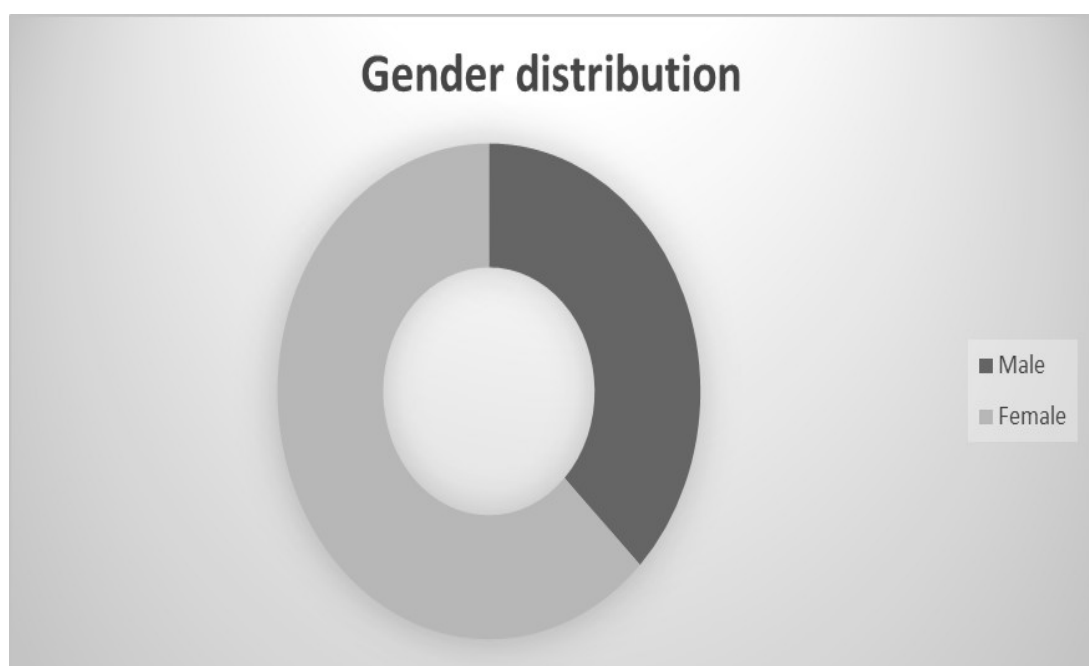
Figure 3:   Gender Distribution of study participants

Figure 3 above shows that the study was dominated by females with a ratio approximately 1:2.

Table 1:   Summary statistics stratified by Gender of study participants

Parameter		Females			Males		
		Mean	Median	Standard Deviation	Mean	Median	Standard Deviation
Age		60.13	61	4.96	59.45	60	2.01
Age at first diagnosis		49.24	50	9.67	47.32	50	8.16
Duration of condition		10.78	9.00	6.74	11.95	10.00	7.67

4.1.1   Age

Figure 4 below shows that the respondents were aged between 30 and 80. The mean age for cases was 61 years whilst that for controls was 59 and the combined mean age was 61 years. The IQ range for age was Q1= 52 years and Q3= 68 years. The majority of cases and controls were aged between 50 years and 69. Age was statistically not significant in this study (χ2=42.4 df=49, p=0.736).
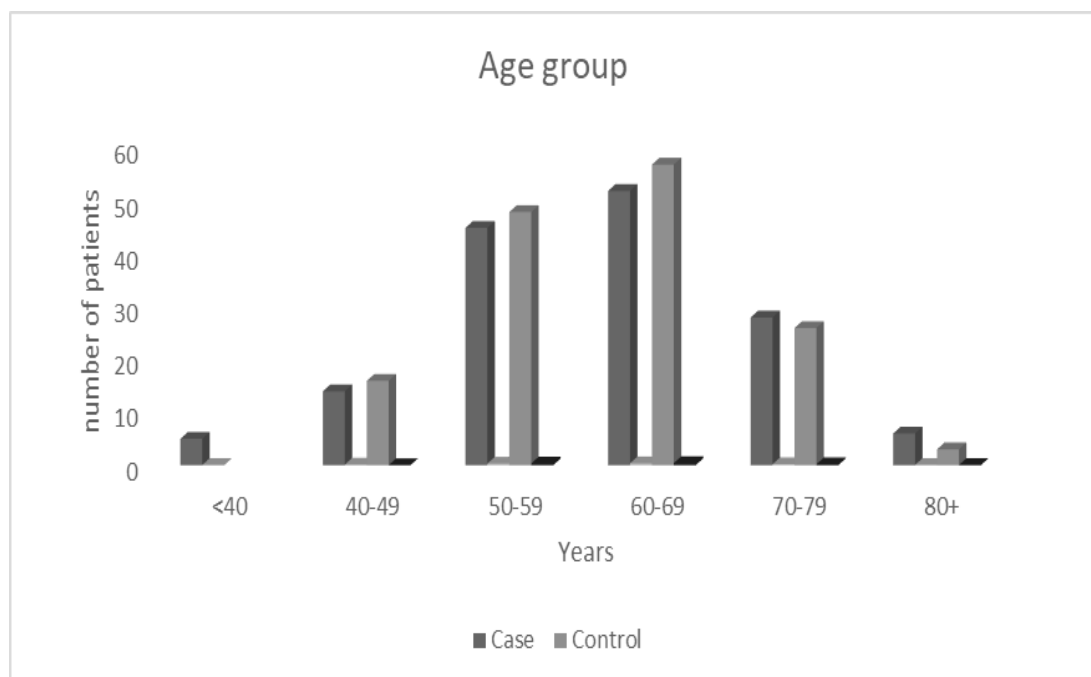
Figure 4:   Age distribution of study participants

4.1.2 Gender

Most of the study participants were females as shown in figure 5 below. On bivariate analysis, gender was significantly associated with glycaemic control as shown in table 4 below. Being male had 50% lower odds of poor glycaemic control [OR=0.5, 95%CI (0.3; 0.8), p=0.008]. However, on multivariate analysis, gender was not a predictor of poor glycaemic control [aOR=2.1, 95%CI (0.9; 3.3), p=0.061)] as shown in table 10 below.
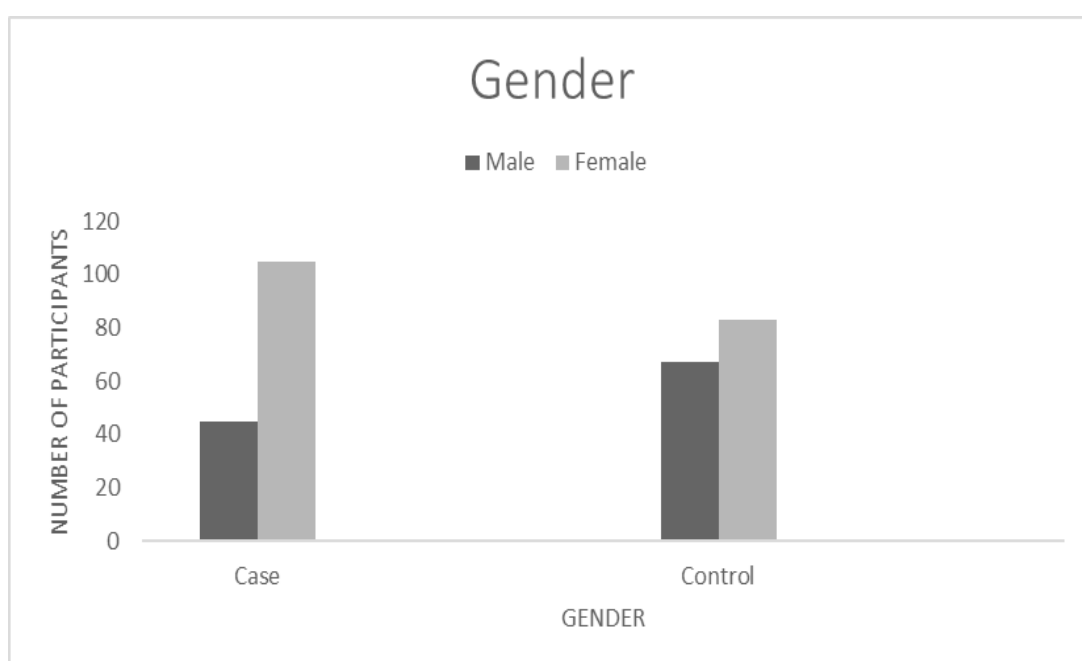
Figure 5:   Gender Distribution of study participants

4.1.3 Marital Status

Most of the cases and controls were married 88(59.5%) and 93(62.4%) respectively, 42(28%) cases and 44(29.5%) controls were widowed and 20(13.3%) cases and 13(8.7%) controls were divorced. Bivariate analysis showed no statistically significant difference between being married or not in this study [OR=0.9, 95%CI (0.5; 1.3), p=0.521].

4.1.4　Family history of diabetes

One hundred and twenty (80%) cases and 109(72.7%) controls had a positive family history of diabetes as shown in table 4 below. In this study, bivariate analysis showed no statistically significant differences between positive family history of diabetes and glycaemic control [OR=1.5, 95%CI (0.1; 3.0)], p=0.050].

4.1.5　Residency

Figure 6 below shows that majority of cases stayed in the rural area whereas the majority of controls stayed in the urban area. In this study, place of residence was also significantly associated with glycaemic control on bivariate analysis. Staying in the urban area had 45% lower odds of poor glycaemic control by [OR=0.6, 95%CI (0.4; 0.9), p=0.015]. However, on multivariate analysis, residence was not a predictor of poor glycaemic control [aOR=1.0, 95%CI (0.2; 5.3) p=0.962].
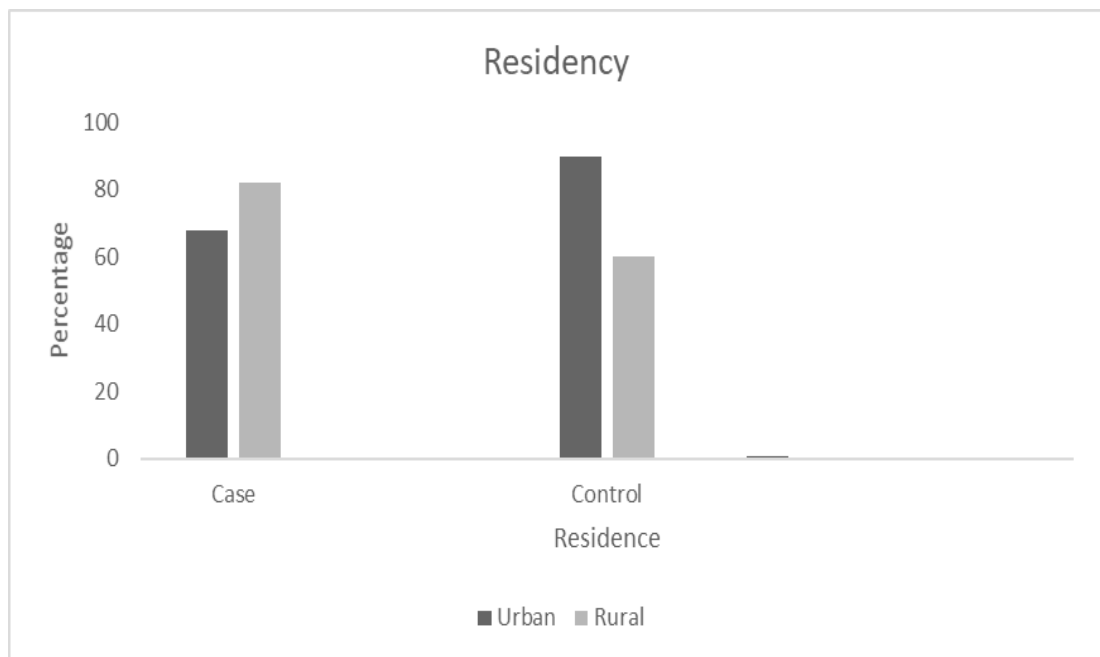
Figure 6:   Residency of study participants

4.2   Socio-economic Characteristics associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

4.2.1   Level of education

Figure 7 below shows that most of participants attended secondary school. However, more controls attended tertiary education 66 (44%). Level of education was

statistically significant in this study as shown in table 5 below. Being educated up to secondary level and above lowered the odds of poor glycaemic control by 60% [OR=0.4, 95%CI (0.2; 0.6) p=0.000]. On multivariate analysis, those who were educated up to primary level were 3.2 times more likely to have poor glycaemic control as compared to those educated up to tertiary level [aOR=3.2, 95%CI (1.2; 3.9), p=0.010].
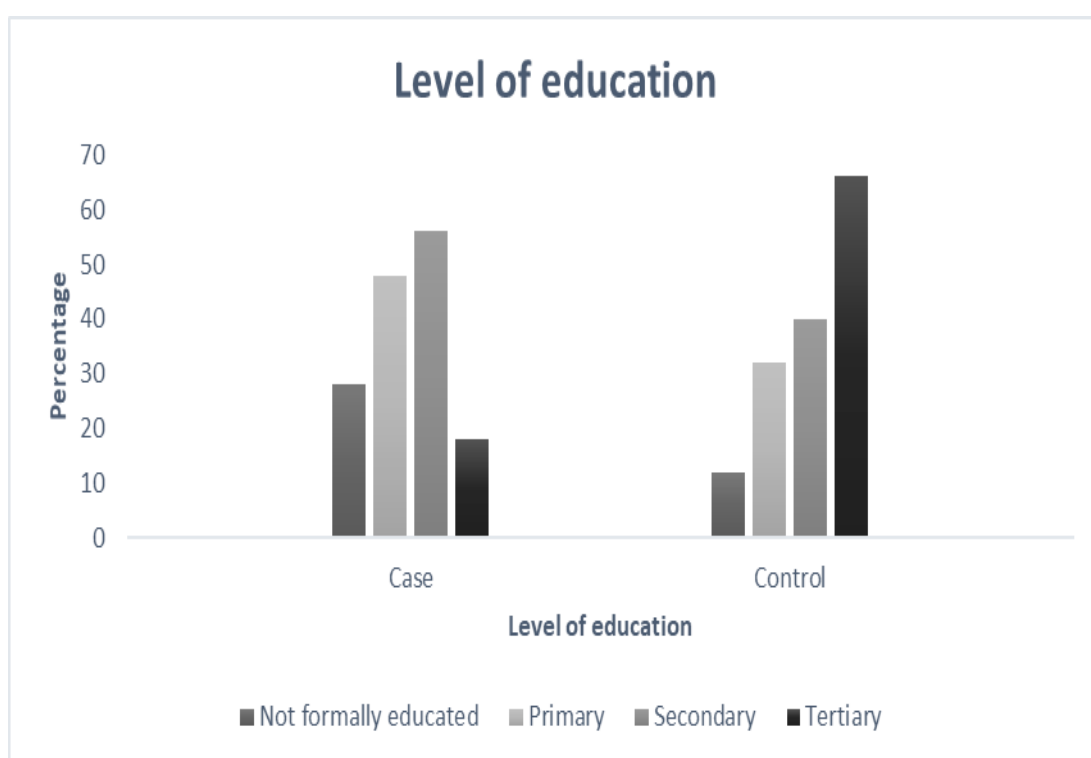
Figure 7:   Level of education of study participants

4.2.2 Employment

Majority of cases were informally employed whereas majority of controls were formally employed as shown in figure 8 below. Employment status was significantly associated with glycaemic control. Those who were not working were 2.3 times more likely to have poor GC as compared to those who were employed on bivariate analysis [OR=2.3, 95%CI (1,3; 4.0), p=0.003]. However, this was not a significant

predictor of poor glycaemic control on logistic regression [aOR=2.6, 95%CI (0.4; 15.3) p=0.279].

Figure 8:   Employment Status of study participants

4.2.3   Income

Figure 9 below shows that majority of cases were low- and middle-income earners whereas majority of controls were low-income earners. The findings from this study were not significantly associated with glycaemic control ($\chi 2=35.0$ df=40, p=0.987).

Figure 9: Income of study participants

4.2.4 Means of paying medications

Figure 10 below shows that 66 (44%) cases and 24 (16%) controls reported being given medications for free. As shown in table 5 below, the difference observed was statistically significant, being given medications for free lowered the odds of poor glycaemic control by 80% [OR=0.2, 95%CI (0.2; 0.4) p=0.000]. On logistic regression, those who self-financed their own medications were 3.9 times more likely to have poor glycaemic control [aOR=3.9, 95%CI (2.0; 13.0), p=0.041].

Figure 10:   Means of financing medications of study participants

4.3   Socio-cultural characteristics associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

4.3.1   Medications believed to be effective

Figure 11 below shows that most of the cases believed that both traditional and modern medications if used in combination are effective in managing diabetes whereas most of the controls believed that modern medications alone are effective in managing diabetes. There was statistical significance difference observed as believing that western medications alone are sufficient in managing the condition improved the odds of good glycaemic control by 70% [OR=0.3, 95%CI (0.4; 0.9, p=0.035). Believing western medications worked was not a predictor of glycaemic control on logistic regression [aOR=0.9, 95%CI (0.6; 1.3)' p=0.088].
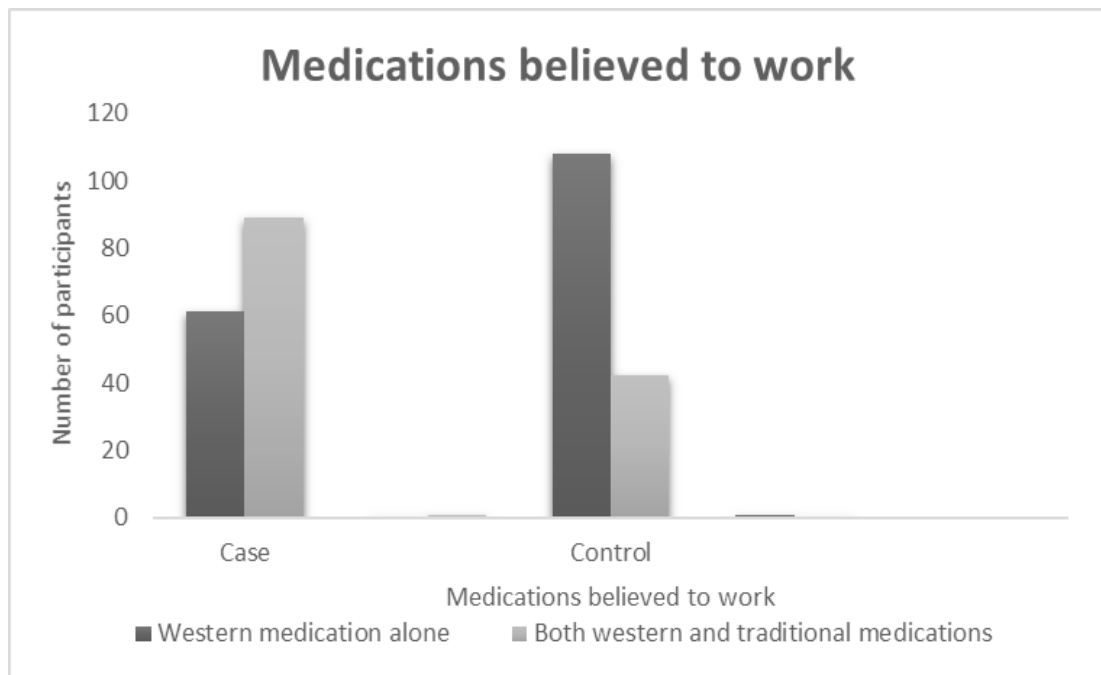
Figure 11:   Medications believed to work by study participants

4.3.2 Type of medication used

There was statistically significant difference observed between type of medications used and GC l. More cases used both traditional and modern medication 94 (62.7%) as compared to controls 50 (33.3%) as shown in table 6 below. Those who used both traditional and modern medications were 3.4 times more at risk of poor GC compared to those who used modern medications alone [OR=3.4, 95%CI (2.0; 5.3, p=0.000]. Type of medications used was a significant predictor of GC [aOR=11, 95%CI (3.1; 13,0) p=0.001].

4.3.3 Family Support

There was statistically significant difference observed between receiving family support and GC. Receiving family support in managing condition improved the odds of GC by 90% however, it was not statistically significant [OR=0.1, 95%CI (0.1; 1.1), p=0.059].

4.4 Treatment related factors associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

4.4.1 Type of treatment

Type of treatment used in managing diabetes was statistically significant in this study. Being on both oral medications and insulin injections improved the odds of GC by 80% [OR=0.2, 95%CI (0.1; 0.5) p=0.000]. Type of treatment was a significant predictor of glycaemic control [aOR=18.8, 95%CI (3.1; 13.4) p=0.000]

4.4.2 Age at first diagnosis of diabetes

Figure 12 below show that the majority of cases and controls were first diagnosed of diabetes between the ages range of 40- 59 years. The IQ range for age at first diagnosis was Q1= 43 years and Q3= 55 years. The mean age for diagnosis for cases was 49 years whilst that for controls was 47 years and the combined mean age was 48 years There was no statistically significant difference between age at first diagnosis and glycaemic control ($\chi 2$=44.7, df=42, p=0.789).
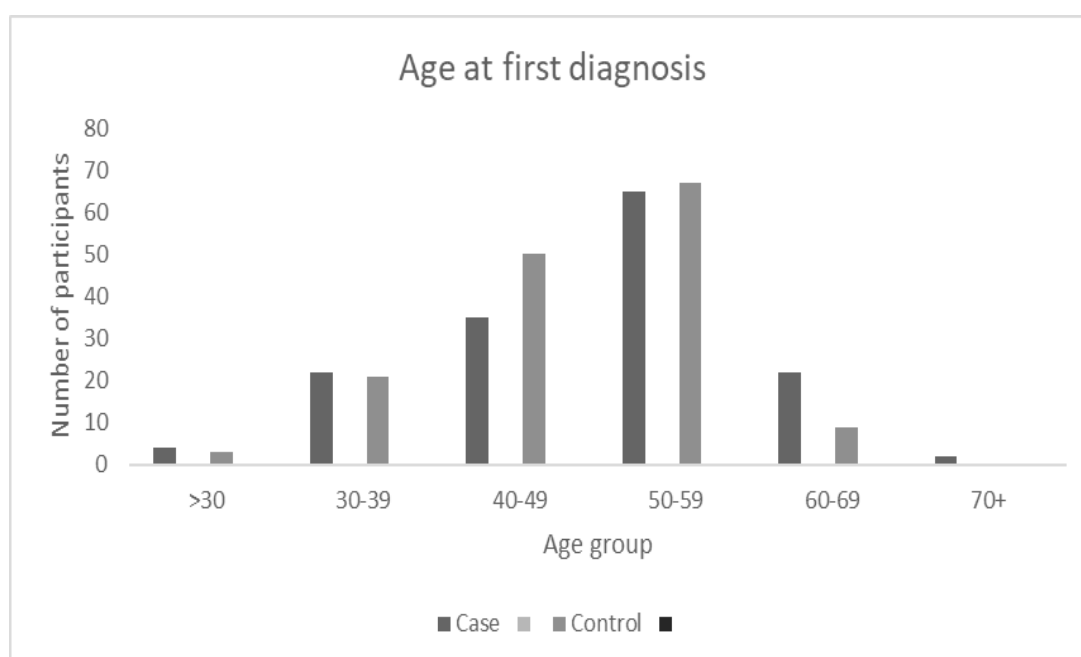
Figure 12:   Age at first diagnosis of study participants

4.4.3 Duration of diabetes

Figure 13 below shows that the majority of cases and controls had a duration of 5-9 years. The average duration of diabetes was 12 years for both cases and controls. There was no statistically significant difference between duration of diabetes and GC (χ2=29.2, df=32, p=0.618).
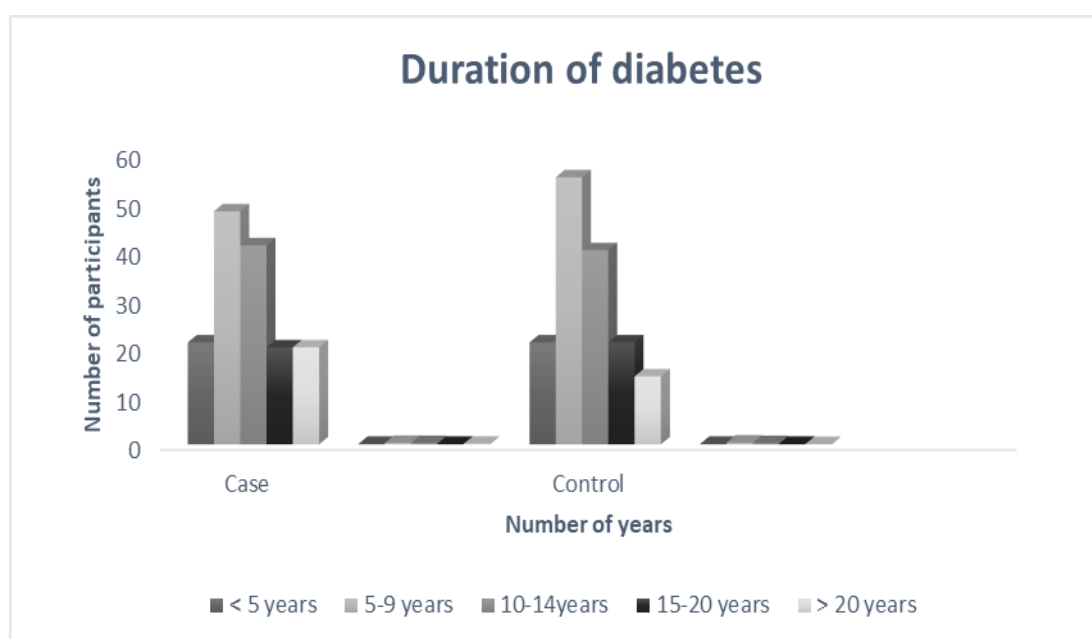
Figure 13:   Duration of condition of study participants

4.4.4 Comorbidities

Table 7 below shows that 99 (66%) cases and 77 (48.7%) controls reported having comorbidities. In this study, having comorbidities was statistically significantly associated with GC l. Those who had comorbidities were 1.8 times more likely to have poor glycaemic control as compared to those who did not have comorbidities [OR=1.8, 95%CI (1.2; 3.1), p=0.006].

4.4.5 Pill burden

The average pill load per day for cases was 8 and that for controls was 6. Pill burden was statistically significantly associated with glycaemic control. Taking less than 5

pills a day improved the odds of GC by 40% [OR=0.6, 95%CI (0.36; 0.9), p=0.017].
Pill burden was not a significant predictor of GC [aOR=11.8, 95%CI (1.0; 13.4)
p=0.057].
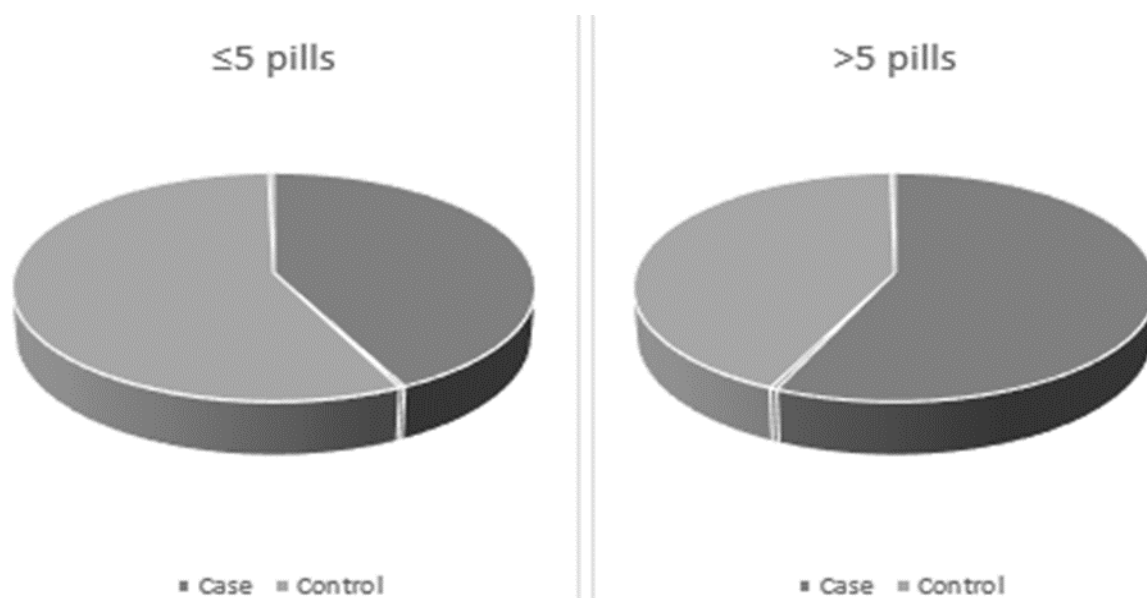
Figure 14:   Pill burden of study participants

4.4.6   Adherence to medications

More cases 89 (59.3%) reported skipping their doses whereas only 28 (18.7%)
controls reported skipping medications as shown in table 7 below. Skipping
medications was statistically associated with GC. Those who skipped medications
were 6.4 times more likely to have poor GC compared to those who did not skip
[OR=6.4, 95%CI (3.2; 11.0), p=0.000]. Skipping medications was a significant
predictor of glycaemic control [aOR=11.8, 95%CI (1.7; 9.5), p=0.021].

Table 2:   Reasons for skipping medications of patients attending Victoria
Chitepo Provincial Hospital Diabetic Clinic, 2021

Reason (N=117)	N	%
Drugs not available at the pharmacy	105	89.7
Lack of travel letter	100	85.5

Forgetfulness	97	82.9
Financial constraints	90	76.9
No bus fare	88	75.2
Fear of side effects	80	68.4

Table 3:   Comorbidities of patients attending Victoria Chitepo Provincial Hospital, 2021

(N=176)	N	%
Hypertension	148	84.1
Cardiac failure	88	50
Osteoarthritis	65	36.9
Kidney disease	50	28.4
Dyslipidaemia	28	15.9

4.5   Healthcare related factors associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

4.5.1   Time spent in the consultation room and at the pharmacy

Majority of cases 133 (88.7%) and controls 146 (97.3%) reported spending less than 30 minutes in the consultation room, and 125 (83.3%) cases and 100 (66.7%) controls reported spending over 30 minutes at the pharmacy as shown in table 8 below. Time spent in the consultation room and at the pharmacy were statistically significant with glycaemic control. Spending less than 30 minutes in the consultation room improved the odds of GC by 80% [OR=0.2, 95%CI (0.1; 0.8), p=0.008], whereas those who spent more than 30 minutes at the pharmacy were 3.4 times more likely to have poor GC as compared to those who spend less than 30 minutes [OR=3.4, 95%CI (2.0; 6.0), p=0.000].

4.5.2 Reminded about follow up and level of satisfaction

One hundred and twenty-one (80.7%) cases and 107 (71.3%) controls reported being reminded about follow ups as shown in table 8 below. In this study, being reminded about follow ups was statistically significant with GC. Those who were not reminded about follow up were 1.8 times more likely to have poor GC as compared to those who were reminded [OR=1.8, 95%CI (1.0; 3.1) p=0.034].

Figure 15 below shows the level of satisfaction of patients with service provided by the health team. Individuals who were not satisfied with service provided were 1.4 times more likely to have poor GC as compared to those who were satisfied. However, these findings were not statistically significant in this study [OR=1.4, 95%CI (0.9; 2.6), p=0,251].

Figure 15: Level of satisfaction of study participants

4.5.3 Counselled about diet, physical activity and self-testing

Table 8 below shows that the majority of cases and controls were counselled about diet, physical activity and self-testing. Being counselled about diet lowered the odds

of poor GC by 75%, however, the findings were not statistically significant in this study [OR=0.3, 95%CI (0.1; 2.2), p=0.171].

Being counselled about physical activity lowered the odds of poor GC by 80%, however, the findings were not statistically significant in this study [OR=0.2, 95%CI (0.1; 3.2), p=0.308].

Being counselled about self-testing in this study was significantly associated with GC. Those who were not counselled about self-testing were 2.8 times more likely to have poor glycaemic control [OR=2.83, 95%CI (1.0; 7.4), p=0.029].`

4.5.4   Smoking and drinking alcohol

Table 8 below shows that the majority of the participants did not smoke or drink alcohol. Those who smoked were 1.3 times more likely to have poor GC as compared to those who did not smoke; however, the findings were not statistically significant [OR=1.3, 95%CI (0.7; 2.3), p=0.456].

Those who drank alcohol were 1.7 times more likely to have poor GC as compared to those who did not drink and the findings were statistically significant [OR=1.7, 95%CI (1.1; 2.6), p=0.035]. Drinking alcohol was not a significant predictor of poor GC on multivariate analysis [aOR=1.1, 95%CI (0.2; 3.7), p=0.111].

4.6   Lockdown related factors associated with glycaemic control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

4.6.1   Affected by lockdown measures

Table 9 below shows that majority of cases and controls were affected by the lockdown measures put in place to curb the spread of the Corona virus. However, this was not statistically significantly associated with glycaemic control [OR=0.6, 95%CI (0.4; 1.3), p=0.235].

4.6.2 Blood sugar control

Table 9 below shows the proportions of individuals who had troubles maintaining normal blood sugar levels during the lockdown period. Those who had troubles controlling blood sugar in this study were 2 times more likely to have poor GC as compared to those who did not, however, this was not statistically significant [OR=2.0, 95%CI (0.9; 3.3), p=0.004].

4.6.3 Services provided

Majority of the study participants reported receiving proactive care from healthcare team during the COVID-19 pandemic as shown in table 9 below. Receiving proactive care lowered the odds of poor glycaemic control by 20%, however, this was not statistically significant [OR=0.8, 95%CI (0.5; 1.3), p=0.383].

4.6.4 Access to medications

As shown in figure 16 below, more cases did not have access to medications as compared to controls. Those who failed to access medications were 3.3 times more likely to have poor GC as compared to those who had access to medications [OR=3.23, 95%CI (2.0; 5.3), p=0.000]. Access to medications was a significant predictor of glycaemic control [aOR=11.8, 95%CI (7.5; 15.8), p=0.000].
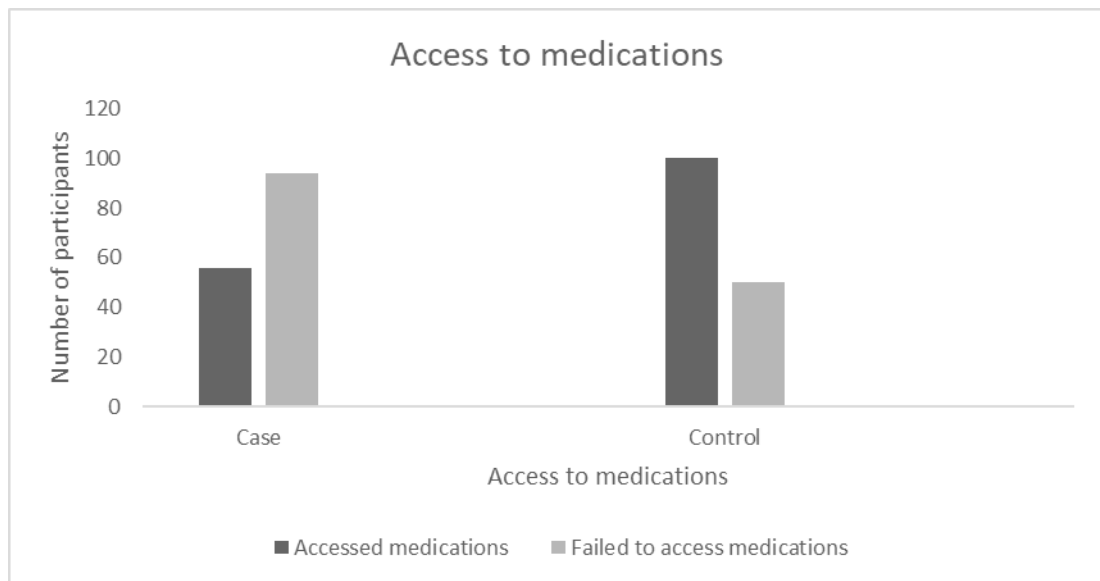
Figure 16:   Accesses to medication by study participants

4.6.5   Exercises

Carrying out exercises during the pandemic was significantly associated with GC in this study. Those who failed to carryout exercises were 1.7 times more likely to have poor GC compared to those who were able to and it is statistically significant [OR=1.7, 95%CI (1.1; 2.7), p=0.026].

4.6.6   Traveling to the hospital

Majority of cases and controls reported being unable to travel to the hospital as shown in table 9 below. Those who failed to travel to the hospital were 3.4 times more likely to have poor GC as compared to those who were able to travel to the hospital and it was statistically significant [OR=3.4, 95%CI (2.0; 5,9), p=0.000]. Travelling to the hospital was a significant predictor of GC [aOR=16.1, 95%CI (5.7; 22.6), p=0.013].

4.6.7 Diet

In this study, maintaining a balanced diet was statistically significant with GC as shown in table 9 below. Patients who were unable to maintain a balanced diet were 3.3 times more likely to have poor GC [OR=3.3, 95%CI (2.0; 5.3), p=0.000]. Access to medications was a significant predictor of GC [aOR=2.6, 95%CI (1.7; 9.5), p=0.026].

4.6.8 Work

As shown in table 9, working during the lockdown period was statistically significantly associated with glycaemic control. Being able to go to work lowered the odds of poor glycaemic control by 80% [OR=0.2, 95%CI (0.1; 0.4), p=0.000].

4.6.9 Recreational activities

Figure 17 below shows that more controls were able to carry out recreational activities as compared to the cases. Patients who were unable to carry out recreational activities were 4.2 times more likely to have poor glycaemic control than those who were able to and this finding was statistically significant [OR=4.2, 95%CI (2.4; 7.4), p=0.000.**.
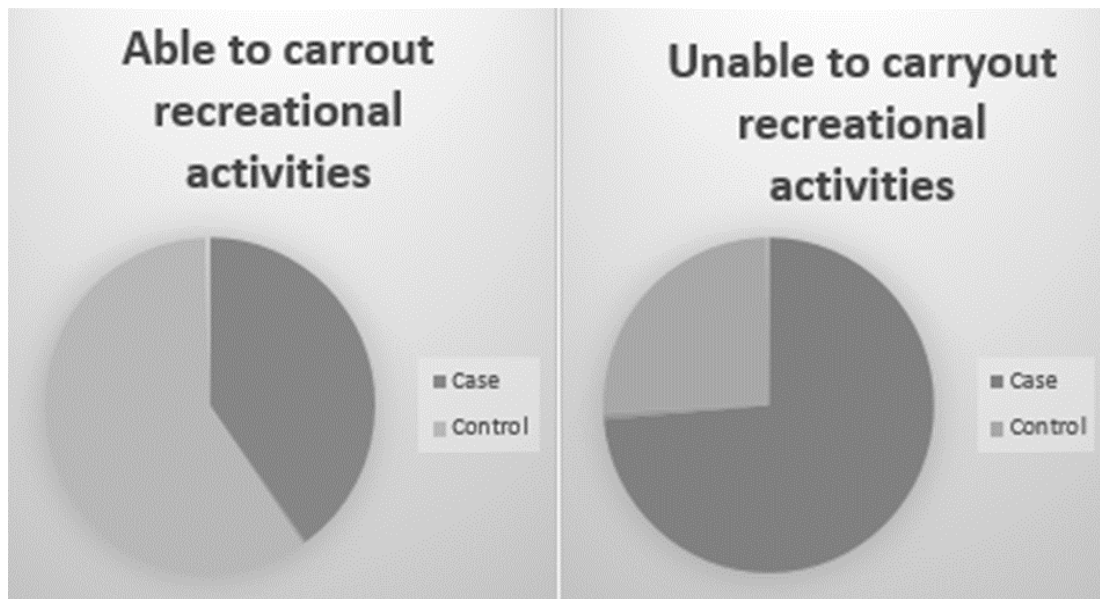
Figure 17:   Recreational activities of study participants

4.6.10 Reasons for failing to travel to the hospital

A univariate analysis was done for the reasons why clients were unable to travel to the hospital. Two hundred and twenty-five participants reported failing to travel to the hospital during the lockdown period. The mentioned reasons as shown in figure 18 below.
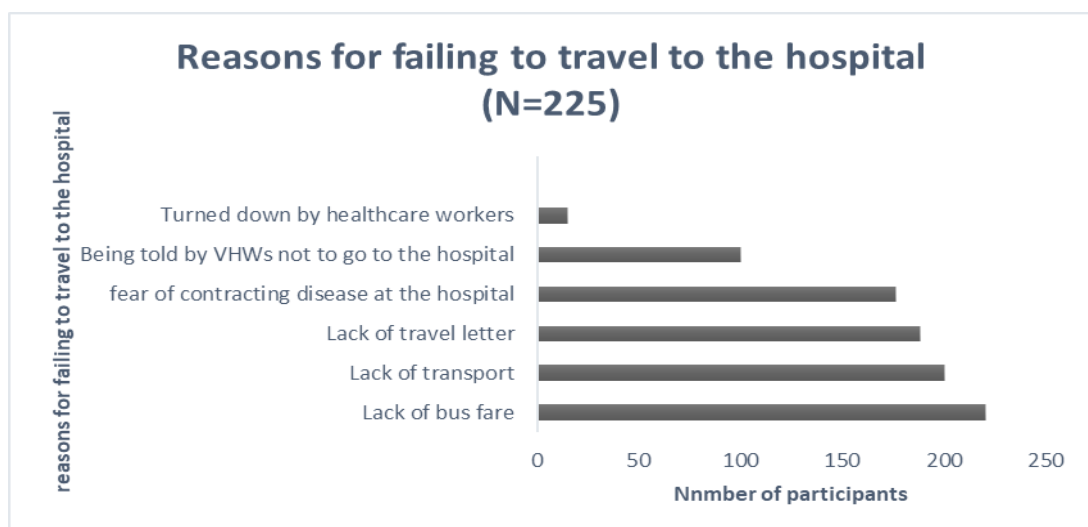
Figure 18:   Reasons for failing to travel to the hospital by study participants

4.6.11 Reasons for failing to exercise

A univariate analysis was done for the reasons why clients were unable to exercise. One hundred and seventy-three participants reported being unable to exercise. The mentioned reasons as shown in figure 19.
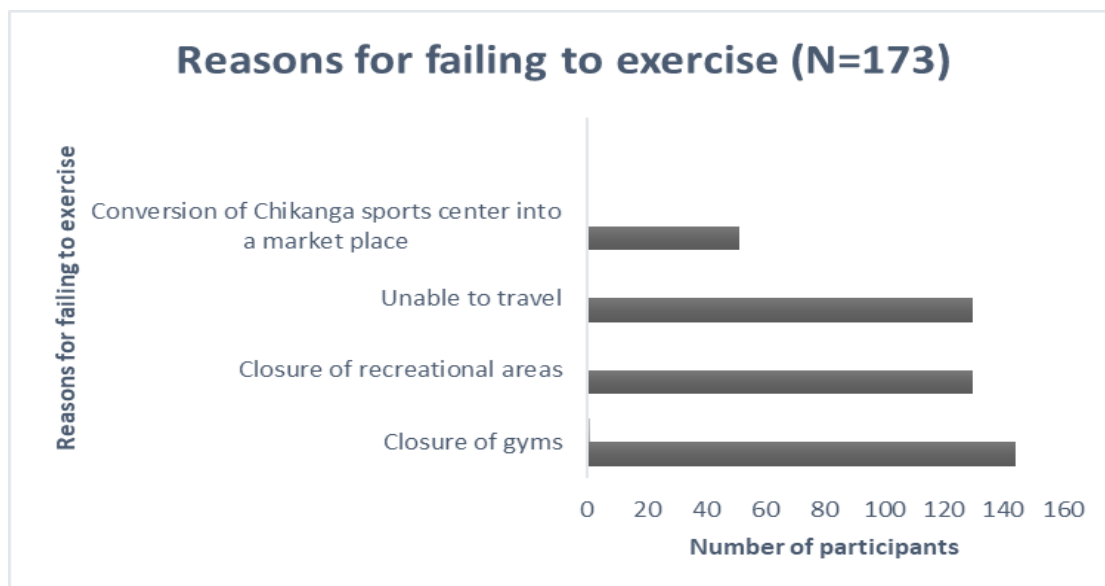
Figure 19:   Reasons for failing to exercise by study participants

Table 4:   Socio-demographic Characteristics associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control		p-value	Odds ratio (OR) (95% CI of OR)
	Cases N=150 n(%)	**Control N=150 n(%)**		
Gender				
Male	45(30)	67(44.7)	0.008	0.5 (0.3-0.8)
Female	105(70)	83(55.3)		
Marital status				
Married	88(58.7)	93(62)	0.521	0.9 (0.5-1.4)
Not married	62(41.3)	57(38)		
Family history				

Positive family history	120(80)	109(72.7)	0.050	1.5 (0.5-3.0)
No family history	30(20)	41(27.3)		
Residence				
Urban	68(45.3)	90(60)	0.015	0.6 (0.4-0.9)
Rural	82(54.7)	60(40)		

The * represents statistically significant results

Table 5: Socio-economic Characteristics associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control		p-value	Odds ratio (OR) (95% CI of OR)
	Cases N=150 n(%)	Control N=150 n(%)		
Education				
Secondary level and above	71(50.7)	107(29.3)	0.000	0.4 (0.2-0.6)
Not formally educated and primary level	78(49.3)	43(70.7)		
Employment status				
Unemployed	46 (30.7)	24(16)	0.003	2.3 (1.3-4.0)
Employed	104 (69.3)	126(84)		
Income				
Low	30(26.7)	40(20)		
Middle	36(24)	25(16.7)	34.985	
High	28(18.7)	22(14,67)		
Means of financing medications				
Self-payment	84(56)	126(84)	0.000	0.2 (0.1-0.4)
Given for free	66(44)	24(16)		

The * represents statistically significant results

Table 6: Socio-cultural Characteristics associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control		p-value	Odds ratio (OR) 95% CI of OR
	Cases N=150 n(%)	Control N=150 n(%)		
Medication believed to work				
Western medication alone	61 (40.7)	108 (72)	0.031	0.3 (0.4-0.9)
Both western and traditional medication	89 (59.3)	42 (28)		
Medication used				
Both traditional and western medications	94 (62.7)	50 (33.3)	0.000	3.4 (2.0-5.3)
Western medications alone	56 (37.4)	100(66.7)		
Get assistance on managing condition from relatives				
Yes	142 (94.7)	149 (99.3)	0.017	0.1 (0.1-0.9)
No	8 (5.3)	1 (0.7)		

*The * represents statistically significant results*

Table 7: Treatment related factors associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control		p-value	Odds ratio (OR) 95%CI of OR
	Cases N=150 n(%)	Control N=150 n(%)		
Type of treatment				
Oral medications and insulin	6 (4)	23 (15.3)	0.000	0.2 (0.1-0.5)
Oral medications alone	144 (96)	127 (84.7)		
Age at first diagnosis				
>30	4 (2.7)	3 (2)	44.744	
30-39	22 (14.7)	21 (14)		

40-49	35 (23.3	50 (33.3)		
50-59	65 (43.3)	67 (44.7)		
60-69	22 (14.7)	9 (6)		
70+	2 (1.3)			
Duration of diabetes				
< 5 years	21 (14%)	21 (14%)	0.609	
5-9 years	48 (32%)	55 (36.7%)		
10-14years	41 (28%)	40 (26.7%)		
15-20 years	20 (13.3%)	21 (14%)		
> 20 years	20 (13.3%)	14 (9.3%)		
Comorbidities				
Yes	99 (66)	77 (48.7)	0.006	1.8 (1.2-3.1)
No	51 (34)	73 (51.3)		
Pill burden				
≤5 pills	64 (42.7)	85 (56.7)	0.017	0.6 (0.4-0.9)
>5 pills	86 (57.3)	65 (43.3)		
Adherence to medications				
Skip medications	89 (59.3)	28 (18.7)	0.000	6.4 (3.9-11.0)
Do not skip medications	61 (40.7)	122 (81.3)		

The * represents statistically significant results

Table 8:   Healthcare factors associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control		p-value	Odds ratio (OR) 95% CI of OR
	Cases N=150 n(%)s	**Control N=150 n(%)**		
Time spent in the consultation room				
< 30 minutes	133 (88.7)	146 (97.3)	0.008	0.2 (0.1-0.8)

| | > 30 minutes | 17 (11.3) | 4 (2.7) | | |

Time spent at the pharmacy

| < 30 minutes | 25 (16.7) | 50 (33.3) | 0.000 | 3.4 (2.0-5.9) |
| > 30 minutes | 125 (83.3) | 100 (66.7) | | |

Reminded about follow up

| Yes | 121 (80.7) | 107 (71.3) | 0.034 | 1.8 (1.0-3.1) |
| No | 29 (19.3) | 43 (28.7) | | |

Level of satisfaction

| Satisfied | 125 (83.3) | 119 (79.3) | 0.251 | 1.4 (0.8-2.6) |
| Dissatisfied | 25 (16.7) | 31 (20.7) | | |

Counselled about diet

| Yes | 144 (96) | 149 (99.3) | 0.171 | 0.2 (0.0-2.1) |
| No | 6 (4) | 1 (0.7) | | |

Counselled about physical activity

| Yes | 144 (96) | 149 (99.3) | 0.306 | 0.2 (0.0-3.2) |
| No | 6 (4) | 1 (0.7) | | |

Counselled about self-testing

| Yes | 144 (96) | 134 (89.3) | 0.029 | 2.8 (1.1-7.4) |
| No | 6 (4) | 16 (10.7%) | | |

Smoke

| Yes | 33 (22) | 24 (16) | 0.456 | 1.3 (0.7-2.3) |
| No | 117 (78) | 126 (84) | | |

Drink alcohol

| Yes | 69 (46) | 52 (34.7) | 0.03563 | 1.6 (1.6-2.6) |
| No | 81 (54) | 98 (65.3) | | |

The * represents statistically significant results

Table 9: Lockdown factors associated with Glycaemic Control of patients attending Victoria Chitepo Provincial Hospital Diabetic Clinic, 2021

Variable	Blood glucose control	p-value	Odds ratio (OR) 95% CI of OR

	Cases N=150 n(%)	Control N=150 n(%)		
Lockdown measures				
Affected by lockdown	112 (74.7)	124 (82.7)	0.235	0.6 (0.4-1.3)
Not affected by lockdown	38 (25.3)	26 (17.3)		
Blood sugar control				
Failed to control blood sugar	66 (44)	42 (28)	0.004	2.0 (0.9-3.3)
Controlled blood sugar	84 (56)	108 (72)		
Health services provided during the lockdown period				
Received proactive care	97 (64.7)	104 (69.3)	0.383	0.8 (0.5-1.3)
Did not receive proactive care	53 (35.3)	46 (30.6)		
Access to medications				
Failed to access medications	94 (62.7)	50 (33.3)	0.000	3.3 (2.0-5.3)
Accessed medications	56 (37.4)	100 (66.7)		
Exercises				
Failed to exercise	73 (48.7)	54 (36)	0.026	1.7 (1.1-2.7)
Managed to exercise	77 (51.3)	96 (64)		
Travelling to the hospital				
Failed to travel to the hospital	25 (16.7)	50 (33.3)	0.000	3.4(2.0-5.9)
Managed to travel to the hospital	125 (83.3)	100 (66.7)		
Balanced diet				
Failed to maintain a balanced diet	94 (62.7)	50 (33.3)	0.000	3.3 (2.0-5.3)
Managed to maintain balanced diet	56 (37.4)	100 (66.7)		
Work				

Failed to work	44 (29.3)	97 (64.7)	0.000	0.2 (0.1-0.4)
Managed to work	106 (70.7)	53 (35.3)		
Recreational activities				
Failed to carry out recreational activities	63 (42)	22 (14.7)	0.000	4.2 (2.4-7.4)
Carried out recreational activities	87 (58)	128 (85.3)		

The * represents statistically significant results

A forward stepwise regression analysis was done to determine the predictors of poor GC among the sampled diabetic patients and the following results were obtained as shown in table 10 below.

Table 10   Predictors of poor glycaemic control among Diabetic patients

Glycaemic control	(aOR)	Z	95% CI	P value
Gender	2.1	1.2	0.9 – 3.3	0.061
Level of education	3.2	0.7	1.2 – 3.9	0.010*
Place of residence	1.0	-0.1	0.2 – 5.3	0.962
Employment status	2.6	1.1	0.5 – 15.3	0.279
Financing methods for medication	3.9	1.9	2.0 – 12.9	0.041*
Medication believed to work	0.9	2.0	0.6 – 1.3	0.088
Type of treatment	18.8	3.2	3.1 – 21.2	0.001*
Pill burden	11.8	2.0	1.0 – 13.4	0.057
Co-morbidities	0.6	0.0	0.2 -1.1	0.073
Adherence to medications	3.2	1.2	1.7 – 9.5	0.021*
Balanced diet	2.6	1.6	1.0 – 5.3	0.010*
Time spent in consultation room	0.7	1.0	0.2 – 1.8	0.991
Travelling to hospital	16.1	0.8	5.7 – 22.6	0.013*
Time spent in pharmacy	10.0	4.0	3.1 – 13.1	0.025*
Reminded about follow-up	0.2	0.0	0.0 -1.2	0.867
Counselled about self-testing	3.1	0.9	0.6 – 3.9	0.225

Drink alcohol	1.1	1.4	0.2 – 3.7	0.111
Access to medication	11.8	2.3	7.5 -15.8	0.001*

*The * represents statistically significant results.*

Controlling for all variables that were statistically significant in bivariate analysis, the multivariate analysis revealed that only poor level of education [aOR=3.5, 95%CI (1.2 - 3.9, p=0.010)]; out of pocket financing methods for medication [aOR=3.9, 95%CI (2.0 -12.9), p=0.041]; type of treatment [aOR=18.8, 95%CI (3.1 - 21.2), p=0,001]; failure to adhere to medication [aOR=3.2, 95%CI (1.7-9.5), p=0.021]; failure to travel to the hospital [aOR=16.1, 95%CI (5.7 -22.6), p=0.01] and failure to access medication [aOR=11.8, 95%CI (7.5 - 15.8), p=0.001] to be statistically significant predictors of poor glycaemic control.

4.7   Summary

This research included more females (63%) than males. The results revealed that key factors such level of education, financing methods for medications, type of treatment, adherence to medication, travelling to the hospital, time spent to get medications in pharmacy and general accessibility of medication were key predictors of GC outcomes.

CHAPTER FIVE   DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0   Introduction

The chapter included the discussion, limitations to the study, study summary and conclusion, implications, recommendations and dissemination of results and the actions taken in response to the findings.

5.1   Discussion

In this case control study, the determinants of poor GC amongst adult type 2 diabetic patients attending the outpatient's diabetic clinic are discussed below.

5.2   Socio-demographic characteristics associated with glycaemic control

5.2.1 Age

The mean age of participants was 61 years and majority of participants were aged between 50 and 69 years. Similar results were made by the IDA were it noted that the majority of diabetic patients are aged between 45 and 64 years (IDA, 2019). In a study conducted in Nigeria, it was noted that the mean age for diabetic patients attending to diabetic clinics in tertiary hospitals was 54 years (Casmir, 2017).

In developing countries, the mean age of diabetes is lower as compared to developed countries where most diabetics are older than 65 years (Tabatabaei, Asadi, Moghaddasi, Khayami, & Niroomand, 2018). Developed countries have better health service delivery, recreational areas, standards of living compared to developing countries thus having longer survival periods or latter onset of diabetes.

There was no statistically significant difference in GC between the different age groups however, there was a trend of worsening GC with increasing age. Casmir (2017) made similar findings where GC worsened with increasing age. As majority

of the older study participants came from the rural areas and reported staying alone, they might have been skipping their medications due to forgetfulness. Furthermore, old people tend to use both traditional and western medications and this might have drug to drug interactions rendering diabetic medications ineffective (Mawoza, Nhachi, & Magwali, 2019).

During the COVID-19 pandemic, it was difficult for people to travel. Even if medications were given for free at VCPH, people from the rural areas could not afford transportation money, had no travel letters and means of transportation was erratic. Coupled with such difficulties, patients might have defaulted their medications and opted for traditional medications thus influencing the results.

The pathophysiology of T2DM in older individuals is different from that in younger individuals thus accounting for the worsening glycaemic levels with increase in age. The worsening degree of diabetes in older people may be primarily as a result of age related decline in beta cell function (Aguayo-Mazzucato, 2020).

Opposite findings were made in Fiji were 52.3% of males and females with poor GC who participated in the study were less than 60 years of age (Pablo et al., 2018). Younger T2DM patients below the age of 60 years were twice likely to have poor GC as compared to their older counter parts. It is argued that older people follow their dietary requirements and exercise than their young counter parts.

5.2.2 Gender

The female dominance can be related to sex-related lifestyle in the sub-Saharan Africa. Females are more likely to become obese or overweight especially soon after marriage as it is culturally acceptable and it is a sign of good living (Casmir, 2017).

Such lifestyle puts women at risk of diabetes thus the dominance of women in this study.

Another explanation can be that females have a better health seeking behaviours than males. Men are more likely to be the bread winners of the house and tend to forego hospital visits as this has some economic implications to the family (Abdulrehman et al., 2016). Similar findings were made in a study carried out in Zimbabwe were women were more active in self-care, eager to learn more about diabetes and looked for more medical attention as compared to their male counterparts (Mufunda, Albin, & Hjelm, 2012).

In this study, being male had a protective factor against poor GC. A study done in Fiji revealed that proportion of T2DM patients with poor glycaemic control was greater in females than in males at 45.3% and 31.9% respectively (Pablo et al., 2018). Similar studies have been done which also revealed that poor GC is most common in women than in men (Abougalambou et al., 2015).

A study carried out to investigate the incidence and risk factors of poor GC in primary care showed that women were at risk of poor GC due to better β-cell function which predispose them to hypoglycaemia. Sex differences in GC observed in various studies probably have multifactorial factors such as different biological mechanisms linked to diabetes, difference in self-management between men and women (Kautzky-Willer, Harreiter & Pacini, 2016).

5.2.3 Marital status

Majority of the study participants were married (61.0%) and (28.7%) widowed. Since T2DM an adult onset condition because it is mostly diagnosed in adults (Ahlqvist et al., 2018), this age group is usually married or widowed.

In this study, being married lowered the odds of poor GC, however, this was not statistically significant. Adisa, Fakeye, & Fasanmade (2011) found out significant correlation between adherence to medications in diabetic patients and their marital status, they noted that widowed patients adhered better to their medications than single and married patients. Casmir (2017) also noticed a trend of better GC in widowed patients.

Schwandt, Coresh & Hindin (2010) in their study concluded that being single, divorced or widowed was associated with poor GC. They argued that married couples or cohabiting individuals tend to encourage each other to take their medications or remind each other which might improve the odds of GC controls as compared to widowed, divorced or single individuals.

5.2.4 Family history

Majority of the study participants had a positive family history of diabetes from an immediate family member. According to IDF (2019) individuals with a positive family history of diabetes are 2 times more likely to develop diabetes later in life. In this study, individuals with a positive family history of diabetes were 1.50 times more likely to have poor GC, however it was insignificant.

According to the Health Belief Model, individuals with a positive family history of diabetes are supposed to have positive health behaviour towards the condition. Similar findings were made in a study conducted to determine the influence of family history on T2DM on positive health behaviour change among African Americans (Ard, Tettey, & Feresu, 2020). In the same study, it was found out that the study participants lived an unhealthy lifestyle and drank alcohol which placed them more at risk of poor GC (Ard et al., 2020).

Contrasting finding were made by Casmir (2017) were patients with a positive family history of diabetes had a better trend of GC. A possible explanation to Casmir's findings is that of the HBM which adds up individuals' behaviour to their perception about the severity of the disease they are susceptible to and the perceived benefits and barriers (Croyle, 2015). Patients with positive family history of diabetes are more likely to perceive diabetes as a serious condition and know that they are more susceptible to diabetes and its complications. Therefore, they see that taking action will reduce that problem and also the cost of taking action is overshadowed by the benefits brought about by taking action (Croyle, 2015).

5.2.5 Residency

Most of the cases stayed in rural areas whereas controls in the city. Staying in urban area had a protective effect against poor GC. During the covid-19 pandemic, travel restrictions were put in place and had to have a travel letter to travel to town or intercity travel whereas VCPH is located in the city of Mutare. Probably, diabetic patients from rural areas were unable to travel to the city and could not access health services as compared to those who stayed in the city.

A possible explanation to such findings is that people in rural area have less access to healthcare facilities, have lower income (World Bank, 2014) and have less access to diabetic information. Also people in the rural areas will be doing their economic activities such as farming and travelling to the hospital means a day of unproductivity thus forego hospital visits if favour to their economic activities. Another explanation is that due to covid-19, rural patients were afraid to travel to the hospital in fear of contracting the disease at the hospital, no bus fare, travel bans, lack of transport means or no travel letters which in-turn compromised their GC due to lack of resupply of medications.

5.3   Socio-economic factors associated with Glycaemic Control

5.3.1   Education

Majority of the cases and controls were educated up to secondary education, however more cases were educated up to tertiary level. The high level of education can be attributed to the decentralised of both primary and secondary schools which have been made easily accessible, acceptable, affordable and efficient (Ministry of Primary and Secondary Education, 2019). Education was significantly associated with GC in this study. Being educated to secondary level or tertiary level had a protective effect against poor GC.

Different findings were made by Al-Hassan et al. (2017) and Casmir (2017) in their studies were they noted trends of poor GC amongst educated T2DM patients. They cited that educated individuals tend to be stubborn when it comes to medication regimes, live a sedentary life style due to office work, eat more fast foods and are physically inactive which all contribute to poor GC.

Possible explanations to the findings of this study is that. educated individuals tend to understand more diabetic teachings from healthcare providers and are more likely to follow instructions. Also educated individuals are more likely to stay away from taking traditional medications during the lockdown period as there was a rising demand of traditional medicines as they were believed to cure or prevent covid-19 infections.

5.3.2   Employment status

Majority of study participants reported being employed, however, they also reported not being able to go to work due to lockdown restrictions. In this study, individuals who were unemployed were more at risk of poor GC as compared to their

counterparts. During the level 4 lockdown periods, those who were formally employed continued to receive their monthly wages thus were able to maintain a living as compared to those who were informally employed or unemployed who relied on hand to mouth as means of earning a living.

Contrasting findings were made by Al-Hassan et al. (2017) and Casmir (2017) who noted a trend of poor GC amongst employed individuals and they attributed it to unhealthy lifestyle experienced by employed individuals due to the demands of their jobs such as more office hours and clean jobs.

As this study was conducted during lockdown periods, majority of the individuals who were employed but not working were able to receive their monthly salaries thus were able to purchase medications, maintain a balanced diet as compared to those who were unemployed and had no source of income.

5.3.3 Income

The study revealed that those who had high income had better GC, however, this was not statistically significant. This is in line with findings made by Osborn, Mayberry, & Kim (2016) who noted that high income earners had better GC. High income earners are able to maintain a healthy diet, keep up with modern medications, have laboratory tests done regularly and afford more specialised care thus maintaining a good GC. Furthermore, high income earners are able to afford to pay monthly subscriptions at gyms, have personalised trainers and travel to various recreational areas which in turn improve GC. Also during the COVID-19 pandemic, high earners were able have laboratory tests done at private facilities as VCPH laboratory staff fell ill to the virus.

During the time of escalating COVID-19 infections, people were afraid to travel to government health facilities as healthcare providers were falling ill with the infection such as those at VCPH. Those who had money could afford to go to private health facilities were they were monitored thus influencing the results.

In contrast, Casmir (2017) found the worst GC in high earners and he argued that diabetic management goes beyond medication financial ability as diabetic patients need to invest time and energy in other behaviours like exercising regularly, weight loss and dietary conscious and.

5.3.4 Means of financing medications

Self-payment of medications reduced the odds of poor GC and it was significant in this study. Casmir (2017) notes that patients that do not rely on being given medications for free had better odds of good GC as they were able to buy all the medications that were prescribed by their physician on time which in turn improve GC

In a study carried out in Ethiopia, it was noted that being given medications for free improved GC of individuals as it ensured that everyone had access to medications regardless of economic status (Habte, Kebede, Fenta, & Boon, 2017). Being given medications for free was a risk factor to poor GC in this study as it introduced a dependency syndrome. Participants reported not adhering to their medication regime as the hospital experienced stock outs of some medications and were less inclined to use out of pocket to finance the missing medications.

5.4 Socio-cultural factors associated with glycaemic control

5.4.1 Medications believed to work and medications used

Majority of the participants believed that using both traditional and western medication concurrently is effective in managing diabetes. Believing in traditional medication and using them has a risk of poor GC as there would be unproven dosage, unknown drug to drug interaction(Lankatillake, Huynh, & Dias, 2019).

Traditional medications have no known dosage, frequency, drug to drug interaction and as such they are more likely to predispose individuals to poor GC (Mellergård et al., 2020). Casmir (2017) noted that participant who took traditional medicines were frequently admitted in hospitals and concluded that western medications alone are sufficient in managing diabetes.

5.4.2 Family support

Majority of the study participants reported receiving support from their family and it was statistically significant in improving GC. Receiving family support helps in various ways in managing diabetes such as getting a hand in buying medications, food and transport money, psychological support (Mellergård et al., 2020).

Receiving family support during this period of escalating COVID-19 infections helped in patients maintaining GC levels as they got assistance in sourcing money for medication, travelling money, buying food supplies, being reminded to take medications by family members and also psychological support as noticed in the study.

5.5 Treatment factors associated with glycaemic control

5.5.1 Type of treatment

Being on both oral medications and insulin injections had a protective effect against poor GC and was statistically significant. Similar findings were made by Xu et al. (2015) who noted that multidrug administration of orals and insulin was more effective to diabetic patients as they get older they become irresponsive to oral medications alone and need injections. However, different findings were made by Casmir (2017), who noted that patients who were on orals medications and insulin injections had a trend of poor glycaemic control.

Casmir (2017) notes that people on oral medications and insulin injections do not adhere to their medications due to needle phobia, cost of insulin, and wrongful insulin storage. Also due to the epileptic nature of electricity supply in Africa, patients might not be able to store their insulin in the appropriate temperature and the potency of the insulin is often questionable after some days of purchase. Furthermore, patients on insulin will be in advanced stages of the disease and having complications thus making it difficult to manage their glucose level.

5.5.2 Age at first diagnosis

Majority of the study participants were diagnosed of diabetes at the age between 40-60 years. Type 2 diabetes is also called adult diabetes as it is mainly diagnosed in old people (ADA, 2019). There was a trend of poor GC with those diagnosed with diabetes at older ages. Casmir (2017) noted that individuals who are diagnosed with diabetes late in life are mostly affected with denial and tend to not adhere to their medications. Also, individuals who are diagnosed with diabetes in their older ages also suffer from comorbidities which contribute to poor glycaemic control.

5.5.3 Duration of diabetes

The mean duration of diabetes was 11 years in this study. Those who had a duration of more than 15 years had poor GC. Diabetic patients with more years of duration are more likely to have comorbidities which in turn have a bearing on GC (Casmir, 2017).

5.5.4 Comorbidities

The high prevalence of comorbidities was mainly because the study had more elderly people and it is known that when people get older they are more likely to develop comorbidities. Hypertension (84.1%) was found to be the most prevalent chronic condition.

Having comorbidities was significantly associated with GC. Having comorbidities increased the chances of poor GC. Casmir (2017) made similar findings were participants who had comorbidities were 2 times more likely to have poor GC. Such finding might be due to the fact that having comorbidities might interfere with one's ability to control blood sugar as their physiological functioning might be compromised. Also, during the lockdown period, it was difficult for individuals to obtain their medications or seek health attention and with comorbidities this might also have influenced the findings.

5.5.5 Pill burden

In the study it was noted that taking 5 tablets or less had a protective effect against poor glycaemic control. Casmir (2017) made similar findings where patients who took fewer medications had better GC. In this study, taking fewer medications improved the adherence of patients to medications. Taking fewer medications indicates lack of comorbidities thus improving the odds of GC as seen in this study.

Different findings were made in a study conducted at Sally Mugabe Central Hospital where they noted that patients with more than 5 tablets per day were more likely to have better GC (Mutowo et al., 2014). In the study, they argued that patients on more than 5 tablets were more likely to be on drugs that have different pharmacological mechanisms of action. It can be further argued that polypharmacy in diabetic clients is a sign of comorbidities.

5.5.6 Adherence to medications

More cases reported not adhering to medications as compared to controls. Overall, 40% of participants reported not adhering medications and this increased the odds of poor GC. Reasons for not adhering to medications given by participants included drugs not being available at the hospital pharmacy, lack of travel letters, forgetfulness, financial constraints, lack of bus fare and fear of side effects, fear of contracting the virus at the hospital, being turned away by health staff.

Donor funding of medications resulted in patients not adhering to their medication regimens as some of the medications will be out of stock at the hospital pharmacy as donor funding has recently stopped. As such patients who were used to be given all their diabetic medications for free are finding it difficult to buy those medications that will be out of stock at private pharmacies. Also due to lockdown measures, patients could not travel to the hospital due to transportation difficulties, being turned away or risked arrestment by law enforcement agencies due to lack of travel letters (Murewanhema & Makurumidze, 2020).

Forgetfulness was also reported as a reason of missing medications. Similar findings were made in Nigeria were the most common cause of non-adherence was forgetfulness (Adisa et al., 2018). Diabetic patients have a tendency of forgetting to

take their medications as advised by healthcare practitioners as missing medications have no immediate negative health outcome and no symptoms are felt if one forgets medication unlike other conditions which results in pain of dizziness like hypertension.

As healthcare personnel at VCPH were contracting the COVID-19 virus, patients were afraid to go for resupply at the diabetic clinic as they feared contracting the virus as well thus leading to low adherence to medications. Some patients reported being turned away by health staff when they had come for resupply of medications and attributed it to their poor adherence to medication regime. As VCPH is a government hospital and is expected to offer health services to the whole province of Manicaland, turning away of patients should be avoided at all costs as they would have travelled long distances and expecting to get services offered.

The low adherence rates found in this study compares well to a study conducted in New York City (Internal Medicine Associates, Mount Sinai Medical Center and Associates in Internal Medicine, Columbia University Medical Center), where 42% of study participants did not adhere to medications (Lo et al., 2016). Both studies agreed on high non-adherence rates since DM patients have difficulties when it comes to adhering to their medications as adhering to medications has no immediate visible positive benefits to them since their condition is asymptomatic and no detrimental effects are seen immediately on non-adherence.

In the study, men were more adherent to medications than women. Several studies have also reported the same that men are more likely to take their medications as compared to women (Sandoval et al., 2018; Li et al., 2016). Such findings might be as a result that women have many responsibilities at household level and this includes taking care of the whole family, doing household chores in their busy

schedule and they tend to forget their medications, whereas, men are actually reminded by women to take their medications.

5.6   Healthcare factors associated with glycaemic control

5.6.1   Time spent in the consultation room

Spending less time in the consultation room reduced the odds of poor GC in this study. A possible explanation is that patients who spend less time in the consultation rooms have no complications and are only coming for routine check-ups. Similar findings were made by Casmir (2017), were he noted that patients who spent less time in the consultation room had no complications.

5.6.2   Reminded about follow up

Majority of the study participants reported being reminded about follow ups as they reported that healthcare providers always write review dates in their hospital book. Casmir (2017), notes that writing down in patients' hospital books review dates improved the odds of GC of study participants as their children and other relatives would read the book and remind them.

However, Adisa et al. (2016) notes that only writing review dates in patients' books is not sufficient alone to fully remind patients about review dates and recommended the use of electronic means. Since the diabetic clinic at VCPH has a data base of all its patients with their phone numbers, it is important to move on with technology and device ways to send reminder SMSs to patients when their review dates are approaching and this helps to cater for patients that stay alone.

5.6.3 Level of satisfaction

A significant association was noticed between GC and patients level of satisfaction with healthcare provider. Alazri & Neal (2003) reported positive association between patients' level of satisfaction and outcome in patients' GC in their study.

A possible explanation to the findings is that if patients are satisfied with the way they are handled at healthcare facilities, they are more likely to remember and adhere to recommendations made thus improving their GC and the vice versa is true. If patients are satisfied with services provided are more likely to come back for review and resupply dates thus improving their management and GC.

5.6.4 Counselled about diet

In this study, majority of study participants reported being counselled about diet by hospital nutritionists and was statistically significant as it lowered the odds of poor GC. The importance of a healthy diet cannot be over emphasized as demonstrated in several studies (ADA, 2020; Casmir, 2017; Almutari, Said & Zainuddin, 2013). A healthful eating plan augments the efforts put in place by both the healthcare team and the patient in managing blood sugar levels.

During the lockdown period, earning a living was difficult as the informal sector was totally shutdown, markets closed making it difficult for individuals to afford a healthy diet as their source of income was affected. During the period individuals were made to stay indoors with nothing to do which might have led to an unhealthy eating plan as individuals resorted to eating more snacks, junk foods at home and increased screen time which might have influenced the results. As such most patients resorted to eating cheaper products such as straight-run mealie meal (high fibre

starch) and vegetables because they could not afford buying other food staff which are refined, low in fibre, high in oil and saturated fats.

5.6.5   Counselled about self-testing

Self-monitoring of blood glucose is considered an effective tool for the management of diabetes, especially for those who require insulin treatment (Chudyk, Russel-Minda, & Petrella, 2009). Self-monitoring gives regular feedback for the patient; however, decisions on both the method and frequency of testing need to be made on an individual basis. Majority of study participants were counselled about self-testing, however, only patients who were on insulin injectable were given blood glucose testing machines at VCPH.

Although self-monitoring of blood glucose has been found to be effective for patients with type 1 diabetes and for patients with type 2 diabetes using insulin, evidence suggests that self-monitoring of blood glucose is of limited clinical effectiveness in improving GC in people with type 2 diabetes on oral agents or diet alone (Clar, Barnard, Cummins, Royle, & Waugh, 2015).

Studies have shown that when patients perform self-monitoring, support through appropriate educational initiatives is critical to ensure that patients understand the rationale for self-monitoring of blood glucose leading to better GC (Blevins, 2013).

5.6.6   Smoking and Drink alcohol

Diabetic patients are encouraged not to smoke as tobacco products contain nicotine which is known to affect blood sugar control. According to the smoking recommendations, nearly all participants in this study were adherent. This is similar to studies conducted in various settings, relating to smoking cessation such as those conducted in Bangladesh, China, Turkey, and Israel, where most participants were

found to be adherent to smoking regulations (Xu et al., 2013; Tonoli et al., 2012; Akhter, 2010). A possible explanation to the findings could be that majority of study participants were elderly individuals, thus the low smoking rates as people tend to stop smoking as they get older or diagnosed with NCDs and most studies agree with this.

Excess consumption of alcohol is known to promote poor GC and that is why it is recommended for diabetic patients to take moderate alcohol if they drink at all. In this study, 40.7% study participants reported taking alcohol. Similar findings were made in a study in Ghana were 84.3% study participants consumed alcohol (Obirikorang et al., 2018). This is in contrast to studies conducted in Bangladesh and Nigeria, were study participants were almost all study participants stated that they have never consumed alcoholic beverages (Casmir, 2017; Akhter, 2010).

Alcohol consumption in this study was significantly associated with GC. The findings of this might have been influenced by the fact that due to lockdown restrictions, a lot of people had more free time as they were not going to work and had nothing to do as such they resorted to alcohol consumption. As expected, out of those who reported drinking alcohol, more men drank alcohol 82% than women 18%. All the participant who reported taking more than 3 pints a day and some mentioned taking spirits called "teku teku or mikozodo" more than 3 bottles. Comparably, studies carried out in Kenya and Chile postulates that alcohol intake was more common in male study participants and was associated with poor glycaemic and hypertension control (Kimani et al., 2019; Sandoval et al., 2019). Both of the studies conclude that more men take alcohol as it is culturally accepted by society for men to take alcohol than women.

5.7   Lockdown factors associated with glycaemic control

5.7.1   Health services provision

Majority of study participants reported receiving proactive care by health staff (68%). However, it was mentioned that they took long to get served. As means to prevent the spread of the virus, the government ordered organisations to decongest workplaces by two thirds, health sector included. This meant that only a third of healthcare providers were present at work which placed more pressure on them thus the long ques. Also at VCPH, health workers were being infected with the virus which resulted in shortages of staff as they went under isolation periods.

Similar findings were made by Matsungo & Chopera (2020) were they reported reduction in access to medical doctors, drugs, immunisations and growth monitoring during the lockdown period. Therefore, the services provided to diabetic patients amongst others at VCPH might have been compromised. This has negative long-term implications as individuals will develop reluctance to access preventative health services. In addition, disruptions in drug supply chains are likely associated with defaulters as individuals will not be wanting to wait long to get served.

5.7.2   Access to medications

One hundred and forty-two (47.3%) of participants reported failing to access medications during the lockdown period. Those who failed to access medications in this study were 3.3 times more likely to have poor GC in this study. Several of factors were mentioned by participants that led to failure to access medications.

Lack of travel letters and means of transportation was the main reason cited due to lockdown restrictions, lack of transportation fares as means of income was affected. Being afraid to contract the virus at the health facility as majority of healthcare

workers were being infected with the virus at VCPH thus demotivating patients. Surprisingly, VHWs were misinforming the community by their misinterpretation of the restrictions measures such as discouraging people from going to the hospital by telling them that if you are not ill, do not go to the hospital. People living with NCDs need regular supplies of their medications even though they might not feel any pain, diabetic patients are ill patients thus this misinformation had a negative impact on GC.

Casmir (2017) notes that NCDs are chronic conditions and require lifelong medications such as diabetes. Type 2 diabetic patients are required to take their oral medications daily thus they are required to visit their health facilities for resupply of medications. Interruptions due to COVID-19 led to diabetic patients being non-adherent to their medications. Studies conducted in Chile, Nigeria and China showed that individuals with diabetes and did not adhere to their medications resulted in poor GC (Adisa et al., 2018; Sandoval et al., 2018; Li et al., 2016).

5.7.3   Exercises and Recreational activities

According to the WHO's Global Recommendations on physical activity, adults who are 18 years and above are recommended to perform at least 75 to 150 minutes of moderate to vigorous physical activity per week (WHO, 2010). Physical activity was significantly associated with GC in this study. As measures to prevent the spread of COVID-19, exercising facilities such as gyms, swimming areas were shutdown.

At schools, and colleges, students are made to participate in sports which is a means of physical activity thus shutting down such institutes had a negative effect. To make matters worse, in Manicaland, Mutare, the marketing place was moved from its designated place in Sakubva to Chikanga sports center in an attempt to control the

virus. The sports center offered free sporting activities to everyone and had a gym as well.

The conversion of the sports center into a marketing place deprives residences of Chikanga the opportunity to utilize such services as reported by study participants as they no longer undertake their evening or morning activities which they used to do in the sports center because it was not safe to run in the community.

Recreational activities/sport refer to physical activity that occurs during leisure time (Tsorbatzoudis, Alexandres, Zahariadis, & Grouios, 2006). At all levels, sport and physical activity are widely understood to have physical, social and psychological health benefits such as improving the management of DM (Downward & Rasciute, 2011). With the advent of COVID-19, exercising and recreational facilities were shut down and this has negative effects on the management of NCDs such as diabetes.

5.7.4 Travelling to the hospital

As part of lockdown measures, intercity travels were banned. VCPH is located in Mutare city and provides services to the whole of Manicaland districts. All across the country, police mounted checkpoints on routes leading into the central business districts of cities, stopping cars and turning away pedestrians who had no authorisation to be in the area (Murewanhema & Makurumidze, 2020).

Such developments affected health service provision to diabetic patients amongst others as they were asked to provide travel letters or risk to be fined or turned back. As such diabetic patients were unable to access services provided by the diabetic clinic as well as to have resupplies of medications.

5.7.5 Diet

In this study, participants reported failing to maintain a balanced diet and this was significantly associated with GC. The study participants mentioned that the lockdown periods were associated with increase in food prices and a decrease in food diversification. Increases in food prices are reflective of the negative impact of COVID-19 on agriculture and food supply systems and this resulted in artificial shortages, inflated prices and compromised food security and access to healthy food in particular the vulnerable such as diabetic patients. Similar findings were made in a study done at the University of Zimbabwe were participants reported that lockdown periods resulted in inflated food prices (Matsungo, & Chopera, 2020).

Such findings are disturbing considering the importance of good nutrition on diabetic individuals for the better GC. Also during the times of COVID-19, optimum nutrition is of great importance for the well-functioning of the immune system of individuals at risk such as diabetic patients. Therefore, increase in food prices reduce access to diverse and nutritious foods, which ultimately makes it difficult for individuals to maintain thriving immune systems.

Healthy diets help to avoid deficiencies of the nutrients that play an essential role in immune cell triggering, interaction, differentiation or functional expression (Meyerding, Trajer, & Lehberger, 2019). Considering that there is currently no known cure, the Hippocrates 400 BC philosophy of, 'let thy food be thy medicine, and let medicine be thy food' is vindicated as consumption of varied and nutritious foods will guarantee a healthy immune system (Jayawardena, Waniganayake, Abhayaratna, & Ranasinghe, 2020).

Unfortunately, this study showed a disturbing high intake of alcohol consumption coupled with decrease in nutritional food consumption. It is mouth-watering to speculate that the surge in alcohol use by diabetic patients during the lockdown period could have been due to increased stress during this period. There was heightened uncertainty, fear, job losses and loneliness though this remains to be proven for other communities.

5.7.6 Work

In this study, diabetic patients who were able to go to work had better GC and this was statistically significant. Due to lockdown restrictions, individuals were forced to stay at home as means to try and control the spread of the virus. This resulted in some losing their jobs, not being able to provide a healthy diet for the family amongst others. However, the workplace also provides means of socializations to individuals were they get to escape stressful conditions at home, being occupied most of the hours of the day means that individuals will desist from unhealthy behaviours such as excessive intake of alcohol, sedentary lifestyle, increase in screen time, unhealthy eating thus preventing the risk factors of poor glycaemic control which might have influenced the findings.

On the other hand, being unable to go to work as a result of lockdown restrictions were coupled with negative effects such as unable to put food on the table, increased in screen time, increase in snacking periods, physical inactivity, failure to buy medications amongst others which might have influenced the results.

5.8 Predictors of poor glycaemic control

The study revealed that level of education [OR=3.5, 95%CI (1.23-3.87, p=0.01)]; financing methods for medication [OR=3.91, 95%CI (1.95 -12.90), p=0.041]; type of

treatment [OR=18.77, 95%CI (3.13 -21.21), p=0,001]; adherence to medication [OR=3.15, 95%CI (1.71-9.54), p=0.021]; travelling to hospital [OR=16.06. 95%CI (5.71 -22.56), p=0.013]; time spent in pharmacy [OR=10.01, 95%CI (3.05-13.10), p=0.025] and access to medication [OR=11.81, 95%CI (7.5 -15.81), p=0.001]. As discussed in the previous sections of this chapter, several regional and global studies have also pointed to similar factors, being attributed too poor GC among diabetic patients especially in the context of emergencies.

5.9   Study limitations

- The study included only diabetic patients who came to the diabetic clinic at VCPH only, because of time constraints and limited funds. It would have been better to also include private hospitals and diabetic patients in the community within Mutare.

- The study did not take note of the duration in which patients were diagnosed as having diabetes or when they started their medication, since patients diagnosed of diabetes for longer periods were mostly controlled and they seemed more adherent to the recommended lifestyle behaviours, as the participants were more experienced and knowledgeable on their condition.

- The study was conducted during a period of an economic crisis in Zimbabwe, thus most participants were not consuming their usual diets because they could not afford to buy some foodstuffs, this might have led to us not getting a true picture of the problem.

5.10   Conclusion

The study sought to find out the determinants of poor GC amongst adult type 2 diabetic patients attending the outpatient's diabetic clinic at Victoria Chitepo

Hospital in Mutare, Manicaland Province, 2021 during the COVID-19 context, using a case-control study design.

Diabetes is a chronic condition which is one of the leading causes of premature mortality. If uncontrolled well as shown in the results, diabetes often causes severe long term complications which compromise quality of life and can cause permanent disability. The results revealed that key factors such level of education, financing methods for medications, type of treatment, adherence to medication, travelling to the hospital, time spent to get medications in pharmacy and general accessibility of medication were key predictors of GC outcomes. Health professional can focus on service provision modalities that address these factors to improve health outcomes among diabetics.

5.11   Recommendations

1. There is need to employ the differentiated care approach in providing health care services amongst type diabetic patients at Victoria Hospital to meet the differing needs and address the varying barriers to effective GC.

2. There might be need to use the supermarket approach in mobile outreaches to ensure that services in a mobile outreach address the needs of the community, starting from children to adults living with chronic conditions in an integrated approach that layer services and address issues of transport.

3. Development of NCD clinics such as diabetes clinic at district levels so as to prevent unnecessary travel and referring of patients to higher levels such as Provincial Hospitals.

4. Use of eHealth (telemedicine) so that consultations with specialised physicians found at provincial and tertiary levels can be done to clients at district levels via online platforms thus reducing transport costs and risk of spread of COVID-19.

7. There is need for proper dissemination of information from higher levels to lower levels so as to avoid misinformation.

8. Law enforcement agencies to consider patient's hospital books as travel letters to go to the health facility during this time of the COVID-19 pandemic.

5.12   Communication and dissemination

The research results will be communicated and dissemination to the key stakeholders of Victoria Chitepo Provincial Hospital, Manicaland Medical Provincial Directorate, and to the Africa University Community through a Brownbag series. The research findings will be disseminated at the Annual Medical Research Day. Nevertheless, the research results will be sent for publication in an identified journal, as well as being kept in the Africa University Research Database and library.

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Appendix 1: English informed consent guide

My name is Blessing Tatenda Alexander Rukunda (184213), a final year (Masters in Public Health) student from AU. I am carrying out a study on the Determinants of glycaemic control among type 2 diabetic patients attending the outpatient's diabetic clinic at Victoria Chitepo Provincial Hospital (VCPH) in Manicaland Province. I am kindly asking you to participate in this study by answering questions which I will be asking or filling in the questionnaire.

Purpose of the study

The purpose of the study is to explore the factors associated with poor glycaemic control after that the researcher will come up with possible solutions to deal with the impacts of poor glycaemic control. You were selected for the study because you are the residents of the Manicaland Province attending the diabetic clinic at VCPH.

Procedures and duration

If you decide to participate, you will be interviewed and participation is on the basis of anonymity. If you decide to participate you will be required to answer the questions and you are allowed not to answer any question you may feel uncomfortable to answer. It is expected that this will take about ten to twenty minutes.

Risks and discomforts

The discomforts are that some of the participants may be ill from other comorbidities and the research will remind them of how sick they are.

Benefits and/or compensation

The benefits are that the Manicaland Province and the healthcare personnel will have full knowledge on the factors associated with glycaemic control among T2DM patients and the health staff will be able to control and promote good glycaemic control thus preventing complications that arise with poor DM control therefore promoting good health. There is no compensation on participating hence it is voluntary to participate.

Confidentiality

Any information that is obtained in the study that can be identified with the participant will not be disclosed without their permission. Names and any other identification will not be asked hence you are not required to write any form of identifications on the questionnaires.

Voluntary participation

Participation in this study is voluntary. If participant decides not to participate in this study, their decision will not affect their future relationship with Africa University or the hospital. If they choose not to participate, you are free to withdraw your consent and to discontinue participation without any penalty.

Complaints/concerns procedure:

If you have any complaints or concerns, please feel free to contact me in the first instance. My mobile is +263 773 601 438. You can also reach me at Africa University rukundab@africau.edu.

Offer to answer questions

Before you agree to take part, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

Appendix 2: Shona informed consent guide

Ini zita rangu ndinonzi Blessing Tatenda Alexander Rukunda (184213) ndiri mudzidzi ari mugore rekupedzisira weMaster's in Public Health paAfrica University. Ndiri kuita tsvagurudzo pamusoro pezvinokonnzera zvinoita kuti warwere weshuga wakwanise kuchengetedza shuga yawo isina kudzikisa kana kukwirisa pachipatara cheVictoria Chitepo Provincial Hospital (VCPH). Ndinokumbirawo kuti muite chikamu nekupindura mibvunzo inotevera yandichabvunza.

Chinangwa chetsvagurudzo iyi

Chinangwa chetsvagurudzo iyi ndechekuda kubuditsa pachena zvinokonzera kuti munhu akwanise kuchengetedza chirwere chake cheshuga zvakanaka munharaunda yeManicaland. Imi masarudzwa kuti mupe ruzivo rwenyu mutsvagurudzo iyi nekuti munowana rubatsiro rwekurapiwa chirwere chenyu paVCPH uye munogona kunge makasangana nematambudziko anokonzerwa nekusachengetedza chirwere chenyu cheshuga zvakanaka.

Maitiro nenguva

Kana muchinge matora danho rekupindura mibvunzo, muchange muchita zveku zvekubvunzwa mibvunzo here. Kana mava kupindura mibvunzo iyi munotenderwa kusiya imwe mibvunzo yamunoona yamusingakwanisi kupindura. Kupindura mibvunzo iyi kunogona kutora maminitsi gumi kana makumi maviri.

Njodzi dzingawanikwa patsvagurudzo

Njodzi inogona kuvepo inoenderana neiyi ongororo ndeyekuti munogona munogona kuyeuchidzwa nezvezvimwe zvirwere zvamuinazvo zvokonzera kusagarisika zvakanaka.

Zvakanakira chidzidzo ichi uye muripo

Vagari veMumanicaland uye vana chiremba nana mukoti vachave neruzivo maererano nezvinokonzera kuchengetedza chirwere cheshuga zvakanaka. Izvi zvinozoita kuti ana chiremba nana mukoti wakwanise kurapa chirwere cheshuga zvakanaka nekuudza warwere awa zvinoda kuteedzerwa kuti wararame zvakanaka. Musatarisira kupihwa mubairo nekuti maita chikamu patsvagiridzo iyi nekuti munenge mazvipira kuita chikamu pasina muripo.

Kuvanzika

Ruzivo rupi zvarwo ruchawanikwa kubva kutsvagurudzo iyi ruchachengetwa pakakavanzika uye haruzoratidzwa pachena pasina mvumo yenyu. Mazita uye humbowo pamusoro pehupenyu hwenyu hazvisi kuzobvunzwa patsvagurudzo yatiri kuita iyi.

Kuzvipira kutora chikamu pasina muripo

Kutora chikamu mune iyi tsvagurudzo hakusi kwekumaninkidzwa. Sevatori vechikamu, mune kodzero yekusatora mukana zvachose kana kusiya tsvagurudzo chero nguva. Kana mukasarudza kusatora chikamu kana kusarudza kusiya tsvagurudzo iyi pakati hazvizounza chero upi mutongo kana chirango kana kurasikirwa kwebatsiro yamunokodzera uye hazvizokuvadza hukama hwenyu nechipatara chenyu kana hukama neAfrica University.

Kutapiwa

Nemvumo yenyu, ndokubirawo kuzokutapai zvatinonga tichitaura kuitira kuti ndinyatso bata mhinduro dzenyu.

Zvichemo

Kana muine zvichemo iwai makasununguka kundifonera panhare mbozha dzinoti +263 773 601 438 kana paemail address inoti rukundab@africau.edu kana kubata chikoro chedu paemai address inoti aurec@africau.edu.

Mvumo kupindura mibvunzo

Musati masaina fomu iri, ndokumbirawo mubvunze chero mibvunzo yamunoda pane chero chikamu chetsvagurudzo ichi chisina kujeka kwamuri. Munokwanisa kutora nguva kuti mufunge nezvazvo

Mushure mekunge munhu awana nguwa yakakwana yekufunga kuti anoda kupindura mibvunzo here?

- Munondipa mvumo yekutora nguwa yenyu ndichikubvunzai here nekukutapai

Hongu [ ]   Kwete [ ]

Appendix 3: English questionnaire

Demographics

1. Age (years)_____

2. Gender

    Male [ ]   Female [ ]

3. Marital Status

    Single   [ ]

    Married   [ ]

    Divorced   [ ]

    Widowed   [ ]

4. Residence

    Urban   [ ]

    Rural   [ ]

Diabetes Related Variables

5. Age at 1st diagnosis_____

6. Do you have any family history of diabetes? (tick all that apply)

    Non   [ ]

    Don't know   [ ]

    Grandparents   [ ]

    Parents   [ ]

    Siblings   [ ]

    Other relatives   [ ]

7. Base line and most current Glycated Haemoglobin value a) ___ b) ____

8. What is the nature of your diabetic treatment?

    Oral medications alone   [ ]

    Insulin injections alone   [ ]

    Combination of a and b   [ ]

9. For how long have you been on diabetic treatment? _____

Socio-economic Variables

10. What is your average monthly income?

Less than RTGS 5 000   [ ]

RTGS 5 000 – 10 000   [ ]

RTGS 10 000 - 15 000   [ ]

RTGS 15 000 – 20 000   [ ]

RTGS 20 000 – 25 000   [ ]

RTGS 25 000 - 30 000   [ ]

More than RTGS 30 000   [ ]

11. What is your level of education?

Not formally educated   [ ]

Primary level   [ ]

Secondary level   [ ]

Tertiary level   [ ]

12. What is your current employment status?

Unemployed   [ ]

Employed   [ ]

Self-employed   [ ]

Retired   [ ]

Socio-cultural Variables

13. Which treatment medication do you believe is more effective in managing diabetes in your own opinion?

Traditional medication   [ ]

Western medication   [ ]

14. Which treatment medication do you use more often?

Traditional medication   [ ]

Western medication   [ ]

Both traditional medication and western medication   [ ]

15. When you face any challenges with management of diabetes, which place is usually the first place to seek help for you?

Health facility   [ ]

Traditional leaders   [ ]

Church leader   [ ]

Others_____

16. Has your family helped you in adjusting to your diabetic diet?

    Yes   [ ]   No   [ ]

Treatment Related Variables

17. Are you on treatment of any other diseases in addition to diabetes?

    Hypertension   [ ]

    Dyslipidaemia   [ ]

    Osteoarthritis   [ ]

    Cardiac Failure   [ ]

    Others_____

    None   [ ]

18 What is the total number of tablets you take daily? _____

19 What is the average monthly cost of your medications? _____

20 How do you pay for your treatment and medication?

    Fully paid by insurance   [ ]

    Partially paid by insurance   [ ]

    Self-payment (out of pocket)   [ ]

    Family sponsored   [ ]

21 How often do you take your medication?

    Never   [ ]

    Here and there   [ ]

    When I get sick   [ ]

    Always (as prescribed)   [ ]

22 What is/are the main reason(s) for not taking your medication(s)?

    Forgetfulness   [ ]

    Financial constraints   [ ]

    Drugs not available at the pharmacy stores   [ ]

Drugs not effective in controlling my blood sugar [ ]

Lack of explanation by healthcare provider   [ ]

Fear of side effects of the drugs   [ ]

Healthcare Provider Related Variables

23 How many minutes did you spend with the in the consulting room? _____

24 Where you reminded by any means (email, calls, texts) by your healthcare provider about follow up?

           Yes [ ]   No[ ]

25 What is your level of satisfaction regarding the services rendered by your diabetes management team?

Very satisfied   [ ]

Satisfied   [ ]

Dissatisfied   [ ]

Very dissatisfied   [ ]

26 Concerning dietary counselling, which of the following has your healthcare team advised you to do? (tick all that apply)

Follow low fat eating plan   [ ]

Follow complex carbohydrate eating plan   [ ]

Reduce number of calories to lose weight   [ ]

Others_____

Have not been given any dietary advice   [ ]

27 Concerning physical activity, which of the following has your healthcare team advised you to do?

Get low level exercise (such as walking) on daily basis   [ ]

Exercise continuously for at least 20 minutes at least 3 times a week   [ ]

Fit exercise into your daily routine (i.e., take stairs instead of elevator, parking a block away and walk)   [ ]

Engage in a specific amount, type and level of exercise   [ ]

Others_____

I have not been given any advice about exercise by the health team   [ ]

28 Concerning blood sugar testing, which of the following has your health care team advised you to do?

Test your blood sugar using a machine (Gluco machine) and record the results   [ ]

Test your urine for sugar   [ ]

Test your blood sugar using a drop of blood from your figure and colour chat   [ ]

Others_____

I have not been given any advice on testing my sugar levels   [ ]

Skip 29 & 30 if you don't smoke and drink

29 Have you been asked of your smoking habits or drinking by the health team?

        Yes [ ]   No [ ]

30 Have you been counselled about stopping smoking or drinking and have you been referred to a stop-smoking or stop drinking program?

        Yes [ ]   No [ ]

COVID-9 related factors

31 Would you say the Covid-19 had a huge impact on your everyday life when it came to managing your glycaemic levels?

        Yes [ ]   No [ ]

32 Have you been able to control your glycaemic levels during the lockdown period?

        Yee [ ]   No [ ]

33 Were you able to receive proactive care when you visited the health facility during the COVID-19 lockdown?

        Yes [ ]   No [ ]

35. During the lockdown period, were you able to access all your medication?

        Yes [ ]   No [ ]

36. During the lockdown period, were you able to travel to the hospital?

        Yes [ ]   No [ ]

37. During the lockdown period, were you able to work?

        Yes [ ]   No [ ]

38. During the lockdown period, were you able to maintain a balanced diet?

Yes [ ]   No [ ]

39. During the lockdown period, were you able to carry out your daily exercises and recreational activities?

Yes [ ]   No [ ]

Appendix 4: Shona questionnaire for diabetic patients

Demographics

1. Makore (years)_____
2. Gender

      Murume [ ]   Mukadzi [ ]

3. Marital Status

      Handisati ndawanikwa/ndawana   [ ]
      Ndakaroora/ndakaroorwa   [ ]
      Takarambana   [ ]

      Ndakafirwa   [ ]

4. Kwanunogara

      Mutaundi   [ ]
      Kumusha   [ ]

Diabetes Related Variables

5. Makabatwa nechirwere cheshuga mune makore mangani _____

6. Mune wehukama wano rwara neshuga here?

      Hapana   [ ]
      Handiziwe   [ ]
      Ana sekuru nana mbuya [ ]

      Wabereki   [ ]

      Wakoma nehanzvadzi   [ ]

      Wamwewo wehukama   [ ]

7. Chiwerengo cheshuga chamakatorwa kwuchipatare chekupedzisira (HbA1c) _____

8. Munorapiswa sei chirwere cheshuga?

      Ndoita mapiritsi ekunwa   [ ]

      Ndinobaiwa majekiseni   [ ]

9. Mawanemakore mangani muchinwa mushonga weshuga? _____

Socio-economic Variables

10. Munohora mari yakawanda sei pamwedzi?

      Iri pasi peRTGS 5 000   [ ]

RTGS 5 000 – 10 000   [ ]

RTGS 10 000 - 15 000   [ ]

RTGS 15 000 – 20 000   [ ]

RTGS 20 000 – 25 000   [ ]

RTGS 25 000 - 30 000   [ ]

Inopfuura RTGS 30 000   [ ]

11. Makadzidza kusvika papi?

Handina kuenda kuchikoro   [ ]
Primary here   [ ]

Secondary here   [ ]

Tertiary here   [ ]

12. Munoshanda here?
Handishande   [ ]
Ndoshandira hurumende   [ ]

Ndodhandira ma NGO   [ ]

Ndinozvishandira mabasa emaoko   [ ]

Ndiri pamudya ndigere   [ ]

Socio-cultural Variables

14. Muno funga kuti mishsonga inoshanda pakurapa shunga ndeipi?

Yechiwanhu   [ ]
Yechirungu   [ ]

15. Munoshandisa mieshonga upi zvakanyanya kurapa shuga yenyu?

Yechiwanhu   [ ]
Yechiringu   [ ]

Yese yechirungu neye chiwanhu   [ ]

16. Mukawirwa nedambudzuki naererano nekuchiengetedza chirewere chenyu, munotanga kuno batsirwa kupi?

Kuchipatara   [ ]
Kune wanoita mishonga yechiwanhu   [ ]

Kune wemachechi   [ ]

Kumwewo _____

17. Wehukama wanokubatsiraiwo here mkugadzira chikafu chamodya?

Hongu [ ]   Kwete [ ]

Treatment Related Variables

18 Munorwara nezvimwe zvirwere pamusoro cheshuga?

Hypertension	[ ]
Dyslipidaemia	[ ]
Osteoarthritis	[ ]
Cardiac Failure	[ ]
None	[ ]

Others_____

19 Munonwa mapiritsi mangani pazuwa? _____
20 Mishonga yenyu inoita marii pamwedzi? _____

21 Muno bhadhara sei mushonga yenyu?

Inobhadharwa yose neinsurance   [ ]
Chimwe chikamu chobhadharwa neinsurance   [ ]

Ndobhadhara ndoga   [ ]

Ndobhandariwa nemhuri   [ ]

22 Munonwa sei mushonga yenyu?

handitombonwe   [ ]
ndonwa pano neapo   [ ]

Ndonwa kana ndarwara   [ ]

Ndonwa semaudzirwo andakaitwa nana mukoti   [ ]

23 Chinyi chinokonzera kuti musanwe mushonga yenyu?
Kukanganwa   [ ]
Kushaya mari yekutengesa mushonga   [ ]

Mishonga kushaika muzvitoro   [ ]

Mapiritsi haasi kushanda kurapa shuga yangu   [ ]

Kusatsanangurirwa nehweutano   [ ]

Kutya kurwariswa nema piritsi   [ ]

Healthcare Provider Related Variables

24. Makatora nguwa yakawanda sei muchirapiwa? _____
25. Makayeuchidzwa here newehutano kuti muuye kuchipatara?

Hongu [ ]   Kwete [ ]

26. Makagutsikana kusvika papi nekurapiwa kwamakaitwa?
    Ndakagutsikana zvakanyanya   [ ]
    Ndaka gutsikana   [ ]

    Handina kugutsikana   [ ]

    Handina kugutsikana zvakanyanya   [ ]

27. Maererano nemadyiro enyu makaudzwa kuti muite zvipi?
    Idyai chikafu chine mafuta akawanda   [ ]
    Idyai chikafu chakawanda   [ ]

    Musadyise kuitira kusimbisa   [ ]

    Hapana chandakaudziwa   [ ]

    Zvimwewo_____

29. Maererano nekugwinyisa mwiri makaudziwa zvipi newehutano?
    Itai zvinogwinyisa mwiri zvishoma sekufamba mazuwa ose   [ ]
    Itai zvinogwinyisa mwiri kwema minitsi makumi maviri kana kupfura
    katatu pavhiki   [ ]

    Itai zvinongwinyisa muwiri mumararamiro enyu (i.e., take stairs instead
    of elevator, parking a block away and walk)   [ ]

    Hapana chandakaudziwa   [ ]

    Zvimwewo_____

30. Maererano nekuzvi tesita shuga yenyu, makaudzwa zvipi newe hutano?
    Tesitai ropa renyu muchishandisa muchina (Gluco machine) monyoera
    pasi   [ ]
    Tesitai weti yenyu kuona kuti ine shuga here   [ ]

    Hapana zvandakaudziwa   [ ]

    Zvimwewo_____

Skip 31 & 32 if you don't smoke and drink

31. Makambo bvunziwa nezve kusvuta kana kunwa doro kwenyu?

                 Hongu [ ]   Kwete [ ]

32. Makapihwa zvidzidziso zvekumira mkusvuta kana kunwa here?

                 Hongu [ ]   Kwete [ ]

COVID-9 related factors

33. Mungati chirwere cheCovid chakakukanganisai mararariro enyu
    pakuchengetedza chirwere chenyu zvakanaka here?
                 Hongu [ ]   Kwete [ ]

34. Panguwa yelockdown, maikwanisa kuchengeta chirewre chenyu zvakanaka?

                Hongu [ ]   Kwete [ ]

35. Panguwa yelockdown, maiwana rubatsiro rwakakwana here kuchipatara?

                Hongu [ ]   Kwete [ ]

36. Panguwa yelockdown, maikwanisa kuwana mishonga yenyu here?

                Hongu [ ]   Kwete [ ]

37. Panguwa yelockdown, maikwanisa kudya zvineutano here?

                Hongu [ ]   Kwete [ ]

38. Panguwa yelockdown, maikwanisa kuenda kubasa here?

                Hongu [ ]   Kwete [ ]

39. Panguwa yelockdown, maikwanisa kuenda kuchipatara here?

                Hongu [ ]   Kwete [ ]

40. Panguwa yelockdown, maikwanisa kuita zvinogwinyisa mwiri nekuenda kunzvimbo dzekutandarira here?

                Hongu [ ]   Kwete [ ]

Appendix 5: PMD's Approval letter

Telephone: 60624/60655

ZIMBABWE

Reference:

PROVINCIAL MEDICAL DIRECTOR
MANICALAND
P.O. Box 323
Mutare

8 March 2021

The Medical Superintendent
Victoria Chitepo Provincial Hospital
Box 30
MUTARE

**PERMISSION LETTER FOR RUKUNDA BLESSING TATENDA ALEXANDER
TO CARRY OUT A STUDY ON THE DETERMINANTS OF GLYCAEMIC
CONTROL AMONGST ADULT TYPE 2 DIABETIC PATIENTS ATTENDING
THE OUTPATIENT'S DIABETIC CLINIC AT VICTORIA CHITEPO
HOSPITAL, 2021**

The office of the Provincial Medical Director Manicaland has granted permission for
RUKUNDA BLESSING T A, a Master in Public Health student at Africa University,
attached at the Provincial Medical Director's office to carry out a study on the
'Determinants of glycaemic control amongst adult type 2 diabetic patients attending the
outpatient's diabetic clinic at Victoria Chitepo Hospital 2021.'

The findings are purely for academic purpose. Please may you kindly assist him.

Thank you for your usual support.

PROVINCIAL MEDICAL DIRECTOR
MANICALAND

0 8 MAR 2021

P.O. BOX 323, MUTARE
ZIMBABWE TEL: 020-2060624

DR S M NYADUNDU
PROVINCIAL MEDICAL DIRECTOR – MANICALAND

Appendix 6: VCPH Medical superintendent's approval letter

Telephone: 263-020-64321
Fax: +263-020-67048
E-mail: mphosp@syscom.co.zw

ZIMBABWE

Reference:

Victoria Chitepo Provincial Hospital
P.O. Box 30
Mutare
MANICALAND
ZIMBABWE

20 May 2021
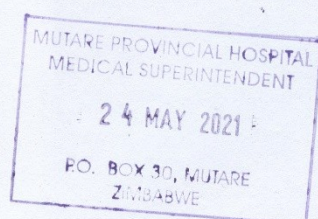
Mr. Rukunda Blessing T.
+263 773 601 438
+263 719 601 438

Re: PERMISSION TO CARRY OUT A STUDY ON THE DETERMINANTS OF GLYCAEMIC CONTROL AMONGST ADULT TYPE 2 DIABETIC PATIETS ATTENDING THE OUTPATIENTS' DIABETIC CLINIC AT VICTORIA CHITEPO PROVINCIAL HOSPITAL: RUKUNDA BLESSING TATENDA ALEXANDER: 2021

In reference to the above subject matter.

I have no objection to your request.

You can come and carry out your study.

Hope you will find this institution helpful in your studies.

MUTARE PROVINCIAL HOSPITAL
MEDICAL SUPERINTENDENT

2 4 MAY 2021

P.O. BOX 30, MUTARE
ZIMBABWE

DR J.D MUTEDE
MEDICAL SUPERINTENDENT

Appendix 7: AUREC's Clearance letter

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africou.edu

Ref AU2126/21   28 June, 2021

RUKUNDA BLESSING TATENDA ALEXANDER
 C/O CHANS
Africa University
Box 1320
Mutare

RE: **DETERMINANTS OF GLYCAEMIC CONTROL AMONGST ADULT TYPE 2 DIABETIC PATIENTS ATTENDING THE OUTPATIENT'S DIABETIC CLINIC AT VICTORIA CHITEPO HOSPITAL IN THE CONTEXT OF AN ESCALATING COVID-19 PANDEMIC**

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.
a) Research proposal
b) Data collection instruments
c) Informed consent guide
- **APPROVAL NUMBER**   AUREC 2126/21
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE**   NA
- **APPROVAL DATE**   June 28, 2021
- **EXPIRATION DATE**   June 28, 2022
- **TYPE OF MEETING**   Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)

APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU – A/AUREC ADMINISTRATORFOR CHAIRPERSON, AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE