DETERMINATION OF BLOOD SUGAR CONTROL PRACTICES IN PATIENTS WITH DIABETES MELLITUS DURING COVID-19 PANDEMIC ATTENDING KENYATTA NATIONAL HOSPITAL

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Declaration

I Daniel Sombe Nzeki declares that this study dissertation is my original work and has not been presented for any examination in any other institution.

Signed..... **Date**26.11.2021

Supervisors' Approval

The study dissertation has been submitted for examination with our approval as the University Supervisor.

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TABLE OF CONTENTS

List of Tables

List of Figures

Abbreviations and Acronyms

ARDS	Acute Respiratory Distress Syndrome
BMI	Body Mass Index
COVID-19	Corona Virus Disease 2019
CVD	Cardiovascular disease
DM	Diabetes Mellitus
FBS	Fasting Blood Sugars
HbA1c	Hemoglobin A1c
ICU	Intensive Care Unit
IDF	International Diabetes Federation
KNH	Kenyatta National Hospital
LOD	Line of Defence
LOR	Line of Resistant
MoH	Ministry of Health
NCD	Non-Communicable Diseases
PWD	People with Diabetes
RBS	Random Blood Sugar
SARS-COV-2	Severe Acute Respiratory Syndrome Corona Virus 2
T2DM	Type II Diabetes Mellitus
USA	United States of America
WHO	World Health Organization

Operational Definitions

Coronavirus disease 2019: An infectious disease resulting from a novel coronavirus referred to as SARS-COV-2 that resulted in an outbreak of COVID-19 in December 2019 and primarily presents with fever, dry cough and fatigue.

COVID-19 preventive measures: these are the measures observed to prevent or contain the spread of the COVID-19 from one person to another. They include hand hygiene, coughing etiquette, wearing face masks, social distancing and isolation/quarantine for those who are sick.

Diabetes Mellitus: is a syndrome denoted by chronic hyperglycemia from abnormal insulin production, impaired insulin use or both and other disruptions on carbohydrates, fat and protein metabolism.

Diabetes-related management practices: These are practices and measures implemented to ensure optimal glycemic control in the patient with diabetes mellitus. In this study, the techniques to be considered are exercising regularly, taking a properly balanced diet, taking medications as prescribed, avoiding excessive alcohol consumption, and avoiding cigarette smoking.

Glycemic control: These are measures taken to ensure that the blood glucose levels of the DM patients remain within normal levels.

Lockdown: This entails a range of stringent COVID-19 containment measures such as restricted travel, social interaction, and limited access to public spaces.

Prevalence: refers to a population segment with a specific disease or attribute at a particular period or particular point in time. This entails every case, both new and pre-existing conditions.

Pandemic-: is a global epidemic, crossing international borders and typically impacting a significant population figure.

Self-care management: are the responses to signs and symptoms whenever they arise that entails assessing physical and emotional changes and making decisions if the variations need to be addressed.

Risk factor: Refers to a variable linked with increased danger or susceptibility to an illness or disease.

Type 2 Diabetes Mellitus: Is a type of diabetes in which the beta cells of the pancreas produces insulin but the body cannot use it effectively as the body cells are resistant to insulin action.

Abstract

Background: The management and control of blood sugars levels in a diabetic patient is a difficult task and entails a number of measures to achieve the desired goals. These measures are complicated more by the recent discovery of COVID-19 pandemic in the medical field making management of most chronic illness a tall holder to achieve. The aim of this study was to find out the measures which the patients with DM attending KNH Diabetic clinic employed to control their blood sugar levels during the COVID-19 period.

Objectives: The broad objective of the study was to determine what blood sugar control measures patients with DM attending KNH diabetic clinic employed to ensure that their blood sugars were under control during the COVID-19 pandemic.

Methods: The study employed a cross sectional research design with a structured questionnaire and also review of participants' medical records was carried out to determine the patient's previous blood sugar levels. Purposive sampling was used to select the participants of the study.

Results: A higher proportion (35.1%) of respondents were aged above 60 years, females (58.3%) and married (75%). Majority of respondents (87.5%) were on diabetic diet. A quarter (25%) were alcohol consumers and about half (46.5%) of them reported to have stopped alcohol consumption during COVID-19 pandemic. A very small proportion (6%) of the respondents were cigarette smokers and a higher proportion (40%) decreased the frequency of smoking during COVID-19 pandemic. Single respondents (26.7%) had higher blood sugar levels compared to other marital status groups (52.4%). Majority of the respondents adhered to WHO COVID-19 preventive protocols. Mean RBS was lower during COVID-19 (8.60mmol/l) pandemic than before (9.54mmol/l) COVID-19 pandemic.

Conclusion: Despite the pandemic, there was adherence to dietary, hypoglycemic agents and WHO COVID-19 preventive protocols among the patients and blood sugar levels improved. This shows that health care providers and facilities should uphold the current DM treatment protocols.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Diabetes mellitus (DM) is a chronic disease whose present global levels and increase has a characteristic of an epidemic. It's among the top global public health problems imposing a heavy burden on health care facilities and socioeconomic development. In recent years, diabetes prevalence has gone up in most developed and developing countries. According to Saeedi *et al.* (2019), persons living with diabetes stand a significant likelihood of developing diverse consequential, and harmful complications, leading to an enhanced medical care need, diminished life quality, and extreme stress on families. Furthermore, mismanagement of diabetes and its complications can result in hospital admission more often and premature mortalities. The proportion of persons with diabetes is rising as a result of population growth, aging, urbanization, and high obesity and physical inactivity prevalence, as asserted by Wild et al. (2014).

Challenges regarding affordability or availability of healthy foods, limited accessibility of healthcare services and information, exercise sites, and poor health-related behaviours among socioeconomic groups have been proposed as potential association factors for type 2 diabetes (T2DM). The established risk factors for T2DM include unhealthy diet, excessive consumption of alcohol, physical inactivity, cigarette smoking, and obesity. These elements are more widespread in underprivileged socio-economic groups. Therefore, as denoted by Stringhini et al. (2018), these components are potentially essential mediators of the linkage among socio-economic status, and T2DM.

The COVID-19 pandemic has emerged as one of the greatest challenges faced by humankind recently. Likewise, persons living with diabetes and its linked comorbidities are at a greater risk of COVID-19 associated complications and even death. Katulanda et al. (2020) cite older age, hyperglycemia, severe inflammatory response, cardiac injury, and multi-morbidity as predictors of poor outcome in diabetes alone or a combination of diabetes and COVID-19 related illnesses.

Through systematic reviews entailing primary data sourced from China, estimates denote 8% and 9.7% of DM persons hospitalized having COVID-19. The percentage of hospitalization appears higher in USA, whereby from 12th February to 28th March 2020, PWD accounted for 10.9% of the total COVID-19 patients. Besides, 24 % of admitted patients were non-ICU admission, and 32% were ICU admissions (Hartmann-Boyce et al., 2020). A study done in

China in mid-February 2020 on the COVID-19 pandemic in people with DM found out that most of the patients were aged 30 to 79 years, accounting for 87%. A large majority representing 81%, were concluded to be presenting with mild illness, yet in 14%, they had severe disease, and 5% were critically ill. 2.3% of the total confirmed cases died resultantly. The soaring death rate was established to be among persons aged 80 and above, denoting 14.8%, in persons having pre-existing CVD's at 10.8%, patients having DM the death rate being 7.3% over and above 3-folds that of the total population as asserted by Riddle et al. (2020).

The prevalence rates of diabetes in individuals presenting with COVID-19 resulting from SARS-COV-2 infection has shown disparity across nations with a recorded range from 5-20% in China, 17% in Lombardy in Italy and 33% in the United States of America (Scheen et al., 2020). Of paramount clinical importance, most of the studies report a higher diabetes rate that is two to three-fold in patients with acute infection requiring ICU admission and requiring invasive care ventilation compared to those with less severe infection as well as increased death rate in diabetic patients (Scheen et al., 2020).

More focus has been geared on diabetic patients, especially those with T2DM, since the outbreak of COVID-19 in China in December 2019. The reasons for the poor prognosis in people with DM are multifactorial thus reflecting the syndromic nature of diabetes. The risk of poor outcome is influenced by age, ethnicity, sex, co-morbidities like hypertension, pro-inflammatory and a pro-coagulative state and obesity (Apicella et al., 2020a). Based on data denoting patients with acute COVID-19 and the dead ones, a high prevalence rate of concomitant conditions inclusive of CVDs exists, diabetes, chronic obstructive pulmonary disease, and obesity. The mortality is specifically high in older patients prone to comorbidities (Apicella et al., 2020a). As the population with DM is highly heterogeneous, it's of great interest to determine the risk factors of progression to a more serious life-threatening COVID-19 infection. Some several prognostic elements exceeding old age have been identified like an increased BMI is a significant risk factor calling for respiratory support (Scheen et al., 2020).

According to Hartmann-Boyce et al., empirical evidence associated with the effect of COVID-19 in PWD is limited but it continues to evolve. Emerging evidence links higher BMI and increased Hemoglobin A_{1C} (HbA_{1C}) to worse outcome in PWD with COVID-19 and poses direct immediate risks to PWD which contributes to poor diabetes outcome due to disruptions

caused by the pandemic that includes stress and change to routine care, diet and physical activity (2020).

Optimizing glycemic control through follow up and observation of instructions for DM management adherence was paramount. However, adherence could have been affected by the COVID pandemic, its containment measures, and not so good news regarding the prognosis of individuals with DM with concomitant COVID-19 infection. Individuals with DM ought to be acknowledged as a risky cohort for complicated illnesses and stand a significant susceptibility during disrupted social systems. Therefore, mechanisms are required to protect PWD from the pandemic (Katulanda et al., 2020). Additionally, understanding what and how people with DM coped in controlling blood sugars and keeping fidelity to the management regime during the COVID-19 pandemic and keeping healthy was critical. A well thought out research study can effectively answer the questions mentioned above.

Therefore, there was a need to determine what measures patients with DM undertook to control their sugars in the presence of the COVID-19 pandemic and the real fear/threat of poor prognosis in patients with DM coexisting with COVID-19 infection. The implemented practices could be evaluated on whether they were enablers or barriers to optimal DM management.

1.2 Problem Statement

Despite COVID-19 being the most significant challenge facing humankind now, individuals with chronic conditions must thrive as well. Those with diabetes and associated co-morbidities are at the most critical risk of its complications and COVID-19 associated deaths. These people must control their glycemic levels, prevent complications, and monitor the progression by adhering to professional /clinical advice and appointments.

COVID-19 pandemic impacts populations in millions and claims hundreds of thousand hence still wreaking devastation. The majority of deaths reported occur among the elderly and or in individuals with chronic infections like DM, obesity, CVD, hypertension, cancer, and chronic kidney disease. DM accounts for a remarkable increase in COVID-19 associated deaths related to acute respiratory distress syndrome (ARDS). Good blood sugar control may lead to a strengthening immune system and reduced severity and disease mortalities (Önmez et al., 2020).

The COVID-19 pandemic and its related containment measures could have impacted individuals with DM. First, because of the fear for the infection and the news of high mortality in those with DM dying from COVID-19, this may have affected adherence to appointments and medication, leading to poor glycemic control and limited access to medications (Shi et al., 2020).

Follow up, and glycemic controls in diabetic individuals have been disrupted due to lockdowns imposed to contain the pandemic. Moreover, compromised blood sugar control is predictable in DM resulting from inadequate dietary adherence, physical inactivity and lack of follow-up (Önmez et al., 2020).

The sudden change in the day-to-day routine for diabetic persons, increased sedentary behaviour, changes of eating patterns, and advancement in their psychological burden resulted in changes in glucose regulation. That is mainly applicable for patients on complex management regime, for instance, multiple daily insulin injection or uninterrupted subcutaneous insulin infusion (Maddaloni et al., 2020).

Several COVID-2019 related preventive and regulatory mechanisms such as social distancing and quarantine practices may have led to lessened physical activity, psychological stress, poor dietary diversity, and delayed care-seeking associated with fear of COVID-19 exposure (Shi et al., 2020). These containment measures could have affected the health care services delivery in the majority of patients with chronic diseases, diabetes included. It was essential to understand how the patients with DM coped during COVID pandemic, and this study strived to bridge that gap. This study aimed to establish what practices were adopted by people with DM to optimize their sugars during the COVID-19 pandemic. The study determined whether the approach enabled or served as barriers to DM control.

1.3 Research questions

i. What were the blood sugar measurement levels patterns before and during the COVID-19 pandemic in patients with DM attending KNH?

ii. What were the blood sugars control practices before and during the COVID-19 pandemic in patients with DM attending KNH?

iii. Were there any association between the blood sugar control practices and blood sugar levels patterns before and during COVID-19 pandemic?

1.4 Research objectives

This study was guided by one broad objective and three specific objectives.

1.4.1 Broad objective

To determine blood sugars control practices during COVID-19 pandemic among patients with DM attending KNH.

1.4.2 Specific objectives

i. To determine the blood sugar levels before and during the COVID-19 pandemic.
ii. To determine blood sugar control practices during the COVID-19 pandemic.
iii. To determine the association between the blood sugar control practices and blood sugar levels during the COVID-19 pandemic.

1.5 Hypothesis testing

H_0- There is an association between blood sugars control practices during the COVID-19 pandemic.

H_1- There is no association between blood sugars control practices during the COVID-19 pandemic.

1.6 Justification of the study

COVID-19 pandemic is a new challenge currently facing mankind and affecting all the aspects of life. It is affecting the management of all health care related illness including chronic comorbidities like DM, hypertension among others. Some preventive measures of COVID-19 might have negative consequences to the patients with DM. The stress which comes with fear of unknown, movement restrictions through lockdowns, financial constrains through lack of jobs might have an impact on the blood sugar control practices.

Studies done so far shows that patients with DM are at an increased risk of developing severe disease and even have higher mortalities when they conduct COVID-19 disease. Also studies have shown that most patients with COVID-19 develops hyperglycemic states during the acute phase and this is associated with the severe inflammatory response which develops.

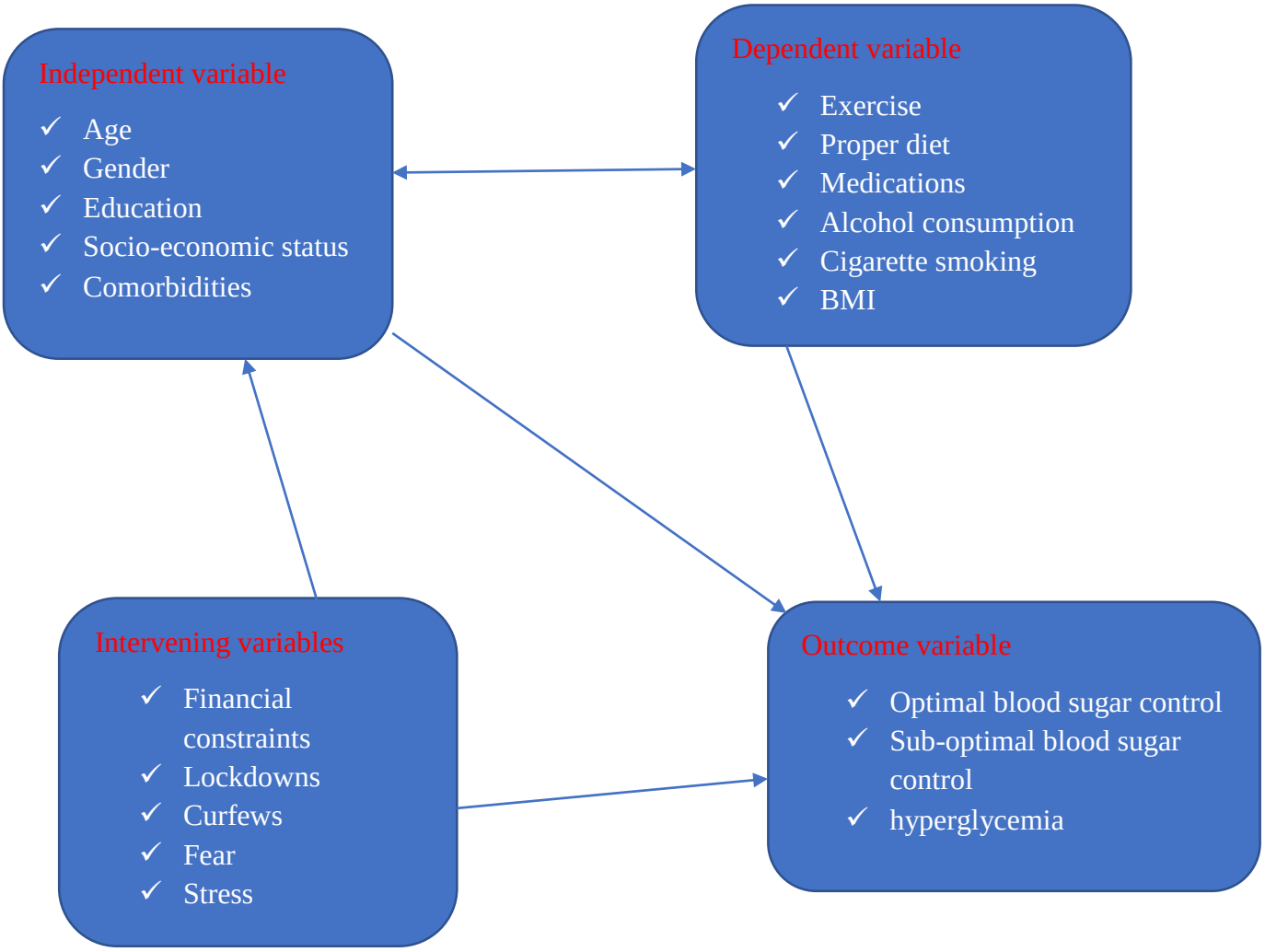
This research was to review the blood control measures which were employed before the COVID-19 pandemic and the measures being employed during the pandemic and compare the differences. The study was to come up with the best interventions which may be implemented to control the blood sugar levels in patients with DM without exposing them to COVID-19 disease. The study was also to add a new knowledge on how to manage DM during this COVID-19 pandemic and also might help the policy makers to introduce new interventions in control of DM.

1.7 Variables

This study was to assess the following variables and establish the relationship between the variables and how they contribute to a person with DM in COVID-19 pandemic times.

a. Independent variables- Age, Gender, Education, Socioeconomic status and Comorbidities.
b. Dependent variables- Exercise, Proper diet, Medications, Avoidance of alcohol, Cigarette Smoking and BMI.
c. Intervening variables- Financial constraints, Lockdowns, Curfews, Fear and Stress.
d. Outcome variables- Optimal blood sugar control, Sub-optimal blood sugar control and Hyperglycemia.

1.8 Conceptual framework



CHAPTER TWO: LITERATURE REVIEW

2.1 Diabetes and its risk factors Diabetes mellitus is a group of clinically heterogeneous disorders with glucose intolerance in common. DM encompasses many causally unrelated diseases and includes different etiologies of disturbed glucose tolerance. The term "diabetes mellitus" is used to describe a syndrome characterized by chronic hyperglycemia from abnormal insulin production, impaired insulin or both, and other disturbances of carbohydrates, fats, and protein metabolism (McCance & Huether, 2006).It is also defined as a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin. DM is linked with acute severe complications, such as ketoacidosis and hypoglycemia, and chronic complications like neuropathy, retinopathy, CVDs such as coronary artery disease, stroke, and heart attack, nephropathy, and atherosclerosis (Innes & Maxwell, 2016).

The International Diabetes Federation (IDF) noted that diabetes is among the quickest evolving healthcare emergencies in this century (Saeedi et al., 2019). Besides, in 2019, it was approximated that close to 463 million persons had diabetes, with the figure estimated to rise to 578 million and 700 million by 2030 and 2045 consecutively, which is 51% worldwide if adequate and effective preventive strategies are not adopted. The highest rise in diabetes prevalence is anticipated to be in low-income nations with a projected 92% succeeded by lower-middle income-earning countries at 57%, and after that upper-middle income-earning nations projected to be at 46%, and lastly the higher income-earning nations at a 25% (Mohamed et al., 2018).

In Africa, 19 million people had diabetes as in 2019, and the number is estimated to increase to 29 million in 2030, which is a 48% increase and to 47 million in 2045, which is a 143% increase (Saeedi et al., 2019). If proper preventive strategies are not employed to arrest this alarming increase, then the disease will be like an epidemic in the whole continent.

The prevalence of diabetes in Kenya, according to WHO (2018), was at 3.3% and predicts a rise to 4.5% by 2025; nevertheless, two-third of diabetes may not be diagnosed. Considering the previous population studies conducted in rural and urban areas of Kenya, the diabetes prevalence rate was found to range between 3.5 to 5%, with higher proportions among those in the urban areas. The studies do not paint a national outlook due to the absence of national geographic coverage. Further, IDF projected in 2015 that the prevalence of diabetes was to be at 2.2% in Kenya. Nevertheless, the IDF's projections are based on a combination of several

data sources such as small population studies, facility data, and modelling that might not produce robust predictions. There is a need for empirical data at the population level to accurately determine the true burden of DM in Kenya (Saeedi et al., 2019).

Urbanization has been established as an essential pilot for the emerging NCD epidemic in developing countries. Moreover, demonstrated modifiable changes in lifestyle entail increased smoking and alcohol intake, reduced physical activity, and insufficient dietary intake of fruits and vegetables. The above components make up behavioral susceptibly elements associated with diabetes and may result in the development of metabolic danger risk factors such as obesity. The non-modifiable risk factors includes aging and genetic susceptibility (Ayah et al., 2013).

A study conducted by Lim et al. (2020) demonstrated that patients highly susceptible to severe COVID-19 or its mortality have several attributes such as advanced age and male sex, suffer from underlying conditions, for instance, CVD, obesity and/ or DM and T2DM has been described as a disease of advanced age.

The COVID-19 infections have a significant impact on DM management since they aggravate inflammation and alter immune system response resulting in challenges with glycemic regulation. SARS-COV-2 infection also increases the risk of thromboembolism and is more likely to induce cardiorespiratory failure in DM patients (Lim et al., 2021).

2.2 Effects of COVID-19 on Diabetes

A cluster of cases of atypical interstitial pneumonia resulting from SARS-COV-2 was identified in December 2019 in Wuhan-China. As a result of the rapid spread of COVID-19, WHO declared it a global pandemic on 11th March of 2020 (Apicella et al., 2020).

The pandemic has come out as one of the most significant challenges faced by humanity recently. PWD and associated comorbidities stand a substantial danger of diabetes complications and COVID-19 associated mortality. Older age, multiple morbidities, cardiac injury, hyperglycemia, and severe inflammatory response are predictors of poor outcome (Katulanda et al., 2020).

DM has been established to be among the most commonly reported NCDs associated with COVID-19. PWD, largely T2DM, if infected with SARS-COV-2, are prone to devastating

clinical outcomes such as increased hospitalization and increased mortality rates. Moreover, coupled with impaired immunity, high coagulation rates, severe inflammation, and numerous other factors have been established to be influencing the gravity of COVID-19 among PWD, that includes poor glycemic regulation, limited medications accessibility, and the pharmacodynamics of some medications regularly used in diabetes (Shi et al., 2020).

Even though there is a lower projected general mortality rate of 6% among COVID-19 patients, DM patients stand a significantly higher risk. Ongoing studies proposes that diabetic patients with poorly regulated glycaemia stand a four-fold mortality risk and long-term hospitalization periods than persons without diabetes mellitus (Yaribeygi et al., 2020).

Generally, COVID-19 patients start developing symptoms following 5 to 6 days after infection. The SAR-COV-2 disease prompts mild symptoms at the initial stage for two weeks on average, but has the potential of developing into acute illness, including ARDS, a systemic inflammatory response syndrome, and multiple organ involvements and shock. Patients at greater danger of acute COVID-19 or mortality display numerous features such as advanced age and male sex and have underlying comorbidities like CVDs, obesity, and DM. A few early studies have demonstrated that underlying CVD and DM are regular in COVID-19 patients admitted in ICUs. T2DM is generally an illness of advanced age (Lim et al., 2021).

Patients with DM have a higher susceptibility to viral and bacterial infections including those affecting the respiratory tract. One of the mechanisms responsible for this predisposition is the “lazy” leukocyte syndrome which represents impaired leukocyte phagocytic function (weakened immunity). This further emphasis the likelihood of increased propensity of SARS-COV-2 infections in DM patients (Ugwueze et al., 2020). COVID-19 infection compounds the stress of DM by releasing glucocorticoids and catecholamines into circulation. These worsen the glycemic control and increases the formation of glycation end products in many organs and worsen the prognosis (Ugwueze et al., 2020).

2.3 COVID-19 preventive protocols

The WHO has outlined the pathway for reducing the spread of COVID-19 disease, regulation and reduction in the mortality figures arising from COVID-19 disease can only be met through the mass institution of basic mechanisms such as hand hygiene, cleaning surfaces, application

of alcohol-based hand rub, social distancing, cough etiquette, and avoiding public gathering (Oliveira et al., 2020).

The COVID-19 disease has had devastating global impacts on people's day-to-day activities and lifestyle. In spite of government mechanisms like enforced self-isolation, travel bans, closure of learning institutions, and national lockdowns of non-essential services, infections and deaths keep on rising. Responding to the rising rates, WHO has suggested a global action plan geared towards minimizing spreading of COVID-19 infections. The action plan outlines the significance of adopting behavioral protection mechanisms such as regular handwashing with running water and soap, self-isolation whenever one feels unwell, keeping social distance, and practicing respiratory hygiene (Lin et al., 2020).

Globally, as evident in Taiwan, the use of face masks and alcohol-based hand rubs, working from home, and a ban on social events were among the containment measures put in place for COVID-19. Taiwan citizens' panic, brought nearly every obtainable mask and alcohol-based hand rub stocks out in two weeks following the first reported case on 21st January of 2020 (Galvin et al., 2020). Nguyen et al. (2020) alluded that preventive public health mechanisms have been instituted to fight the COVID-19 disease. Even though the plans for action employed internationally are homogenous, the scale, timeliness, and decisiveness of the executive authorities have differed substantially.

Currently, Vietnam is among the nations recording the lowest COVID-19 cases, which is exceptional considering its estimated total population of 95million and its proximity to the epicenter. Since the pandemic onset, Vietnam authorities instituted intensive regulation employing a rapid testing strategy to facilitate preliminary detection of infection roots, decisive contact tracing, prompt isolation, and subsequently free clinical care for the infected persons. Further, community protective strategies were instrumented early and have demonstrated pervasiveness across the nation. The state embraced self-isolation of endangered groups, social distancing, compulsory isolation of symptomatic persons and everyone testing positive for the virus, central environmental sanitization, regular handwashing and putting on of face masks publicly (Nguyen et al., 2020).

In Kenya, the Ministry of Health (MOH) placed protocols at the end of March 2020 to enforce social distancing, hand washing with water and soap or using alcohol gel sanitizers, wearing a mask when in public and crowded places and also other measures included lockdowns, curfews to help contain the situation. To prevent COVID-19 from spreading in Kenya, the government

instituted measures such as school closures, closure of bars and restaurants, suspension of international flights, closure of international borders, suspension of in-person schooling and curfews. Other measures were a ban on social and political gatherings and the limiting of several passengers in public vehicles.

2.4 Impact of COVID-19 on DM control measures

The COVID-19 outbreak in Italy forced the government to enforce lockdown on 9th March 2020. That immediately changed the day-to-day routine of PWD, enhancing sedentary behaviour, leading to a changed eating habit and increasing their psychological burden, all of which lead to changes in glucose control. This is chiefly pertinent for patients on complex like multiple daily insulin injection or continuous subcutaneous insulin infusion (Maddaloni et al., 2020).

Katulanda et al, (2020) denoted that since mass population lockdown is regarded as essential in containing disease spread, PWD are affected by limited healthcare accessibility, insulin, supplementary medications, and blood glucose tracking. PWD ought to be acknowledged as a risk cohort for complex illness, and they are mainly endangered in periods of interrupted social systems. Thus, there is a need for an institution of strategies to protect the health of PWD in the course of the pandemic.

Follow up and glycemic regulations in PWD have been interrupted due to lockdowns enforced to contain the pandemic. Impaired blood sugar control is therefore predicted due to such factors as physical inactivity, absence of follow-up, and poor dietary adherence. A study conducted in China demonstrated worsening in glycemic control and high fasting blood sugars (FBS) during COVID-19 outbreak (Önmez et al., 2020)

Several COVID-19 associated preventive and regulatory mechanisms such as social distancing and quarantine practices may lead to decreased physical activity, psychological distress, poor dietary diversity, as well as delayed care-seeking related to fear of exposure COVID-19 (Shi et al., 2020).

2.5 Theoretical framework

Betty Neuman's system model (1974) is the theoretical framework for this research. The systems model gives a particular pliable comprehensive and system-based nursing viewpoint. The model perceives a PWD as a holistic system possible of being influenced by both the entirety of the interior and exterior environment. The model focuses on every person's perception regarding stress, its responsive elements, and every person's response to the stressor.

Further, the model centres on the client system to natural and probable stressors in the environment. Betty's model marked the interior and exterior stressors as extra-personal, interpersonal, and intrapersonal. Stressors could interrupt the system's steadiness, forcing the system to adapt to stressors by employing energy in response to the situation. Thus, the stressors drained the client's normal and flexible defence lines, protecting them from a normal reaction or wellness state.

In a PWD, the common stressor may entail intrapersonal stressors such as hyperglycemia, the interpersonal stressor of the low social support, and the extra-personal stressor of limited financial resources. PWD might have various stressors capable of negatively impacting well-being and general health. The correlation between physiological, socio-cultural, developmental, psychological, and spiritual variables would affect how PWD perceive and deal with the stressors both internally and externally.

Furthermore, the model presupposes that every client system is unique, a compound of factors and features in a particular range of reactions entailed in a fundamental structure. Several known, undisclosed, and comprehensive stressors are in place. Every stressor varies in its likelihood of interrupting a client's usual stability level or normal line of defence (LOD). The particular inter-relationship of client variable at any point in time can affect the degree to which a client is protected by the flexible line of defense against possible reaction to stressors.

Every client or client system has evolved a normal range of responses to the environment. The normal LOR may be employed as a standard for measuring health variance. Whenever the flexible LOD is incapable of stabilizing the client or client system at odds with a given environmental stressor, the latter quantum leaps the normal LOR.

Despite the state of wellness or illness, the client is an active compound of the correlation of the variables. Wellness is on a continuum of available energy to support the system in an ideal

condition of system wellness. Inferred within every client system are interior resistance elements called LOR, supporting and readjusting the client to the common stable condition.

CHAPTER THREE: METHODOLOGY

3.1 Study design

The research design employed was a cross-sectional design using a structured questionnaire where each participant was given one questionnaire to fill the best responses to each question. The participant's medical records were also reviewed to assess the blood sugar levels before and after the pandemic. The data was collected at a single point in time at the month of September 2021.

The cross-sectional study entails collecting information at a single point in time, it does not involve manipulation of variables and also allows the researcher to look at numerous characteristics at once. The cross-sectional study design also is often used to look at the prevailing characteristics in a given population and can provide information about what is happening in the current population.

3.2 Study site

Kenyatta National Hospital is the oldest hospital in Kenya. It was founded in 1901 as a Native Civil Hospital and had a bed capacity of 40. In 1952 it was renamed the King George VI Hospital. At that time the settler community was served by the nearby European Hospital (now Nairobi Hospital). The facility was renamed Kenyatta National Hospital by the first president Mzee Jomo Kenyatta after independence. It is currently the largest public referral and teaching hospital in the country. Kenyatta National Hospital employs over 6,000 staff and has a bed capacity if 1,800. The hospital complex sits in an area of 45.7 acres.

The study was undertaken at the diabetic clinic situated within KNH. People who attend the clinic come from Nairobi County with a population of approximately 5million and all other parts of Kenya, especially for cases that have been referred for specialized treatment. KNH been a referral and teaching hospital means that all counties in Kenya were likely to been represented. The patients are assessed regularly by clinicians for sugar levels, BMI, any diabetic complications which might arise and are health educated about the diet, exercise and signs of common complications of DM and how to manage the complications before seeking medical interventions. The clinic meets daily from Monday to Friday, and an average of 100 clients are seen by clinicians and nutritionists and advised accordingly.

3.3 Study population

The study population for this study were all adult patients diagnosed with DM and on active management attending KNH diabetic clinic. The patients were to have been diagnosed with DM six (6) months before the emergency of COVID-19 in Kenya that is by September 2019.

3.3.1 Inclusion Criteria

The participants included were all the patients on active management of DM at KNH diabetic clinic and had been on follow up six (6) months before the emergence of the COVID-19 pandemic. The participant had been diagnosed with DM before September 2019. The participants were aged 18 years and above and of a sound mind. The participants had no any other comorbidities.

The research assistant disclosed the content of the study to the participants, written consent was provided to the participants to read and understand, and then gave a signed consent for those who wanted to participate in the study. The research assistant also interpreted the consent information to the participants who were unable read and understand English. Participants willing to participate in the study were supposed to give informed consent.

3.3.2 Exclusion Criteria

The study excluded participants with COVID-19 signs and symptoms. Very sick patients admitted in the wards were also be excluded from the study. Patients with comorbidities were also excluded and also participants who had no clinic appointment during the data collection period. Participants who were unwilling to participate and unable to give informed consent were also excluded. The rationale for exclusion were due to observation of COVID-19 preventive measures, the study was confined to the diabetic clinic only and the data was collected at a fix point time and also the participants were required to give an informed consent.

3.4 Sample size

To establish the research sample size, modified Fischer *et al* (1990) was adopted to determine the sample size for the study as illustrated below:

$n=z^2pq/d^2$

Where; n=the desired sample size when target population is more than 10,000

z=the standard normal deviation (set at 1.96)

p=the proportion of the target population estimated to have a particular characteristic of being measured estimated at 50% (0.5)

q= compliment of p, i.e., 1.0-p

Thus; $n= (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2$

$=384$

Since the study area has a population of less than 10,000, the following formulae was used to determine the final sample size

nf=n/1+(n/N)

where nf=the desired sample size (population less than 10,000)

n=the desired sample size (population more than 10,000)

N is the estimated population of patients with diabetes attending KNH diabetic clinic per month was 300 and this number includes both the old and new cases.

nf = 384/1 + 384/300)

nf = 384/(1+1.28)

nf = 384/2.28

nf = 168 patients.

The sample size for the study was one hundred and sixty-eight (168) patients.

3.5 Sampling Technique

The purposive sampling technique was employed to recruit the suitable participants who met the inclusion criteria as they entered the clinic. After the suitable participants had been selected, they were informed about the study to include the purpose of the study, what was expected if they consented to participate in the study, any risk, harm or discomfort associated with the

study and any benefits associated in participating in the study. Those willing to participate signed an informed consent and proceed to fill the structured questionnaire.

Purposive sampling is a non-probability sampling method in which the researcher uses his/her judgement when choosing members of a population to participate in a study. The sampling method is directed by the inclusion criteria in participating in the study and the researcher will chose participants who meets the inclusion criteria.

3.6 Recruitment of participants

The researcher sought for permission to carry out the study from KNH administration. After the authorization was provided, the researcher informed the staff working at the diabetic clinic about the research. The researcher and his assistants identified the eligible participants meeting the criteria to participate in the study, then adequately explained the study to the potential participants and also obtain an informed consent from the potential willing participants. Study participants who met the criteria and consented to participate in the study were included. The recruitment took place at the KNH diabetic clinic during working hours from Monday to Friday at 0900hrs to 1600hrs. This happened in the month of September 2021.

3.6.1 Participant Consenting

The researcher or his assistants took the potential participants through the participants' information statement sheet and consent form. The researcher/assistants explained the crucial aspects of the study including study background, nature and objectives, the purpose of the study, the implications of participation in terms of benefits, utility and risks if any that may result due to taking part in the study to the participants. The potential participants were allowed to ask any questions to clarify any aspects relating to the study. If they consented to participate, they were taken through the statement of consent declaration. Once the participant expresses an understanding of the terms agreed then they were given a consent form to sign.

3.7 Data collection tools

The researcher used a self-administered questionnaire to obtain data from DM patients attending KNH diabetic clinic. The tool consisted of demographic data, the risk factors of DM, DM management practices, the effects of COVID-19 pandemic on DM management and COVID-19 preventive measures. The questionnaire was formulated according to a model

established during the literature review and modified to suit the locality of the study. The structured questionnaire comprised of close-ended questions and multiple-choice questions. The questionnaire was pre-tested at the KNH Medical Wards.

3.7 Validity and Reliability

The validity and the reliability of the instruments were done as follows:

3.7.1 Validity

Validity refers to examining the level of accuracy of a given result or a computation of how efficient the design technique could estimate whatever they are to quantify during a study. Thus, this study was to carry out assessment face validity via pilot tests that was undertaken before the survey. The research supervisor reviewed the items to mark out their face validity. Content validity is defined as the scope with which the study questions are expressive of expected perceptions (Aday, 1996). To determine content validity, every construct measure was obtained from studies applying enhanced reliability stability.

3.7.2 Reliability

Reliability is the test of replicability or constancy of study results (Mohamad et al., 2015) Reliability was determined by the extent to which the instrument gave the same results on repeated trials. Cronbach's Alpha was applied to test obtained data reliability. Cronbach's Alpha may take any value from zero (no interior constancy to one (complete interior constancy). According to the proposal by Nunnaly (1978), as a thumb rule, score with ranges from 0.5- 0.6, 0.6- 0.7, 07- 0.8, 0.8- 0.9 ought to be contemplated to have an interior constancy which is flawed, contentious, permissible, or good respectively. Values that exceed 0.9 denote exceptional constancy, whereas those less than 0.5 are contemplated to be unsatisfactory. The measure of reliability of the study was pretested using the structured questionnaires from twenty (20) selected respondents from KNH medical wards. Cronbach alpha coefficient was computed using Statistical Package for Social Sciences (SPSS) version 28. The Cronbach coefficient value above 0.8 showed the measurement procedure was reliable.

3.8 Data Analysis

Computer aided programs SPSS version 28 was used to analyze the quantitative data. Basic descriptive analysis of demographic and results presented using the measures of central

tendency with appropriate measures of continuous variables and measures of association. The data variables were summarized using descriptive statistics and also cross-tabulation of variables individually between a dependent and independent variable. A multiple regression test was employed during the analysis of categorical variables to examine the linkage between dependent and independent variables of the study participants. The degree of significance was set at $p<0.05$.

3.9 Ethical Considerations

Ethical approval to undertake research was obtained from the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee. Authorization to conduct the study was also sought from the KNH administration. Study participants voluntarily signed the informed consent before partaking in the study have been informed of the particulars and purpose of the research. Additionally, the study was devoid of any coercion or induction of persons to partake in it. Further, the anonymity of the respondents was guaranteed through the sterilization of the structured questionnaires. There was no identification form needed from respondents, neither was any makers be made to recognize any respondent in any questionnaires obtained. Every research tool was accessible by the analyst alone. Every research tool was stored with guaranteed security of study information by encrypting computers with passwords.

The contacts of a member of the Ethics Research Committee and those of research supervisors were availed on the consent form so that in any case a study participant feels his/her rights are violated during the period of research, they can report to any contact provided. The respondents were free to query anything about the study, and responses were provided to their satisfaction. Besides, the researcher questioned the respondents concerning the provided information to determine their understanding of the research before signing consent forms. Also, the researcher decoded feedback and proposals following the study's completion to make sure respondents benefitted from the research findings. Further, the study participants were guaranteed a lack of conflict of interest from the researcher concerning the study. Participation in this research was voluntary, and no remuneration was availed to the study participants. Participation was voluntary and there was no penalty. Moreover, the respondents hold on to the right to withdraws from the research with no repercussions. Besides, participants had the freedom of not responding to questions making them uncomfortable. The researcher and supervisors declared no conflict of interest concerning the research.

3.10 COVID-19 preventive measures

The researcher and his assistants ensured that the data was filled in an open well-ventilated space to safeguard the participants from COVID-19 infection. The researcher used self-administered questionnaire where the participant was given a questionnaire to fill the best responses assisted by research assistants. All participants were screened before entering the study area and any participant with signs and symptoms of COVID-19 were referred according to the KNH policy.

All participants were required to wear a face mask before entering the study area and at all time thereafter. The participants were encouraged to wash hands before entering and frequently thereafter with soap and running water which were available at all times at the entrance and also at designated hand washing points. Enough alcohol-based hand sanitizers were also placed in various designated places to ensure that transmission between person to person was prevented/minimized. The social and physical distancing of one meter apart between the participants was maintained at all times to prevent close contact transmission between the participants. The researcher and his assistants ensured that proper personal protective equipment was wore at all times during the data collection period.

3.11 Dissemination plan

A duplicate of the comprehensive study report shall be submitted to the Ethics and Research Committee. Research findings will be submitted to the Department of Nursing Sciences faculty and students during thesis defense and school websites and will also be shared with the Kenyatta National Hospital Diabetic clinic for future reference. A duplicate of the final study report shall be availed to the University of Nairobi library for future reference. The study findings will be published in one of the international journals. The research findings will be presented at a scientific conference of health care workers and stakeholders.

CHAPTER FOUR: RESULTS

4.0 Introduction

This chapter presents data analysis and the findings of the study. The chapter includes the socio-demographic data, the blood sugar levels before and during the COVID-19 pandemic and the blood control practices during the pandemic.

The study was based on determination of blood sugar control practices in patients with DM during the COVID-19 pandemic attending KNH Diabetic clinic. A total of 168 questionnaires were administered and all were returned realizing a response rate of 100%

4.1 Respondents socio-demographic characteristics

A total of 168 respondents participated in the study. The study shows that a higher proportion of the respondents (35.1%) were aged above 60 years. Majority of them were females (58.3%), married (75%), belong to Christian religion (97%), self-employed (51.2%) and urban residents (72%). Approximately one third (35.1%) were not employed. About, half (47.6%) had secondary level of education (Table 1).

Table 1 Respondents Socio-demographic characteristics

Characteristics	Frequency	Percent
Age (years)		
Below 50	56	33.3
50-59	53	31.5
≥ 60	59	35.1
Total	168	100.0
Gender		
Female	98	58.3
Male	70	41.7
Total	168	100.0
Marital Status		
Married	126	75.0
Single	15	8.9
Divorced/Separated/Widowed	27	16.1
Total	168	100.0

Level of education		
None-primary	47	28.0
Secondary	80	47.6
Tertiary	41	24.4
Total	168	100.0
Religion		
Christian	163	97.0
Muslim	5	3.0
Total	168	100.0
Occupation		
Employed by the government	16	9.5
Not employed	59	35.1
Self employed	86	51.2
Used by a private firm	7	4.2
Total	168	100.0
Permanent residence		
Urban	121	72.0
Rural	47	28.0
Total	168	100.0

4.2 Respondents Random Blood Sugar levels before and during COVID-19

Changes in Random Blood Sugar (RBS) levels before and during COVID-19 is presented in figure 2. Before COVID -19, majority (54.2%) had high level of Random Blood Sugar (≥ 8 mmol/L). While, during COVID-19, there was an improvement in RBS, where majority (50.6%) had normal level of RBS. Further analysis with paired t-test showed that there was a significant ($p = 0.005$) mean reduction of RBS level during COVID-19 (8.60 mmol/l) as compared before COVID -19 (9.54 mmol/l) (Table 2).

Figure 2. Levels of Random Blood Sugar before and during COVID-19 (%)

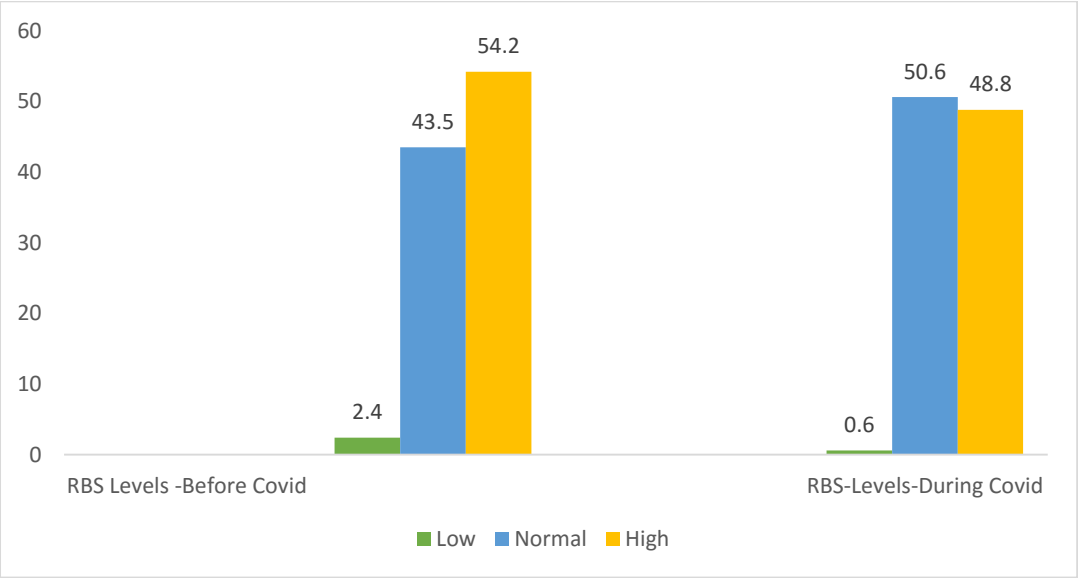


Table 2. Comparison of Blood sugar levels before and during COVID-19 (Mean±SD)

Before COVID-19	During COVID-19	Mean difference	Paired t-test	df	p-value
9.5423(4.381)	8.6018 (3.225)	-0.94	2.875	167	0.005

4.3 Blood sugar control practices during COVID-19 pandemic

The blood sugar control practices during COVID-19 pandemic included the respondents lifestyle modifiable practices, respondents compliance with treatment regime and respondents health maintenance practices.

4.3.1 Respondents lifestyle modifiable practices during COVID-19 pandemic

Table 2 presents modifiable factors of the respondents during COVID -19. Majority (87.5%) of the respondents were on diabetic diet during the COVID-19 pandemic. Only, 12.5% were not on diabetic diet, of which, most (76.2%) reported that diabetic diet is costly. However, most, 73.2% stated that they did their eating habits during covid-19. Of the respondents, one quarter (25%) were alcohol consumers. Of those who consumed alcohol, a higher proportion (40.4%) took alcohol for less than five years. Furthermore, about half (46.5%) of the alcohol consumers, they reported they stopped it during the COVID-19 pandemic. Regarding physical activity, majority, (63.1%) reported there was no change in their physical activity. Only 6% of the respondents were cigarette smokers during the COVID -19 pandemic. Of the smokers, 40% reported that they decreased frequency of smoking. While, another 40% did not change their smoking habits.

Table 3 Respondents lifestyle modifiable practices during COVID-19

Characteristics	Frequency	Percent
Are you on a diabetic diet		
No	21	12.5
Yes	147	87.5
Total	168	100.0
If not on a diabetic diet, why		
I don t know the diabetic diet	5	23.8
The foods are costly	16	76.2
Total	21	100.0
Effect of COVID-12 on eating habits		
Decreased my eating habits	32	19.0
No change in eating habits	123	73.2
Increased my eating habits	13	7.7
Total	168	100.0
Alcohol intake		
No	126	75.0
Yes	42	25.0
Total	168	100.0
During of alcohol consumption		
Less than five years	17	40.4
6- 10 years	8	19.0
11- 15 years	6	14.3
Over 15 years	11	26.2
Total	42	100.0
Changes in alcohol consumption during COVID-19		
Stopped	20	46.5
Decreased	14	33.3
No change	5	11.9
Increased	3	7.1
Total	42	100.0
Effect of COVID-19 on physical activities		
Stopped physical activity	22	13.1
Decreased physical activity	36	21.4
No change	106	63.1
Increased physical activity	4	2.4
Total	168	100.0
Smoking status		
No	158	94.0
Yes	10	6.0
Total	168	100.0
How has COVID-19 affected your smoking		
Decreased my smoking	4	40.0
I did not change my smoking	4	40.0

I stopped smoking	1	10.0
Increased my smoking	1	10.0
Total	10	100.0

4.3.2 Respondents compliance with treatment regime during COVID-19 pandemic

Of the respondents, a higher proportion (40.5%) visited the hospital to refill their medication. Approximate one quarter, (26.8%) visited the hospital for consultation, and another quarter for follow up (25%). Majority, (76.8), of the respondents were on oral hypoglycemic agents. About one fifth (19.6%) were on insulin therapy. Of the respondents, majority (82.1%) reported that their clinic appointment was not affected at all by the COVID-19. Moreover, most (65.5%) reported that COVID-19 did not affect their drug refill. Most, 53% of the respondents, refilled their drugs and consulted directly from KNH diabetic clinic. However, a small percentage (14.3%) and (13.1%) stopped honoring clinic appointments and drug refill, respectively. Regarding mode of payment for diabetes services, most (72%) reported that they use out of pocket (Table 4).

Table 4. Respondents compliance with treatment regime during COVID-19 pandemic

Characteristics	Frequency	Percent
Reasons for visiting the hospital		
Consultation	45	26.8
To refill my medication	68	40.5
For treatment	13	7.7
For follow up	42	25.0
Total	168	100.0
Current treatment		
Oral hypoglycemic agents	129	76.8
Insulin	33	19.6
Both oral and Insulin	6	3.6
Total	168	100.0
Effects of COVID-19 on clinic appointments		
I consult my clinician through the phone	4	2.4
I sent my relative on my behalf	2	1.2
I stopped honoring appointments	24	14.3

Not affected at all	138	82.1
Total	168	100.0
Effects of COVID-19 on drug refill		
I refill from a pharmacy	25	14.9
I seek refill through delivery from the pharmacy	11	6.5
I stopped going for a refill at the hospital	22	13.1
Not affected at all	110	65.5
Total	168	100.0
Drug refill during lockdown		
From KNH diabetic clinic	89	53.0
From chemists	61	36.3
From local health facilities	12	7.1
I did not refill my drugs	6	3.6
Total	168	100.0
Methods of consultation during COVID-19 pandemic		
I went direct to KNH diabetic clinic	89	53.0
I consult through telephone calls	3	1.8
I consulted my local healthcare providers	73	43.5
I did not consult at all	3	1.8
Total	168	100.0
Mode of payment for diabetes services		
Out of pocket	121	72.0
From families and friends	26	15.5
National Health Insurance Fund	17	10.1
Private insurance	4	2.4
Total	168	100.0

4.3.3 Respondents health maintenance practices during COVID-19 pandemic

Majority, 59%, of the respondents reported that they used face mask when going to the market place. Approximate half, (48.8%) said that they sent someone to get foodstuff from market place. Regarding physical activity, about a third, 33.3% stated that they exercised less frequently than the recommended level of physical activity. While, approximately, one fifth (19%) reported that they never engaged in physical activity during the COVID-19 pandemic.

Most, 82.1% reported that their source of income was affected by COVID-19 pandemic. Of those whose income was affected, most (69.6%) stated that the effect was severe. Moreover, majority, 57.7% of the respondents reported that their major constraint regarding diabetes management was lack of money to buy drugs.

Table 5. Respondents health maintenance practices during COVID-19 pandemic

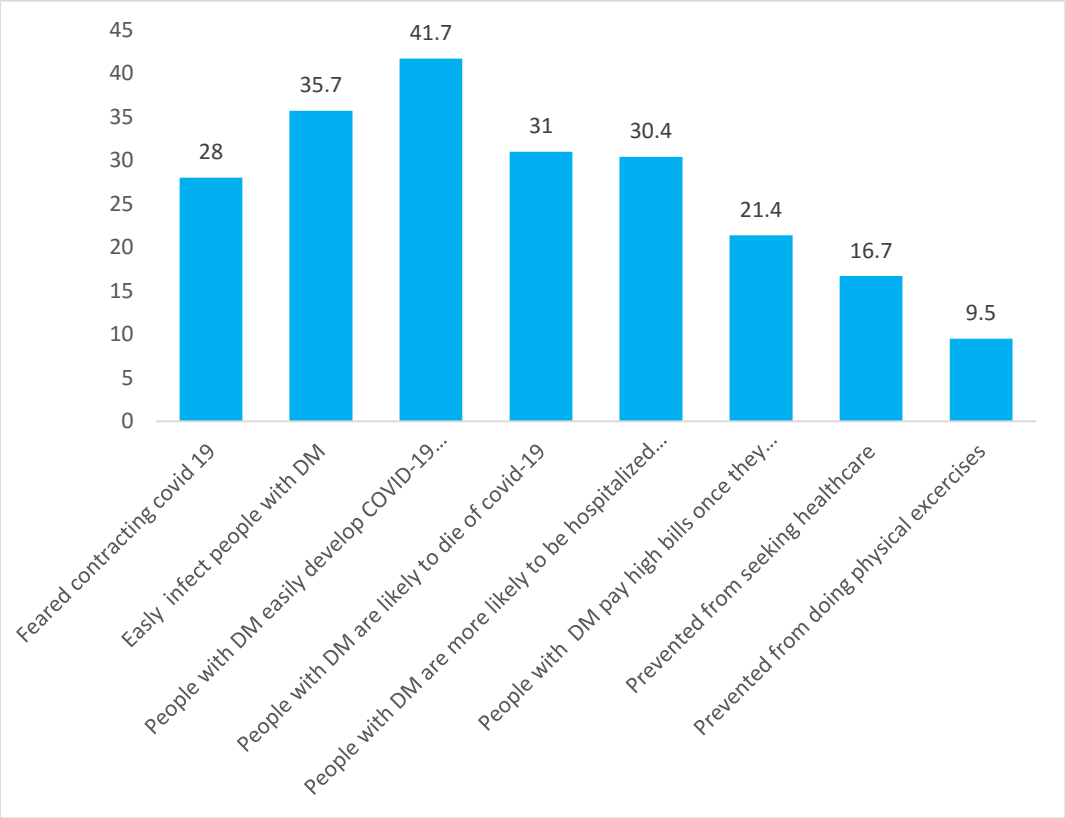
Characteristics	Frequency	Percent
Maintain diabetic diet without exposing yourself to COVID -19		
It took my foodstuff from my kitchen garden	22	13.1
I bought foodstuff from market place in bulk	22	13.1
I used face mask when going to the market place	99	59.0
I sent someone to get foodstuff from market place	82	48.8
Total	168	100.0
Exercise maintenance without exposure to COVID-19		
I did not exercise at all	32	19.0
I exercise in open fields	32	19.0
I exercise less frequently	56	33.3
I used face mask when exercising	48	28.6
Total	168	100.0
Has the COVID-19 affected source of income		
No	30	17.9
Yes	138	82.1
Total	168	100.0
If yes, to what extent		
Slightly	8	5.8
Moderately	34	24.6
Severely	96	69.6
Total	138	100.0
Had constraints on diabetes management		
No	41	24.4
Yes	127	75.6
Total	168	100.0
If yes, what were the constraints		
Lacked money to buy drugs	90	57.7
Lacked money for appointments	15	9.6
Lacked money for proper nutrition	51	32.7
Total	156	100.0

4.3.3.1 Respondents perception towards COVID--19 infection in relation to DM

Of the respondents, a higher proportion (41.7%) perceived that people with DM easily develop COVID-19 complications. Approximately one third (35.7%) of them perceived that people

with DM are more likely to be infected by COVID-19. Close to a third (30.4%) and (31%) of the respondents perceived that people with DM are more likely to be hospitalized and die of covid-19, respectively (Figure 3).

Figure 3. Respondents perception towards COVID-19 infection in relation to DM (%)



4.3.3.2 Respondents preventive measures of COVID-19 pandemic

Of the respondents, nearly, half (48.8%), always went outside of their residence during the COVID-19. Majority, went outside of their residence during the covid-19 for work (63.7%) and clinic appointments (62.5%). Others they went out to do shopping (48.8%) and exercise (14.3%). All the respondents reported that they wear their masks when they go public places. Most (77.4%) reported they always wear their masks. Moreover, most (61.3%) reported that they wash their hands with soap and water. However, a good number (38.1%) rarely practiced hand washing during the COVID-19 pandemic. Furthermore, majority, (71.4%) reported that they always maintain social distancing when in public places (Table 5).

Table 6. Respondents Preventive measures of COVID-19 pandemic

Characteristics	Frequency	Percent
Frequency of going outside of residence during this COVID-19		
Always	82	48.8
Sometimes	67	40.0
Rarely	19	11.3
Total	168	100.0
What makes you go out		
Work	107	63.7
Clinic appointments	105	62.5
Shopping	82	48.8
Exercise	24	14.3
Total	168	100.0
You wear masks when in public places		
Yes	168	100.0
No	0	0.0
Total	168	100.0
How often do you wear a mask		
Always	130	77.4
Sometimes	36	21.4
Rarely	2	1.2
Total	168	100.0
How often do you wash your hands with soap and water?		
Always	103	61.3
Sometimes	1	0.6
Rarely	64	38.1
Total	168	100.0
How often do you maintain social distancing when in public places		
Always	120	71.4
Sometimes	43	25.6
Rarely	5	3.0
Total	168	100.0

4.4 Determining the association of respondents blood sugar levels during COVID-19

The association of respondents blood sugar levels during COVID-19 pandemic was determined by looking at the relationship between socio-demographics and levels of RBS and also the association between the blood sugar control practices and levels of blood sugars.

4.4.1. Relationship between socio-demographics and levels of RBS

Chi-square statistics were used to show the relationship between the socio-demographic and the levels of RBS. The study showed that there was no significant difference between socio-demographic factors and levels of RBS in this study population during the COVID-19 pandemic. Respondents aged above 60 years (59.3%) were more likely to have normal RBS relative to respondents aged below 40 years (47.1%), however, the difference was not significant (p= 0.408). Regarding gender, females (55.1%) were more likely to control their blood sugar as compared to their male counterparts (44.3%), but the difference was not significant (p=0.156). Concerning marital status, single respondents (26.7%) were less likely to control their blood sugar level relative to married individuals (52.4%). The difference was marginally significant (p= 0.059). Respondents with tertiary level of education (41.5%) were less likely to have normal blood sugar level compared to individuals with none-primary (46.8%) and secondary (57.5%) level of education. However, the difference was not statistically significant (p =0.183). Regarding employment status, respondents who were not employed (45.8%) were less likely to control their blood sugar level relative to government employees (68.8%), but the difference was not significant (p= 0.558) (Table 8)

Table 7. Relationship between socio-demographics and levels of RBS (%)

Characteristics	Levels of RBS			Total	Chi-Square	df	p-value
Age group (years)	Low	Normal	High				
Below 40	0(0.0)	8(47.1)	9(52.9)	17(100.0)	4.091		0.408*
40-59	1(1.1)	42(45.7)	49(53.3)	92(100.0)			
60 and above	0(0.0)	35(59.3)	24(40.7)	59(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Gender							
Female	0(0.0)	54(55.1)	44(44.9)	98 (100.0)	3.000		0.156*
Male	1(1.4)	31(44.3)	38(54.3)	70(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Marital Status							
Married	0 (0.0)	66(52.4)	60(47.6)	126(100.0)	8.721		0.059*
Single	1(6.7)	4(26.7)	10(66.7)	15(100.0)			

D/S/W	0(0.0)	15(55.6)	12(44.4)	27(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Education							
None-primary	0 (0.0)	22(46.8)	25(53.2)	47(100.0)	5.403		0.183*
Secondary	0(0.0)	46(57.5)	34(42.5)	80(100.0)			
Tertiary	1(2.4)	17(41.5)	23(56.1)	41(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Employment status							
Gov. Employed	0(0.0)	11(68.8)	5(31.3)	16(100.0)	5.877		0.558*
Private employed	0(0.0)	4(57.1)	3(42.9)	7(100.0)			
Self-employed	1(1.2)	43(50.0)	42(48.8)	86(100.0)			
Not employed	0(0.0)	27(45.8)	32(54.2)	59(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
*Fisher's Exact Test, D/S/W = divorced, separated, widowed							

4. 4.2. Association between blood sugar control practices and levels of blood sugar during the COVID-19 pandemic

Association between blood sugar control related practices and levels of RBS during the COVID-19 pandemic is shown in table 9. Respondents who were under oral hypoglycemic agents (47.3%) were less likely to control their blood sugar level as compared to respondents who were under insulin (66.6%) and both oral and insulin treatment (66.7%). However, the difference was not statistically significant (p= 0.498). There was not difference in blood sugar levels whether the respondents were on diabetic diet (50.7%) or not (50%). Interestingly, respondents who consumed alcohol (57.1%) were more likely to control their blood sugar level as compared to respondents who did not take alcohol (48.4%), however, the difference was not significant (p =0.533). Regarding exercise, respondents (75%) who reported increased their physical activity were more likely to have normal RBS as compared to those who stopped physical activity (40.9%) during the COVID-19 pandemic. However, the difference was not statistically significant (p= 0.727). Respondents with history of cigarette smoking (40%) were less likely to control their blood sugar level relative to none smokers (51.3%), but this difference was not significant (p=0.558).

Table 8. Association between blood sugar control practices and levels of blood sugar during the COVID-19 pandemic (%)

Characteristics	Levels of RBS			Total	Chi-Square	df	p-value
Type of diabetic drug	Low	Normal	High				
Oral hypoglycemic	1(0.8)	61(47.3)	67(51.9)	129(100.0)	4.450		0.498*
Insulin	0(0.0)	20(66.6)	13(39.4)	33(100.0)			

Both oral and insulin	0(0.0)	4(66.7)	2(33.3)	6(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
On diabetic diet							
No	0(0.0)	11(50.0)	11(50.0)	22(100.0)	0.659		1.000*
Yes	1(0.6)	74(50.7)	71(48.6)	146(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Alcohol intake							
No	1(0.8)	61(48.4)	64(50.8)	126(100.0)	1.292		0.533*
Yes	0(0.0)	24(57.1)	18(42.9)	42(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Physical activity							
Stopped PA	0(0.0)	9(40.9)	13(59.1)	22(100.0)	5.273		0.727*
Decreased PA	0(0.0)	20(55.6)	16(44.0)	36(100.0)			
No change in PA	1(0.9)	53(50.0)	52(49.1)	106(100.0)			
Increased PA	0(0.0)	3(75.0)	1(25.0)	4(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
Cigarette smoking							
No	1(0.6)	81(51.3)	76(48.1)	158(100.0)	1.699		0.558*
Yes	0(0.0)	4(40.0)	6(60.0)	10(100.0)			
Total	1(0.6)	85(50.6)	82(48.8)	168(100.0)			
*Fisher's Exact Test, PA= Physical activity							

CHAPTER FIVE: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter provides the summary of the findings, conclusions and the recommendations of this study. The findings are discussed under the sections based on the objectives of the study. It has also considered other studies whose findings either corresponded to or disagreed with the findings of the study. The conclusions presented in the chapter are drawn from the data analysis and recommendations for future area of research are identified.

5.1 Respondents socio-demographic characteristics

Majority of the respondents were females, married, belong to Christian religion, self-employed and urban residents, about half had secondary level of education. This affirms to a study done by Wild et al (2014) which shows that DM is common among the urban residents and persons of advanced age. Most studies done cited that male gender is more commonly diagnosed with DM contrary to this study which revealed that majority of the respondents were female. This can be attributed to the fact that female seeks medical attention more often than their male counterparts. Urbanization has also e associated with the development of DM due to the sedentary lifestyle and also due to limited spaces to exercise and this corresponds to a study done by Ayah et al., 2013. A study done by Pond et al found out that the quality of DM control was worse in women than men at all ages and the author suggested that this may be because women often have to cope with both their DM and the care of their families.

Female respondents were more likely to be on diabetic diet as compared to their male counterparts. This is due to the fact that female gender is more likely to come in contact with the foodstuff due to their roles when shopping, preparing and cooking food and also caring for the family. These findings are consistent with study done by Kimani and colleagues that revealed that females had higher BMI because they had easy accessibility to food stuffs (Kimani et al., 2019).

In regard to marital status, the divorced/separated/widowed were more likely to be on diabetic diet relative to married respondents. Respondents with no or primary level of education were less likely to be on diabetic diet as compared to individuals with secondary and tertiary level of education. This is associated with the level of knowledge one acquires with the level of education.

About employment status, respondents who were not employed were less likely to be on diabetic diet relative to employed ones due to affordability issues.

5.2 Respondents RBS levels before and during COVID-19 pandemic

Before COVID -19, majority of the respondents had high level of Random Blood Sugar (≥ 8 mmol/L) and slightly less than half had their RBS within normal range (3.5-7.9mmol/l) While, during COVID-19, majority of the respondents had their RBS within normal range and slightly less than half had high RBS. There was an improvement in RBS during the COVID-19 pandemic. Further analysis with paired t-test showed that there was a significant mean reduction of RBS level during COVID-19 (8.60 mmol/l) as compared before COVID -19 (9.54

mmol/l). The difference of the mean RBS before COVID-19 and mean RBS during COVID-19 was statistically significant.
This can be attributed to the fact that, during COVID-19 pandemic, majority of the respondents adhered to the DM control practices with a view of preventing contracting COVID-19 disease. The COVID-19 containment measures also contributed significantly to the reduction of blood sugar levels during the pandemic.
A study in done by Eberle & Stichling., 2021, showed that the glycemic control of patients with T1DM improved slightly during COVID-19 lockdown although the same study the glycemic values worsened during the short term lockdown. A similar study done in Spain by Pla et al., 2020 processed similar results showing that glycemic control I patients with T1DM improved during the COVID-19 pandemic.

5.3 Blood sugar control practices during COVID-19 pandemic

Majority of the blood control practices were maintained during the COVID-19 pandemic and included lifestyle modifiable factors, compliance to treatment regime and maintenance of healthy practices.

5.3.1 Respondents lifestyle modifiable factors during COVID-19 pandemic

Majority of the respondents were on diabetic diet during the COVID-19 pandemic. Only, a small fraction was not on diabetic diet, of which, most of them reported that diabetic diet being costly. This finding is similar to a study done by (Sánchez-Sánchez et al., 2020), which shows that diet adherence slightly increased during the confinement period in the Spanish population. A study done by Mekonnen et al., 2021, contrasts this finding as it showed that the dietary adherence was relatively low during the COVID-19 pandemic.
Of the respondents, one quarter were alcohol consumers. Of those who consumed alcohol, a higher proportion took alcohol for less than five years. Furthermore, about half of the alcohol consumers, they reported they stopped it during the COVID-19 pandemic. Interestingly, respondents who consumed alcohol were more likely to control their blood sugar level as compared to respondents who did not take alcohol however, the difference was not statistically significant. Many studies published in the western countries and USA shows that moderate alcohol consumption has a beneficial effect to DM clients due to their cardio protective effect.
Regarding physical activity, majority, majority of the respondents who reported increased their physical activity were more likely to have normal RBS as compared to those who stopped physical activity during the COVID-19 pandemic. Physical inactivity may been associated with the fear of contracting the disease.
Only a very small fraction of the respondents were cigarette smokers during the COVID -19 pandemic. Of the smokers, less than half reported that they decreased frequency of smoking. This affirms a study done in Italy by Di Renzo et al., 2020, which 3% reduction of smoking during the COVID-19 lockdown. While, another less than half did not change their smoking habits. Respondents with history of cigarette smoking were less likely to control their blood sugar level relative to none smokers but this difference was not significant.

5.3.2 Respondents compliance with treatment regime during COVID-19 pandemic

Of the respondents, a higher proportion visited the hospital to refill their medication. Approximate one quarter, visited the hospital for consultation, and another quarter for follow up. Majority of the respondents were on oral hypoglycemic agents and about one fifth were on insulin therapy. Respondents who were under oral hypoglycemic agents were less likely to control their blood sugar level as compared to respondents who were under insulin and both oral and insulin treatment. However, the difference was not statistically significant.

Of the respondents, majority reported that their clinic appointment was not affected at all by the COVID-19 pandemic. Moreover, most reported that COVID-19 did not affect their drug refill. Most of the respondents refilled their drugs and consulted directly from KNH diabetic clinic. However, a small percentage stopped honoring clinic appointments and drug refill. A study done in Germany by Kostev et al.,2020, supports this finding in that there was a good drug adherence during COVID-19 pandemic compared to pre-COVID era. A similar study done in United Arab Emirates by Asheq et al., 2021, contrasts this finding as to shows that there was low compliance of persons receiving hypoglycemic medications during COVID-19 pandemic. Regarding mode of payment for diabetes services, most of the respondents reported that they use out of pocket for payment of the services offered.

According to Oliveira et al, 2020, WHO outlined measures to reduce the spread of COVID-19 pandemic including hand hygiene, social distancing and avoiding public gathering. These measures had devastating impacts on people's day to day activities and lifestyle.

The movement restriction imposed to contain the spread of COVID-19 pandemic did not affect most of the respondents as majority came with Nairobi County.

5.3.3 Maintenance of a healthy practices COVID-19 pandemic

Majority of the respondents reported that they used face mask when going out of their residence. Approximate half sent someone to get foodstuff and other household commodities outside their residence. Regarding physical activity, about a third stated that they exercised less frequently than the recommended level of physical activity. While, approximately, one fifth reported that they never engaged in physical activity during the COVID-19 pandemic. Majority of the respondents reported that their source of income was affected by COVID-19 pandemic. Of those whose income was affected, most of them stated that the effect was severe. Moreover, majority of the respondents reported that their major constraint regarding diabetes management was lack of finances to purchase drugs.

COVID-19 affected majority of people financially as they could not move freely to work and do business due to the imposed lockdowns and movement restrictions and also due to fear of one exposing himself/herself to the disease. Preventive measures mostly from WHO guidelines have been adopted to contain the disease. Also, the discovery of the COVID-19 vaccine is a big milestone in the fight of the disease.

5.3.3.1 Preventive measures of COVID-19 pandemic

Of the respondents, nearly, half always went outside of their residence during the COVID-19. Majority, went outside of their residence during the COVID-19 for work and clinic appointments. Others they went out to do shopping and minority for exercise. All the

respondents reported that they wear their masks when they go public places. Most reported they always wear their masks. Moreover, most of the respondents reported that they wash their hands with soap and water. However, a good number of the respondents rarely practiced hand washing during the COVID-19 pandemic. Furthermore, majority, reported that they always maintain social distancing when in public places. This measures affirms a study done by Lin et al., 2020 which emphasized on adopting behavioral protection mechanisms such as regular handwashing with running water and soap, self-isolation whenever one feels unwell, keeping social distance, and practicing respiratory hygiene. The Vietnam state embraced self-isolation of endangered groups, social distancing, compulsory isolation of symptomatic persons and everyone testing positive for the virus, central environmental sanitization, regular handwashing and putting on of face masks publicly (Nguyen et al., 2020).

In Kenya, the Ministry of Health (MOH) placed protocols at the end of March 2020 to enforce social distancing, hand washing with water and soap or using alcohol gel sanitizers, wearing a mask when in public and crowded places and also other measures included lockdowns, curfews to help contain the situation.

5.4 Conclusions

Despite the pandemic, there was a good adherence to dietary regime, hypoglycemic agents and WHO COVID-19 preventive protocols among the DM patients attending KNH Diabetic clinic. This shows that the health care providers and facilities upholded the treatment protocols with patients with chronic diseases DM included. A good adherence of blood control practices among the patients with DM is more critical during this COVID-19 pandemic and this was upholded by the patients with DM attending KNH Diabetic clinic. The blood control practices included behavioral modifications like reduction in alcohol consumption among alcoholic consumers and also reduction in cigarette smoking among the smokers. This ensured that the blood sugar levels were well controlled during the COVID-19 pandemic.

5.5 Recommendations

There is a need to be more vigilant and continue to monitor patients with DM during this period of lessened restrictions due to ongoing worldwide vaccination drive and also low reported COVID-19 cases. Clients with DM should be offered specific instructions for COVID-19 as well as blood sugar control and also be encouraged to get vaccinated against the COVID-19 disease as they are the most vulnerable group.

A further study with a different design and study site especially of rural setting is recommended and the study findings and results be compared with the results of this study. Also a different study after the discovery of COVID-19 vaccine and the blood control practices is recommended.

5.6 Limitations

The main limitation of the study was its cross-sectional design, assessment of blood sugar levels and blood control practices at one point of time might not give the true picture of the trend. The study area was at urban setting and the respondents may not have been affected by COVID-19 containment measures like the lockdowns due to the locality and the curfew imposed due to the times for attending the clinic and times the curfew was been imposed. The results of the study may not be generalized in other setting like in the rural settings. Use of structured questionnaire was likely to produce information bias. The opinions of the medical professionals and treatment supporters could also have been obtained for a more complete picture.

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Appendix 1: Letter to Ethics and Research Committee

Daniel Sombe Nzeki,
School of Nursing Sciences.
University of Nairobi,
P.O Box 19676,
Nairobi.
Date…….

To: The Chairman,
Kenyatta National Hospital-University of Nairobi,
Ethics and Research Committee,
P.O Box 20723,
Nairobi.
Dear Sir/Madam

RE: Request for a permission to conduct research at Kenyatta National Hospital

I kindly request for approval to conduct a research study titled "Determination of blood sugar control practices in patients with diabetes mellitus during COVID-19 pandemic attending Kenyatta National Hospital".

I am a second year student at the University of Nairobi, School of Nursing Sciences undertaking a Master of Science degree in Nursing (Medical/Surgical) and propose to undertake this study as a requirement for partial fulfillment of the degree.

Attached please find the study proposal for the study.
Looking forward for your positive response.

Yours faithfully

Daniel Sombe Nzeki
H56/34412/2019
Email Address: h56344122019@students.uonbi.ac.ke
Phone No: +254727777803

Appendix 2: Letter to Kenyatta National Hospital

Daniel Sombe Nzeki,
School of Nursing Sciences.
University of Nairobi,
P.O Box 19676,
Nairobi.
Date…….

To:
The Chief Executive Officer,
Kenyatta National Hospital-University of Nairobi,
P.O Box 20723,
Nairobi.
Dear Sir/Madam

RE: Request for a permission to conduct research at Kenyatta National Hospital

I kindly request for approval to conduct a research study titled "Determination of blood sugar control practices in patients with diabetes mellitus during COVID-19 pandemic attending Kenyatta National Hospital.

I am a second year student at the University of Nairobi, School of Nursing Sciences undertaking a Master of Science degree in Nursing (Medical/Surgical) and propose to undertake this study as a requirement for partial fulfillment of the degree.

Attached please find the study proposal for the study.
Looking forward for your positive response.

Yours faithfully

Daniel Sombe Nzeki
H56/34412/2019
Email Address: h56344122019@students.uonbi.ac.ke
Phone No: +254727777803.

Appendix 3: Introduction Letter

Daniel Sombe Nzeki,
P.O. Box 19676,

Nairobi.

Date

The Participant

Dear Sir/Madam,

RE: Invitation to participate in a study

My name is Daniel Sombe Nzeki (Student No. H56/34412/2019) a Postgraduate student at the University of Nairobi under the supervision of Dr. Lilian Adhiambo Omondi and Dr. Samuel Kimani. I am a second year student currently undertaking a Master of Science Degree in Nursing (Medical/Surgical). I am required to carry out a research as part of the course. My proposed study is "Determination of blood sugar control practices in patients with diabetes mellitus during COVID-19 pandemic attending Kenyatta National Hospital". I am inviting you to participate in this study.

I hope that the findings of the proposed study will enhance nursing knowledge and facilitate an improved quality of life for people Diabetes Mellitus. A structured questionnaire will be used to collect the data and will take you the participant 30-45 minutes. All information will be confidential and no personal identifiable data will be included in the study. All data from the questionnaire will be managed, stored and disposed of as per the Data Protection Acts and Data Compliance Guidelines. Also, your right to withdraw from the study at any stage is guaranteed.

If you would like to participate in the study, please sign the attached consent form. If you have any questions before making a decision, please feel free to tell me and this will be kept. Please feel free also to contact me on h56344122019@students.uonbi.ac.ke in regard to any queries you may have or on mobile number 0727 777 803, Supervisors contact Dr. Lilian Adhiambo Omondi, Mobile No. 0720861317, email laomondi@uonbi.ac.ke, Dr. Samuel Kimani, Mobile No. 0722384917 email: thuo.kimani@hmail.com or ERC 2726300 Ext 44102, email uonknh_erc@uonbi.ac.ke

Yours faithfully,

Daniel Sombe Nzeki

MScN Student University of Nairobi

Appendix 4: Participants' information statement sheet

Study Title: Determination of blood sugar control practices in patients with diabetes mellitus during COVID-19 pandemic attending Kenyatta National Hospital.

INVESTIGATOR: Daniel Sombe Nzeki
School of Nursing Sciences
University of Nairobi
P.O Box 19676, Nairobi
Phone No. 0727-777803

Introduction:

I am a student at the University of Nairobi pursuing a Masters of Science Degree in Nursing (Medical Surgical). I am conducting a study titled: "Determination of blood sugar control practices during COVID-19 pandemic among patients with Diabetic Mellitus attending Kenyatta National Hospital". The purpose of this information is to give you details about the study that will enable you to make an informed decision regarding your participation. You are free to ask questions to clarify any of the aspects we will discuss in this information and consent form. The researcher will also ask you questions regarding the study before you sign the consent form to ascertain your comprehension of the information provided.

The Purpose of the study:

The purpose of this study is to determine blood sugar control practices during COVID-19 pandemic among patients with diabetes mellitus attending Kenyatta National Hospital. The aim is to understand how the COVID-19 pandemic affected the blood sugar control practices to diabetes mellitus patients. This will inform best design and review of the implementation approaches to ensure diabetes mellitus services are provided with minimal interruptions.

i).Risks: There are no economic or physical risks to participating in the study. However, due to the time taken in responding to question, you may take a longer time than usual at your clinic. Also during the interview, some questions will require you to disclose some personal information that might trigger some negative feelings and possibly anxiety. If this happens, the

researchers will refer you to the hospital counsellor. The researcher will also endeavor to spend approximately 3-45 minutes with you.

ii).Confidentiality: Confidentiality will be maintained and the information you provide will only be used for the intended purpose of the study. Besides, your name will not be required on any forms or used during publication of the final report thus ensuring your anonymity. All materials used during the study will be under lock and key and only the persons involved in this study will have access to them. Electronic files will be saved on password protected laptop.
iii).Voluntary Participation: Participation in this study is voluntary. Refusal to take part will not attract any penalty. You retain the right to withdraw from the study without any consequences. You are free not to answer any question during the interview.

iv). Compensation: There is no compensation for participating in the study. But these proposed study results may benefit other people like you in the future.

v). Conflict of interest: The researcher confirm that there is no conflict of inte

Appendix 5: Consent form

PARTICIPANT INFORMATION AND CONSENT FORM

FOR ENROLLMENT IN THE STUDY

Title of Study:

DETERMINATION OF BLOOD SUGAR CONTROL PRACTICES IN PATIENTS WITH DIABETES MELLITUS DURING COVID-19 PANDEMIC ATTENDING KENYATTA NATIONAL HOSPITAL

Principal Investigator: Daniel Sombe Nzeki, MSc in Nursing (Medical/Surgical) student at the University of Nairobi.

Introduction:

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in a medical research:

i) Your decision to participate is entirely voluntary
ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal
iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities. We will give you a copy of this form for your records.

May I continue? **YES / NO**

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol No: P354/05/2021

WHAT IS THIS STUDY ABOUT?

The researchers listed above are interviewing individuals who are visiting the diabetic clinic in KNH for DM management and follow-up. The purpose of the study is to find out how the patients have managed their DM condition before and during the COVID-19 pandemic. Participants in this research study will be asked to fill a structured questionnaire on the practices they have being employed to manage their DM condition and if the COVID-19 pandemic have affected those practices. The researchers will also review the participant's medical records to find out the blood sugar levels before and during the COVID-19 pandemic.

There will be 168 participants in this study randomly chosen. We are asking for your consent to consider participating in this study.

WHAT WILL HAPPEN IF YOU DECIDE TO BE IN THIS RESEARCH STUDY?

If you agree to participate in this study, the following things will happen:

You will be requested to fill a structured questionnaire and will be assisted by a trained researcher in a private area where you feel comfortable filling the questionnaire. The questionnaire will last approximately 30-45 minutes.

After filling the questionnaire that will be all about the study.

We will ask for a telephone number where we can contact you if necessary. If you agree to provide your contact information, it will be used only by people working for this study and will never be shared with others. The reasons why we may need to contact you is in case we need any other information for the purposes of this study only.

ARE THERE ANY RISKS, HARMS DISCOMFORTS ASSOCIATED WITH THIS STUDY?

Medical research has the potential to introduce psychological, social, emotional and physical risks. Effort should always be put in place to minimize the risks. One potential risk of being in the study is loss of privacy. We will keep everything you tell us as confidential as possible. We will use a code number to identify you in a password-protected computer database and will

keep all of our paper records in a locked file cabinet. However, no system of protecting your confidentiality can be absolutely secure, so it is still possible that someone could find out you were in this study and could find out information about you.

Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview or any questions asked during the interview. Some questions about your feelings may be repetitive.

ARE THERE ANY BENEFITS BEING IN THIS STUDY?

You may benefit by receiving free counselling, testing, and health information. We will refer you to a hospital for care and support where necessary. Also, the information you provide will help us better understand more about your general state of health. This information is a contribution to science and patient care.

WILL BEING IN THIS STUDY COST YOU ANYTHING?

Being in this study will not cost you any money.

WILL YOU GET REFUND FOR ANY MONEY SPENT AS PART OF THIS STUDY?

There will be no money given to any participant for engaging in this study.

WHAT IF YOU HAVE QUESTIONS IN FUTURE?

If you have further questions or concerns about participating in this study, please call or send a text message to the study staff at the number provided at the bottom of this page.

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

The study staff will pay you back for your charges to these numbers if the call is for study-related communication.

WHAT ARE YOUR OTHER CHOICES?

Your decision to participate in research is voluntary. You are free to decline participation in the study and you can withdraw from the study at any time without injustice.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with a study counselor. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study: **Yes** **No**

I agree to provide contact information for follow-up: **Yes** **No**

Participant printed name: _____

Participant signature / Thumb stamp _____Date_____

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name: _____

Date: _____ Signature_____

Role in the study: _____ [i.e. study staff who explained informed consent form.]

For more information contact Daniel Sombe Nzeki at UONBI/SON

From JUNE 2021 to SEPT 2021

Witness Printed Name (A witness is a person mutually acceptable to both the researcher and participant)

Name _____ Contact information_____

Signature /Thumb stamp: _____ Date_____

Appendix 6: The structured questionnaire

Serial No. **Received Consent……..**

"Determination of blood sugar control practices in patients with diabetes mellitus during COVID- 19 pandemic attending Kenyatta National Hospital".

Current Weight…… Previous weight…… (From patient records)

Height……

Blood sugar levels					
Before COVID-19			After COVID-19		

Random blood sugar (RBS)……..

Kindly select the most appropriate response to you.

Section 1: Social Demographic Data

1. What is your gender?
   - ☐ Male
   - ☐ Female

2. What is your current marital status?
   - ☐ Single/Engaged
   - ☐ Married
   - ☐ Divorced/separated
   - ☐ Widowed

3. How old are you?
   - ☐ 10-19 years
   - ☐ 20-29years
   - ☐ 30-39 years
   - ☐

40-49 years

☐ 50-59

☐ Above 60years

4. What is the highest level of education attained?

☐ None

☐ Primary

☐ Secondary

☐ Tertiary

5. Where is your permanent home of residence?

☐ Urban resident

☐ Rural resident

☐ Others -----Specify…….

6. If residing in an urban area, how can you rate your estate?

☐ In high-end estates

☐ In moderate estates

☐ In low-end estate

☐ In slums/informal settlement

7. What is your religion?

☐ Christian

☐ Muslim

☐ Others ……Specify……..

Section 2: Diabetes mellitus risk factors

8. Do you smoke cigarettes?

☐ Yes

☐ No

9. If yes, how many years?

☐ Less than five years

☐ 6- 10 years

☐ 11- 15 years

☐ Over 15 years

10. How many cigarettes do you smoke per day?

- ☐ Less than one pack per day
- ☐ 1 pack per day
- ☐ 2 packs per day
- ☐ More than 2 packs per day

11. How has the COVID-19 pandemic affect your smoking?

- ☐ It increased my smoking…… Why do you think so? …….
- ☐ It decreased my smoking ……Why do you think so? ……
- ☐ I stopped smoking…… Why? …….
- ☐ I did not change my smoking. Why? .....

12. Have you ever taken alcohol?

- ☐ Yes
- ☐ No

13. If yes, for how many years have you taken alcohol?

- ☐ Less than five years
- ☐ 6- 10 years
- ☐ 11- 15 years
- ☐ >15 years

14. How often do you take alcohol?

- ☐ Daily
- ☐ Every alternate day
- ☐ Weekly
- ☐ Monthly

15. If you consume alcohol, how has it change during the COVID-19 pandemic?

- ☐ Increased….Why?
- ☐ Decreased….. Why?
- ☐ Stopped……Why?
- ☐ No change….Why?

16. How has the COVID-19 affect your physical activities?

- ☐ Increased physical activity…….why?

☐ Decreased physical activity…….why?

☐ Stopped physical activity……....why?

☐ No change…….....why?

17. Are you on a diabetic diet?

☐ Yes

☐ No

18. If you are not on the diabetic diet, why not?

☐ I don't know the diabetic diet.

☐ The foods are not available in my locality.

☐ The foods are costly.

Others……..specify……..

19. How has the COVID-19 affect your eating habits?

☐ Increased my eating habits ……why?

☐ Decreased my eating habits ……...why?

☐ No change in my eating habits……why?

20. How has the COVID-19 affect your body weight?

☐ Increased my weight ……why?

☐ Decreased my weight ……...why?

☐ No change in my weight ……...why?

☐ Not aware of my weight ……why?

Section 3: Diabetes management practices

21. Why did you come to the hospital today?

☐ For consultation

☐ To refill my medications

☐ For treatment

☐ For follow-up

22. When were you diagnosed with diabetes mellitus?

☐ < 5 years

☐ 5- 10 years

☐

☐

11- 15 years

>15 years

23. Does anyone in your family have diabetes?

- ☐ Yes
- ☐ No
- ☐ Not sure

24. What treatment are you using currently?

- ☐ Oral anti-diabetic agents
- ☐ Insulin
- ☐ Both

25. How has the COVID-19 affect your clinic appointments?

- ☐ Not affected at all
- ☐ I stopped honoring the appointment
- ☐ I consulted my clinician through the phone
- ☐ I sent a relative to consult on my behalf

26. How has the COVID-19 affect your drug refill?

- ☐ Not affected at all
- ☐ I stopped going for a refill at the hospital
- ☐ I seek refill through delivery from the pharmacy
- ☐ I desire my refill from a pharmacy

27. How did you refill your drugs during lockdowns?

- ☐ From KNH diabetic clinic
- ☐ From the chemists
- ☐ From local health facilities

I did not refill my drugs

28. How do you consult your health care provider during the COVID-19 pandemic?

- ☐ I went direct to KNH diabetic clinic
- ☐ I consult through telephone calls
- ☐ I consulted my local health care providers

I did not consult at all

29. How do your pay for your diabetes management?

- ☐ National Health Insurance Fund
- ☐ Private insurance
- ☐ Out of the pocket
- From family members and friends

30. How do you maintain your diabetic diet without exposing yourself to COVID-19?

- ☐ I took my foodstuff from my Kitchen garden
- ☐ I bought foodstuff from market place in bulk
- ☐ I used face mask when going to market place
- ☐ I send someone to get the foodstuff from the market place

31. How do you maintain your exercise without exposing yourself to COVID-19?

- ☐ I exercised in open fields
- ☐ I used face mask when exercising
- ☐ I exercised less frequently
- ☐ I did not exercise at all

32. What is your source of income?

- ☐ Employed by the government
- ☐ Used by a private firm
- ☐ Self-employed
- ☐ Not employed

Section 4: Effects of COVID-19 pandemic on DM management

33. Has the COVID-19 pandemic affect your sources of income?

- ☐ Yes
- ☐ No

34. If yes above, how?

- ☐ To a very great extend
- ☐ To moderate extend
- ☐ To slight extend

35. Do the financial constraints affect your diabetes management?

- ☐ Yes
- ☐ No

36. If yes to the above, to what extend?

- ☐ Lacked money to buy drugs
- ☐ Lacked money for appointment
- ☐ Lacked money for proper nutrition

37. Has the COVID-19 containment measures affect your health-seeking behaviours?

- ☐ Yes
- ☐ No

38. How has the COVID 19 affect your health-seeking behaviour?

- ☐ I feared contracting COVID 19
- ☐ I feared because the disease could easily infect people with DM
- ☐ I worried because people with DM could quickly develop COVID-19 complications
- ☐ I worried because people with DM were likely to die of the COVID 19
- ☐ I worry because people with DM were likely to be hospitalized if they had COVID 19
- ☐ I worried because people with DM could quickly pay high hospital bills once they had COVID 19

39. If yes to the above, what was affected by the containment measures?

- ☐ Missed clinic appointment
- ☐ I failed to refill my drugs in time
- ☐ Prevented from seeking health care
- ☐ Prevented from doing physical exercises

Section 5: COVID-19 preventive measures

40. How often do you go outside your residence during this COVID-19 pandemic?

- ☐ Always
- ☐ Frequently
- ☐ Occasionally
- ☐ Rarely

41. What makes you go out?

- ☐ Work
- ☐ Shopping
- ☐ Clinic appointments
- ☐ Exercise

42. Do you wear masks when in public places?

- ☐ Yes
- ☐ No

43. If yes, to the above, often do you wear the mask?

- ☐ Always
- ☐ Frequently
- ☐ Occasionally
- ☐ Rarely

44. How often do you wash your hands with soap and water?

- ☐ Always
- ☐ Frequently
- ☐ Occasionally
- ☐ Rarely

45. How often do you maintain social distancing when in public places?

- ☐ Always
- ☐ Frequently
- ☐ Occasionally
- ☐ Rarely