

**FACTORS ASSOCIATED WITH HOSPITALIZATION AMONG DIABETES
PATIENTS AT BUSIA COUNTY REFERRAL HOSPITAL**

BY

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**A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of a
Master of Science Degree in Epidemiology and Biostatistics of Jaramogi Oginga
Odinga University of Science and Technology**

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DECLARATION

I declare that this is my original work and has not been presented for an award of a degree or diploma in any other university or institution.

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DEDICATION

This thesis is devoted to my precious mother Lilian N. Mugubi.

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I sincerely thank my supervisor Prof. George Ayodo for his devotion and excellent mentorship that saw me through this degree. I also thank Dr. Shehu Awandu for his awesome supervision, and guidance during this journey. I greatly appreciate my family, especially my fiancé Evans Mudibo and my sisters, Mariah Nadecho and Isabella George for their motivation and dedication during this journey.

ABBREVIATIONS AND ACRONYMS

BCRH	Busia County Referral Hospital
BPS	Board of Postgraduate Studies
DALYs	Disability Adjusted Life Years
ERC	Ethics Review Committee
HIV/AIDs	Human Immunodeficiency Virus/ Acquired Immuno-Deficiency Syndrome
IDF	International Diabetes Federation
JOOUST	Jaramogi Oginga Odinga University of Science and Technology
KNBS	Kenya National Bureau of Statistics
KNDS	Kenya National Diabetes Survey
LMIC	Low- Middle-Income Countries
NACOSTI	National Commission for Science, Technology and Innovation
NCDs	Non- Communicable Diseases
OGLA	Oral Glucose Lowering Agents
PHC	Primary Health Care
PLWH	People Living With HIV/AIDs
QALYs	Quality Adjusted Life Years
SSA	Sub Saharan Africa
SDG	Sustainable Development Goals
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Extreme diabetes condition: this describes diabetes patients with unstable sugars resulting to frequent hospital visits.

Hospitalization: defined as a visit to the health facility for routine clinic visits or **inpatient care**. In patient care is termed to be hospital admission.

Normal occasions: this describes the standard diet practice by a diabetes person.

Pre-diabetes: this defines impaired glucose tolerance.

ABSTRACT

Globally, the prevalence of diabetes remains high despite enhanced sensitization and management strategies. In Sub-Saharan Africa, the diabetes prevalence is thought to be under-estimated. Busia County a rural setup in Kenya is estimated to have about 20,000 persons diagnosed with diabetes. Despite the high prevalence which eventually results in increased hospitalization, the driving factors of hospitalization are barely understood. This study determined factors associated with hospitalization among diabetes patients at Busia County Referral Hospital (BCRH). The study adopted a hospital-based analytical cross-sectional design. Data was collected using close-ended structured questionnaires. Systematic sampling was used to select the 155 participants among diabetes patients seeking health care services at BCRH. Pearson's Chi-square test of association, bivariate and multivariate logistic regression were used for data analysis using STATA version 16. More than one-half of the participants, 89 (57.4%) were female. More than half (52.9%) had been admitted at least once within six months. Those who had routine clinic visits with no admission to the hospital were 47.1%. Participants aged over 60 years were 16.07 (AOR=16.07, 95% CI= 4.47-57.72, p-value<0.001) and 7.30 times more likely to have both routine clinic visits and admission, respectively, compared to the participants aged 20-39 years old (AOR=7.30, 95% CI= 2.35-22.62, p-value<0.010) after adjusting for possible confounders. Participants taking alcohol were more likely to be admitted to the hospital as compared to those who were not taking alcohol (AOR=2.73, 95% CI=1.03-7.27, p-value=0.044). HIV status was significantly associated with clinic visits (p-value=0.005). Counseling on the diagnosis day was significantly associated with hospital admission (OR=2.30, 95% CI=1.10-4.81, p-value=0.026). This study revealed that: age, alcohol consumption, HIV-diabetes comorbidity, and counseling on diagnosis are significant factors associated with hospitalization among diabetes patients at BCRH. The study therefore recommends strengthening of policy on education and diabetes management strategies in line with the significant factors.

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CHAPTER ONE: INTRODUCTION

1.1 Background Information

Non-communicable diseases (NCDs) including diabetes remain a significant public health burden with potential economic implications as they result in long term health-related complications and high treatment costs. These NCDs are difficult to manage and control since they are predisposed to multiple risk factors with no specific causative agent (WHO, 2021). Globally, NCDs are the leading cause of mortality and morbidity. Approximately 41 million (71%) deaths are attributed to NCDs with almost 77% of the deaths occurring in low- and middle-income economies like Kenya (WHO, 2022b). In Kenya, approximately 39% of deaths are associated with NCDs. This figure is up from 27% in 2014 and it is projected that deaths from NCDs will increase by 55% by 2030 (Karinja *et al.*, 2019).

Diabetes is a chronic disease that occurs either when the pancreas produces inadequate insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates sugars in the blood (NCD Countdown 2030 collaborators, 2020). The inadequacy results to hyperglycemia which implies too much sugar in the blood. This becomes degenerative to organs and body function over time (IDF, 2021). There are different forms of diabetes; Type 1 which is usually insulin-dependent and is characterized by deficient insulin production. It requires daily administration of insulin. Type 2 is non-insulin dependent that results from the body's ineffective use of insulin hormone. The third type is gestational diabetes and it's associated with hyperglycemia and involves relatively high blood glucose levels but below diagnostic values for diabetes, it occurs during pregnancy. Generally, diabetes is associated with multiple risks like poor nutrition lifestyle, physical inactivity, and hereditary factors among other factors (WHO, 2022a).

Diabetes is the most prevalent NCD worldwide, with findings of the current 10th International Diabetes Federation edition (IDF) confirming that it is one of the fastest growing global health emergencies of the 21st century. In 2021, it was estimated that over 537 million people had diabetes, and the number is projected to rise to 643 million by 2030, and 783 million by 2045. In addition, 541 million people were estimated to have

pre-diabetes in 2021 and that over 6.7 million people aged 20–79 will die from diabetes-related causes in this 21st century. Comparing these numbers with the 1st edition estimates of 151 million in 2000 there is clearly a rise in prevalence of diabetes (IDF, 2021).

A study done in countries within the Sub-Saharan Africa (SSA) on prevalence of prediabetes, Tanzania was estimated to have about 8.3% of prediabetes and it is projected to rise to 9.3% by 2035, with prevalence of diabetes in Tanzania estimated at 7.8% and in Uganda at 4.1% (Chiwanga *et al.*, 2016). Studies carried out in Ethiopia reported high prevalence of diabetes 2.0% - 6.5% with a 2% prevalence in rural settings. The high prevalence is associated with rapid urbanization, limited resources, and lifestyle changes (Bishu *et al.*, 2019; Oluma *et al.*, 2021; Sileshi *et al.*, 2022).

Kenya is not spared with the increasing numbers as its estimated prevalence of diabetes was at 3.3% in 2019 and is projected to rise to 4.4% in 2035 if no effective prevention and management strategies are put in place. More than 88% of Kenyan males and females have never had their blood sugar tested (Mohamed *et al.*, 2018). This results in late diagnosis of diabetes with advanced health complications which may be difficult to manage, contributing to high morbidity and mortality. Kenya has one of the highest proportion of deaths (88%) from diabetes for persons below age 60 years in Sub-Saharan Africa (Price *et al.*, 2018). Persons in the rural settings are at a high risk because of inadequate healthcare facilities and systems to deal with the early detection and management of diabetes (Ministry Of Health Kenya, 2021). Notably, Busia County with a population of about 893,700 (KNBS, 2019) is estimated to have a prevalence of 1.9% persons diagnosed with diabetes and a high number of people remain undiagnosed according to County Department of Health data reports (Busia County, 2021)). This could be due to multiple factors influencing routine screening of diabetes at the community level.

Hospitalization among persons with diabetes has been described in different forms including; routine visits to the diabetes clinic, inpatient admission, duration and frequency of visits and admissions. Hospitalization among diabetes patients is associated with hypoglycemia and its related complications including kidney failure and diabetic foot ulcer (WHO, 2022a). Diabetes is the leading cause of hospital admissions. This

retrospective cohort study conducted in Ethiopia identified poor lifestyle habits like alcohol drinking, presence of other chronic co-morbidities and living in rural set ups as predictors of high prevalence of diabetes (Lemma *et al.*, 2021)). The World Health Organization (WHO) indicates that multiple risk factors that predispose one to diabetes, especially type 2 diabetes can be adjusted and managed. This will control glycemic levels. Hospitalization among diabetes patients potentially increases the burden on health costs. Proper management of diabetes at individual level is associated with prolonged quality of life; this includes reduced incidences of hospitalization. Reduction of prevalence of hyperglycemia and other diabetes related complications require optimal management of diabetes that control glucose levels (Block, 2020). In Kenya, several measures including routine screening of glucose levels, subsidized costs of insulin and diabetes related medications have been implemented. Hospitalization among persons living with diabetes has however remained relatively high.

1.2 Statement of the Problem

Diabetes being characterized by multifaceted risk factors presents formidable challenges to its management and control. Studies done in the developed countries reported a decrease in hospitalization among diabetes patients. The decrease was associated with proper adherence to the WHO recommended measures of management and control of diabetes. Contrary to this finding, reports from a study in Nigeria revealed an increase on hospitalization among diabetes patients. The increase was attributed to poor behavioral habits and living in the rural settings. There's still a rise in prevalence increasing the risk to hospitalization despite the concerted efforts to manage diabetes and its complications through policy frameworks, by WHO. Studies done in Africa have reported poor medical adherence among diabetes patients and this poses a risk of increased hospitalization among the diabetes patients. These substantial gaps called for the need for this research.

In Kenya, the prevalence of diabetes is on the rise posing a risk to hospitalization from diabetes and its related complications. Despite the high prevalence, little is known about hospitalization. This has resulted to hospitalization rates among diabetes persons remaining disconcertingly high, transcending management and available services at BCRH. Busia County which is a rural setting in Kenya, has a diabetes prevalence of about 2% out of a total population of approximately 900,000. This figure is an under

estimation since a number of diabetes patients remain undiagnosed posing a risk to hospitalization due to late diagnosis with severe complications. This high prevalence of diabetes at the County with little documented on hospitalization, highlights an urgent need to comprehensively understand the driving factors of hospitalization among diabetes patients presenting at the County's referral hospital.

1.3 Objectives

1.3.1 General Objective

The overarching objective of the study was to determine the factors associated with hospitalization among diabetes patients at Busia County Referral Hospital (BCRH).

1.3.2 Specific Objectives

- a) To determine socio-demographic factors associated with hospitalization among diabetes patients at BCRH.
- b) To determine individual factors associated with hospitalization among diabetes patients at BCRH.
- c) To determine health system factors associated with hospitalization among diabetes patients at BCRH.

1.4 Research Questions

- a) What are the socio-demographic factors associated with hospitalization among diabetes patients at BCRH?
- b) What are the individual factors associated hospitalization among diabetes patients at BCRH?
- c) What are the health system factors associated hospitalization diabetes patients at BCRH?

1.5 Justification of the Study

The escalating prevalence of diabetes, coupled with its significant impact on healthcare systems at BCRH, underscores the urgency of investigating factors contributing to hospitalization among diabetes patients. This research was a critical response to the pressing need for a deeper understanding of the complex interplay between socio-demographic, individual, and health system determinants leading to hospitalization. Uncovering these factors within the unique context of healthcare delivery, patient

characteristics both socially and individually, and offering potential actionable strategies was important for alleviation of the burden of diabetes-related hospitalization at BCRH. This study addressed a crucial gap in knowledge by shedding light on the specific drivers of hospitalization among diabetes patients, which have not been extensively studied in the BCRH context. By pinpointing these determinants, the study provided a nuanced understanding of the root causes and patterns of hospitalization. This research revealed practical implications for healthcare providers, policymakers, and diabetes patients including improved patient education, improved healthcare services, strengthening of PHC services and policy adjustments that would enhance diabetes management and reduced hospitalization rates in the quest of mitigating the healthcare burden posed by diabetes-related hospitalization in Busia County.

1.6 Study Significance

The findings of this study have uncovered the factors associated with hospitalizations among patients at BCRH, thus offering an opportunity to guide evidence-based policymaking and intervention strategies. Policymakers can utilize the insights gained on health system to improve present interventions, aimed at more effective diabetes management and reduced hospitalizations. For instance, strengthening of PHC services to include blood sugar screening at household level would minimize cases of late diabetes detection eventually leading to increased hospitalization. The healthcare providers can benefit from a deeper understanding of the determinants, enabling them to offer more personalized care and support to diabetes patients. Additionally, the diabetes patients and the public can better comprehend on what is expected of them in order to reduce their risk of being hospitalized for example by using findings on dietary practice from this study. Moreover, this study findings contributes to the existing body of knowledge by shedding light on the unique context of BCRH enriching the discourse on diabetes management.

1.8 Study Assumptions

This study assumed that participants have sufficient level of awareness and understanding of their diabetes diagnosis, hospitalization history, and personal health-related factors. It also assumed that participants provided accurate and honest responses during the interviews, despite potential social desirability bias. Furthermore, the study assumed that

the data collected from the facility is representative of the broader population of diabetes patients within the county. Lastly, the research assumed that the associations identified between factors and hospitalization were not solely due to chance but rather indicate meaningful relationships.

1.9 Limitations of the Study

This study, like any research endeavor, was not without limitations. One key limitation was the potential for selection bias, as the study focused on known diabetes patients who seek care at BCRH. This might not have captured the entire spectrum of diabetes cases, particularly those who remain undiagnosed or seek treatment in other health facilities. Additionally, the reliance on self-reported information from participants might have introduced recall bias and social desirability bias, impacting the accuracy of the collected data. Furthermore, the study's scope being restricted to BCRH, limited the generalizability of findings to other settings.

1.10 Scope of the Study

The rising prevalence of diabetes poses an increased risk of hospitalization among diabetes patients. This study sought to specifically assess how socio-demographic, individual and health system factors influence hospitalization among diabetes patients. The study was carried at Busia County Referral Hospital which is the main diabetes clinic in Busia County, with a population of 400 diabetes patients seeking diabetes care and treatment in a month. The research was limited by finding thus inclusion of a large sample size was difficult. A cross-sectional study design was employed using close-ended questionnaires to collect information from diabetes patients. The study population was determined using the Cochran formula. Pearson's Chi-Square test of association, bivariate and multivariate logistic regression using STATA version 16 were used to determine the association of the study variables with hospitalization. This research targeted diabetes patients, healthcare providers and policy makers to address the gaps identified in the study in order to strengthen the existing interventions and management practices of diabetes.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents Literature review briefly on non-communicable diseases, overview on diabetes and current information on hospitalization among persons living with diabetes.

2.1.1 Overview of Non-Communicable Diseases (NCDs)

Globally, NCDs prevalence are on increase as they account for a majority of deaths. Approximately 71% of deaths worldwide were associated with NCDs in 2021 and this is projected to increase in the coming years. According to reports by WHO prevalence of the different NCDs is on the rise and is associated with different factors like nutrition, demographic, lifestyle adjustment, and rapid urbanization (WHO, 2021). Among these NCDs; diabetes, ischemic heart disease, cancer, and cardiovascular disease are associated with a higher risk of mortality. Similarly, these NCDs accounted for approximately 80% of premature deaths globally (WHO, 2021), which greatly affects the Sustainable Development Goals (SDG) target of 3.4 by 2030 since NCDs majorly affect populations that are at the peak of their production potential thus hindering their productivity (NCD Countdown 2030 collaborators, 2020). The public health burden of NCDs is global with countries in low-resource settings reporting an increased prevalence of NCDs in recent years, further stretching the overwhelmed health systems in these countries (Muka *et al.*, 2015).

A study in Sub-Saharan Africa (SSA) in 2019, among adults, reported an increase in the prevalence of NCD in the region with cardiovascular infections being the leading NCD. The increasing prevalence of these diseases was related to general globalization which led to air pollution, physical inactivity, and unhealthy dietary shifts. The study further reported a notable increase in the number of Disability-Life-Adjusted-Years (DALYs) due to NCDs in the region, from 90.6 million in 1990 to 151.3 million in 2017 (Bigna & Noubiap, 2019).

In Kenya, NCDs have become a public health concern with a significant impact on the nation's economy. This is associated with the notable trend of NCDs affecting persons at

around 40 years who are perceived to be at the apex of sustaining their livelihoods (Onyango *et al.*, 2018). Families end up with high expenditures of settling the management demands of the NCDs-related complications like DALYs. NCDs in Kenya account for about 39% of deaths. These numbers continue to rise despite the efforts of the government on putting up different management strategies for NCDs including screening and treatment of the diseases and setting up disease surveillance tools for NCDs (Ministry Of Health Kenya, 2021). A recent study showed that the increased prevalence of NCDs in the country was associated with socioeconomic, demographic, and behavioral factors. Additionally, tobacco and alcohol use predispose consumers to higher risks of developing NCDs including diabetes (Mwangi *et al.*, 2020).

2.1.2 Overview of Diabetes

Diabetes is described as a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar. Diabetes presents in different forms; Type 1 which was previously known as insulin-dependent because it requires daily administration of insulin as it is characterized by a deficiency in insulin production. Type 2 formally known as non-insulin dependence occurs as a result of the body's ineffective use of insulin and is mostly associated with excess body weight and physical inactivity. Gestational diabetes occurs during pregnancy in women and is characterized by raised glucose levels above normal but the diagnostic level of diabetes. Women who experience this form of diabetes have an increase of developing type 2 diabetes or their children in the future. Lastly, prediabetes is described as impaired glucose tolerance and occurs as an intermediate condition during the transmission between normality to diabetes. Prediabetes is an indicator of developing Type 2 diabetes (WHO, 2022a).

Diabetes is associated with being overweight, obese, increasing age, nutrition, lifestyle, and family history. It presents with symptoms including diabetes ketoacidosis, frequent urination, excessive thirst, sudden weight loss, blurred vision, and fatigue. Diabetics develop adverse complications including kidney failure, foot ulceration, neuropathy, and retinopathy due to hyperglycemia or raised blood sugar levels. Regular screening for early development of the complications and proper management of glucose levels is

recommended for the prevention of and progression of these complications (IDF, 2021). Additionally, WHO recommends modification of lifestyle, physical activity, and insulin medication as key measures of glucose level control.

Diabetes is the fastest-growing health emergency of the 21st century with an estimated prevalence of 537 million as of 2021 and a projection of 643 million by 2030 and 783 million by 2045. Cases of prediabetes were estimated to be approximately 541 million in 2021 (Sun *et al.*, 2022). It's currently among the leading causes of death unlike in the 1990s when communicable diseases like HIV/AIDs, respiratory infections, and diarrheal infections were the leading causes of mortality (Bommer *et al.*, 2017). In 2019, WHO reported an estimation of 1.5 million deaths being associated with diabetes (WHO, 2021). Despite effective preventive and control measures the global estimates of diabetes are on rise. This is a limitation to the achievement of global SDGs (Bommer *et al.*, 2018). As such it is worthy of understanding the hospitalization status of diabetes patients especially in resource constrained settings.

Studies have attributed the prevalence and risk of developing diabetes to different factors. For instance, a study in Malawi in 2018 among adult men showed men living in rural settings were more likely to develop diabetes (Price *et al.*, 2018). Studies in Ethiopia have associated the high prevalence of diabetes with rapid urbanization, limited resources, and lifestyle changes (Oluma *et al.*, 2021; Sileshi *et al.*, 2022). The prevalence of diabetes in Ethiopia ranges between 2.0% - 6.5% with a 2% prevalence in rural settings ((Bishu *et al.*, 2019). Similar findings were reported in other low- and middle-income countries including Tanzania where the prevalence of prediabetes was estimated to be about 8.3% and it's projected to rise to 9.3% by 2035. The prevalence of diabetes in Tanzania was estimated at 7.8% and in Uganda at 4.1%. These are countries within the SSA region with almost the same socio-economic status. This indicates that proper interventions and control should be implemented specifically targeting the large diabetes population (Chiwanga *et al.*, 2016). Implementation of the proper control strategies requires a better understanding of the factors associated with hospitalization to reduce the burden of the disease including comorbidities and health costs.

In Kenya, the prevalence of diabetes is estimated at 3.3% with the possibility of increasing to about 4.5% by 2025 (Ministry Of Health Kenya, 2021). Contrary to the WHO estimates, the Government of Kenya presumes that the 3.3% figure could be an underestimation since about 14% of the population is estimated to have prediabetes (WHO, 2022a). The Kenya National Diabetes Survey (KNDS) done in the year 2010 revealed that several people are living with diabetes undiagnosed due to unknown reasons (Ministry Of Health Kenya, 2021). Studies done within the country's rural settings like in Meru County, associated the high prevalence of diabetes in the area with poor healthcare utilization (Karinja *et al.*, 2019). A population-based household survey carried out in Nairobi's biggest slum, Kibera associated the prevalence with age, tobacco, and alcohol use. The same household survey reported high levels of physical activity meeting the recommendations with very low screening rates. This survey revealed the neglected prevalence of diabetes in peri-urban settings (Ayah *et al.*, 2013). More research is needed to precisely establish the associated factors of the prevalence of diabetes. Considering the findings of the above studies there are different needs to curb the diabetes menace depending on urbanization setups. There is limited data on the precise state of diabetes in the country due to few population-based studies focusing on diabetes (Ministry Of Health Kenya, 2021) despite reports on the high prevalence of diabetes and undiagnosed diabetes. Therefore, there is a need for more studies on diabetes to inform on the prevalence of diabetes in the country and identify factors associated with hospitalizations among diabetes patients (Mohamed *et al.*, 2018).

In Busia County, Kenya little has been done and documented to address the risk of diabetes despite the 1.9% prevalence rate reported in 2021 (Busia County, 2021). This poses an increased risk of hospitalization among diabetes patients impacting high risks of developing complications that are difficult to manage. A recent study carried out in Busia County on diabetes awareness and risk reduction revealed health illiteracy and age as risk factors associated with diabetes prevalence in the County (Munyasia *et al.*, 2021).

2.2 Hospitalization among Persons with Diabetes

Hospitalization is theoretically described as the admission of a patient to a hospital for patient care when there is a need for close medical attention as recommended by a duly qualified medical professional (Guk & Choi, 2017). This study operationally describes hospitalization as clinic visits by persons with diabetes and admission for inpatient care among persons with diabetes. Hospitalization among persons with diabetes is wholly due to diabetes and its related conditions including kidney failure. It poses extra costs on medication thus proper adherence to recommended measures of managing diabetes by WHO would reduce these costs. The recommended measures include; physical activity, proper nutrition lifestyle, and drug medication (WHO, 2022a).

Proper adherence to these measures is key in managing the condition, development, and progression of complications such as kidney failure. This should eventually lead to a notable decline in hospitalization. A survey in England reported diabetes as the leading cause of hospital admissions with over 50% of admissions at the start of the survey, decreasing to 30% at the end. The decrease was associated with the uptake of prevention measures put in place. The 20% admissions are still high thus the survey recommended the evolution of advanced prevention and control strategies to manage those with persistence in hospital admissions (Pearson-Stuttard *et al.*, 2022). Another study in Spain reported a similar trend of decrease in hospital admissions throughout the study period with women registering the highest decrease (Orozco-Beltrán *et al.*, 2021). Other studies have reported a decline in diabetic-specific admissions among older adults and in rural settings with an increase among young adults 19-29 years, these unclear disparities raise concern for more research on the interventions (Turbow *et al.*, 2022). There is the potential for a decrease in hospitalization as reported in developed countries though with a difference among the associated factors.

Contrary to the decreasing trends in the aforementioned Western countries, a study in Nigeria reported an increasing burden on health due to hospitalization of diabetes and its related complications including cardiovascular disease and diabetic foot ulcer. The same study results showed health unawareness among people living with diabetes thus cases of undiagnosed diabetes are high in the area (Adeloye *et al.*, 2017). This contradicting

results in two different economies calls for further studies especially in poor-resource settings where diabetes burden remains unacceptably high.

2.3 Socio-Demographic Factors Associated with Hospitalization

Socio-demographic factors including age, gender, and level of income have been reported to influence the outcome of hospitalization among diabetes patients. Age is a key risk factor since as one ages there is degeneration of the body's vital organs and weakening of immunity (WHO, 2022a). Due to these several studies have associated age to be predisposing a person to diabetes for instance; a study done in Congo reported most aged individuals practicing poor glycemic control measures (Lino *et al.*, 2021). Advanced age and female gender are associated with increased hospitalization among diabetes patients. Elderly individuals often have multiple comorbidities and may face difficulties in managing their diabetes, leading to higher hospitalization rates (Guk & Choi, 2017). A study carried out in Uganda on medical adherence among diabetes patients reported that diabetes persons aged 60 years and above had poor medical adherence thus increasing their hospital admission rates (Faisal & Tusiimire, 2022).

A secondary data study done in Kenya on health seeking behavior among diabetes patients reported the association of level education and marital status. This study described that patients who were married were more likely to seek health care services because of the moral and financial support they received. This study stated that people with diabetes who attained a minimal of secondary education sought for health care services better than those who didn't attain secondary education (Waweru, 2016). A cross sectional study done in Kenya across nine counties on patients with diabetes and hypertension associated gender with the presentation to hospital for health care services (Karinja *et al.*, 2019). Lower income levels are consistently associated with higher rates of hospitalization among diabetes patients. Financial constraints often hinder access to adherence to medication and sustainability of the recommended diet, leading to complications that necessitate hospitalization (Allen *et al.*, 2017).

Studies have reported that rural population are at a high risk of being hospitalized compared to their urban counterparts as they often face challenges in accessing healthcare facilities, specialist care, and diabetes education programs (Chiwanga *et al.*, 2016). In contrast, a study done in the peri-urban settings in Kenya reported increased rates of hospitalization among the peri-urban population due to inadequacy in health care services and low income levels (Ayah *et al.*, 2013). The disparities in healthcare infrastructure and services across regions influence hospitalization rates among diabetes patients. Regions with inadequate health care facilities and services with limited availability of diabetes management resources have higher increased hospitalization. This explains the decrease in hospitalization from studies done in Western Countries (Orozco-Beltrán *et al.*, 2021) compared to findings of studies done in developing countries like Kenya and Busia County the context in this study.

2.4 Individual Factors Associated with Hospitalization

Individual factors are described by WHO as the claimant characteristics that influence a person's well-being and living. Different personal factors determine the management and uptake of health care utilization. A study in Congo reported the presence of comorbidities, adherence to medication, and proper nutrition lifestyle as key factors in glycemic control (Lino *et al.*, 2021). A retrospective cohort study in Ethiopia revealed inactive lifestyle, alcohol consumption, and poor nutrition as risks of the high frequency of hospital admissions among persons with diabetes (Lemma *et al.*, 2021). Medication adherence which involves proper uptake of drugs and adjusting to the recommended measures of management of glycemic levels has been associated with hospitalization. Adherence to diabetes medication results in proper control of glycemic levels reducing occurrences of related complications and therefore suppressing chances of hospitalization (Nonogaki *et al.*, 2019). In Kenya, non-adherence to the diabetes-prescribed medication has also been reported. This has been associated with the incidences of hospital admissions, mortality, and morbidity among patients with diabetes (Barasa Masaba & Mmusi-Phetoe, 2020). In Uganda, non-adherence to medication was reported among aged participants in a study done in Mbarara. Several factors including income, health literacy, and health provider's attitude were observed as key factors influencing medication adherence in the same study. Traditional health practices including self-

unfounded beliefs have also been reported to influence the uptake of medication among diabetes patients (Faisal & Tusiimire, 2022).

The presence of comorbidities including HIV/AIDs, hypertension, tuberculosis, and cardiovascular diseases among others predisposes one to more risk of hospitalization. These chronic conditions pose a public health concern as they are associated with an increased need for health services, decreased quality of life, and increased mortality. Dealing with comorbidities poses heavy burdens on the healthcare system regarding the delivery of quality service (Godongwana *et al.*, 2021). A study done in Zimbabwe reported significantly higher incidences of hospitalization in persons with two or more comorbidities. The study related the presence of comorbidities with an effect of two or more drug prescriptions leading to increased health costs (Mutsa *et al.*, 2016). Another study in Northern Tanzania reported high incidences of hospitalization among persons living with both diabetes and hypertension. This same study related the presence of these comorbidities as the risk factors of the complications presented among hospitalized persons which included stroke and heart failure (Julian *et al.*, 2019). A study carried out in the SSA highlighted comorbidities as key components that require complex interventions in integrating a model aimed at quality delivery of health care services (Geoff *et al.*, 2021).

Self-care assessment among persons with diabetes describes the behavior that predicts better management of the disease. These include proper diet, being physically active, adherence to medication, and regular blood sugar monitoring. A study in Ethiopia reported adherence to self-care practice as an optimal way of managing glucose eventually minimizing incidences of hospitalization. The same study indicated that most persons with diabetes had not adhered to self-care, especially physical activity and monitoring of blood sugars (Sileshi Tadesse Gemedal* and Zinash Beyene Woldemariam, 2022).

2.5 Health System Factors Associated with Hospitalization

Healthcare system factors are described by WHO as a constitution of all the organizations, people, and actions whose primary intent is to promote, restore or maintain

health. The healthcare system encompasses healthcare utilization and factors associated with the utilization, government policies, and health personnel. Healthcare utilization is associated with hospitalization. Healthcare utilization also includes adherence to medication and health-seeking behavior such as regular screening. A study in Germany showed high rates of hospitalization due to diabetes and its related complications was associated with the utilization of the available healthcare services (Pollmanns *et al.*, 2019).

Health education involves creating awareness to the public on matters to deal with health to promote good health. Hospital admissions have been associated with low health literacy levels. During health education on diabetes, persons with diabetes get enlightened and empowered on how best they can manage their condition. Lack of this awareness impacts increased rates of hospitalization due to poor glycemic control (Sanaeinasab *et al.*, 2021). Poor glycemic control has been associated as a key factor leading to hospitalization in studies. In Ethiopia, poor glycemic control as a predictor of hospitalization in public hospitals was associated with a lack of self-assessment tools, poor self-care, duration of illness, and the presence of comorbidities and complications (Oluma *et al.*, 2021). Generally, health education is associated greatly with the recommended practices of managing diabetes as a whole. It's through this education that the patients get to understand the effect of their diet on their condition, and how to maintain a healthy lifestyle and all these factors collectively influence incidences of hospital admissions (Castro *et al.*, 2020). An assessment study on the association of health literacy and nutrition lifestyle revealed inadequate literacy being associated with poor adherence to the recommended nutrition. This was reported highly among females, especially housewives. This report indicated poor glycemic control among persons with poor adherence to the recommended diet (Hashim *et al.*, 2020).

Rural settings have been associated with increased risks of mortality and high prevalence of diabetes among diabetes patients. This has been associated mostly with a lack of easy access to the health facility for routine testing. This has greatly influenced the reports on hospitalization being high among rural residents (Comino *et al.*, 2015; Lemma *et al.*, 2021). In contrast, a study done in the peri-urban settings in Kenya, attributed the high

prevalence of diabetes which eventually results in hospitalization to the inadequacy of screening services and programs in the area (Ayah *et al.*, 2013).

2.6 Synthesis

In conclusion, this comprehensive literature review illuminated the escalating global burden of NCDs, with diabetes emerging as a prominent concern. The pervasive rise of NCDs, carries profound implications for public health, mortality rates and economic well-being. The prevalence of NCDs has reached alarming levels, with a substantial portion of global deaths attributed to these diseases.

The review underscores the crucial role of hospitalization in diabetes management. While some regions have seen a decrease in diabetes-related hospitalizations due to improved prevention measures, others face an upward trajectory. Factors such as comorbidities, medication adherence, health literacy, and access to healthcare services contribute significantly to hospitalization rates. These findings emphasized the necessity of interventions that consider socio-demographic, individual, and health system elements to effectively manage and reduce hospitalization due to diabetes. By adopting holistic strategies, we can mitigate the impact of diabetes, improve patient outcomes, and work towards a healthier global population.

2.7 Theoretical Framework

The Social Ecological Model considers health behaviors and outcomes within the context of multiple interacting levels, ranging from individual to societal. This model emphasizes the influence of various factors at each level on health-related problems (CDC, *n.d.*) . This study explored how factors at the individual level, interpersonal level, community level, and policy level collectively contribute to hospitalization among diabetes patients in Busia County. By using the Social Ecological Model as the theoretical framework, the study analyzed the interplay between these levels of influence to understand the multifaceted factors that contribute to hospitalization among diabetes patients. This framework allowed for a comprehensive examination of the individual, interpersonal, community, organizational, and systemic factors that collectively shape diabetes-related hospitalization in Busia County.

2.8 Conceptual Framework

Figure 2.1 below presents the various variables of this study. The independent variable investigated in the study included sociodemographic factors, health system factors and individual factors including comorbidities. The study sought to investigate whether attendance or diagnosis in other health facilities rather than BCRH had an effect on hospitalization. This was the intervening variable and was measured through evaluation on how prompt one was diagnosed to have diabetes and the health education received on the diagnosis day in the other health facilities. The dependent variable of this study was hospitalization among diabetes patients and was measured as either routine clinic visits or hospital admission or both.

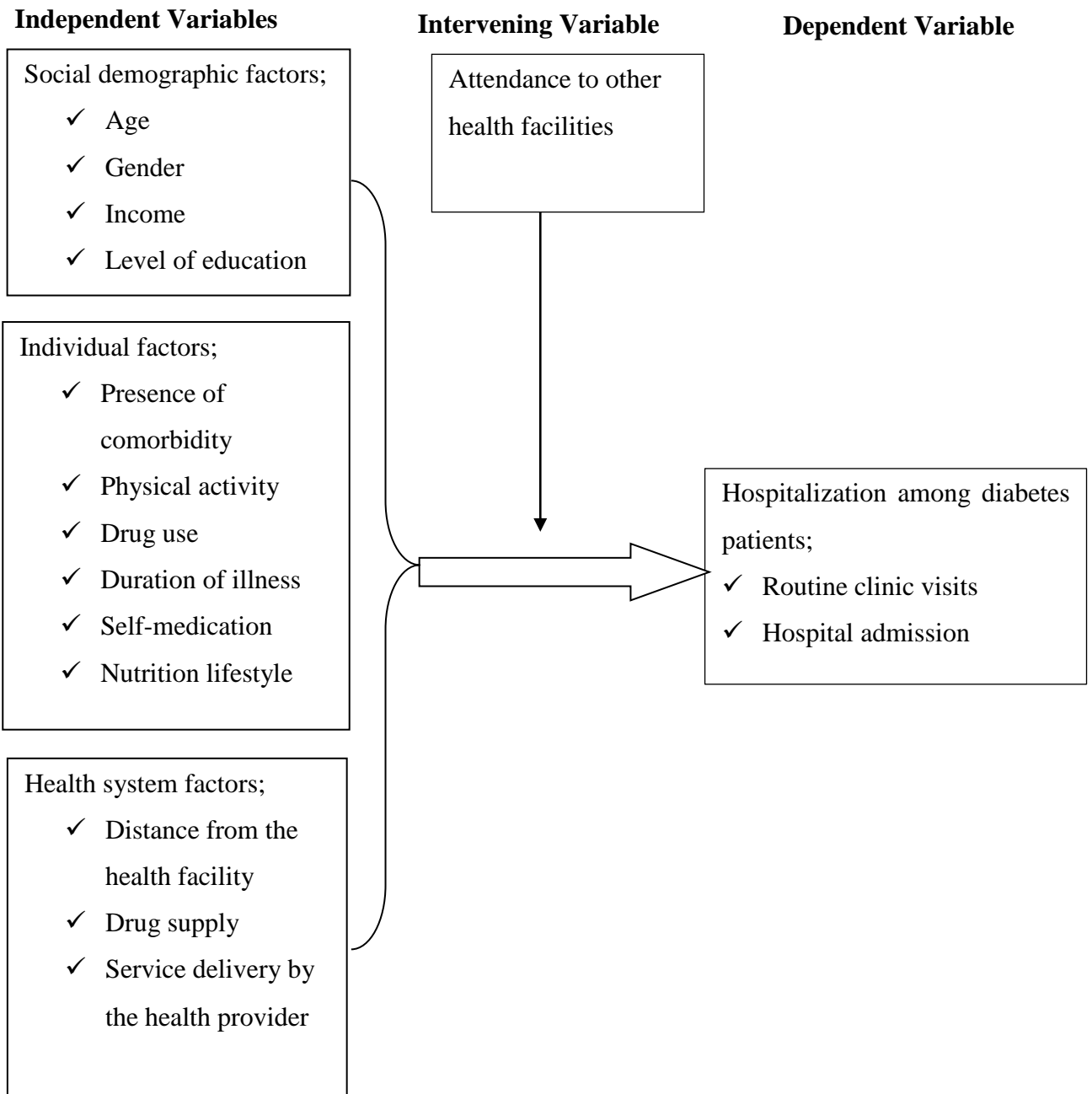


Figure 2.1: *Conceptual Framework*

Source: Tessy M. Achieno,

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Study Area

The hospital-based study was conducted at Busia County Referral Hospital (BCRH) which is the largest health facility in Busia County with an active diabetes clinic. It has a bed capacity of about 179 with a catchment area of around 42154 (Busia County, 2022). The facility serves the neighboring country Uganda, and the neighboring counties that is Siaya, Bungoma and Kakamega.

3.2 Study Design

The study employed a hospital based analytical cross-sectional study design. This entailed the use of primary data from the participants.

3.2.1 Variables of Analysis

Independent variables

Independent variables of this study include;

- I. Socio-demographic factors (Age, gender, level of education, income level).
- II. Individual factors (Presence of a comorbidity, self-medication, physical activity, nutrition lifestyle, duration of illness, drug use).
- III. Health system factors (Distance from the health facility, drug supply, service delivery by health provider).

Intervening variable

The study sought to investigate whether attendance/ diagnosis in other health facilities rather than BCRH had an effect on hospitalization. This was measured through evaluation on how prompt one was diagnosed to have diabetes and the health education received on the diagnosis day.

Dependent variables

The outcome of this study was hospitalization among diabetes patients. Hospitalization included routine visit to the health facility (diabetes clinic) and hospital admission for in patient care with diabetes.

3.3 Study Population

The study population was adults living with diabetes and utilizing health care services at BCRH. The adults targeted were those aged 19 years and above according to the WHO description of adults. The study population included patients presenting to the facility for routine clinic visits, medication resulting in hospital admission from diabetes and its related complications. BCRH has averagely 400 diabetes patients visiting the facility on a monthly basis for diabetes related treatment. This was the target population of the study and the study population of 155 was derived from it.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

Persons aged 19 years and above living with diabetes and attending seeking health care services at BCRH for at least 1 year. Only persons who consented through a written informed consent were be included in the study.

3.4.2 Exclusion Criteria

Persons living with diabetes and attending clinic at BCRH but did not consent to participate in the study were excluded. Diabetes patients under 19 years of age who attend clinics at BCRH were also excluded in the study.

3.5 Sampling Procedures

3.5.1 Sampling Technique

The facility was purposively selected due to it being the highest level with the highest workload in the county. The study participants were recruited using a systematic sampling method where every 3rd patient was selected. Participant registers from the clinic records were checked to ascertain the frequency of visits documented.

3.5.2 Sample Size

According to the BCRH database, an average of 100 persons living with diabetes report to the facility for health care services weekly. Data collection took a period of one month. Sample size determination was done using Cochran formula (1998) for a population less than 10,000.

Formula is:

$$nf = \frac{n}{\left(\frac{1+n}{N}\right)}$$

Where;

- **nf**= final sample size of the population less than 10,000
- **n**= the desired sample size when the population is more than 10,000 using $N = \frac{Z^2pq}{d^2}$
- **N**= The desired sample size, if the population is more than 10,000.
- **Z**= Standard normal deviation at required confidence level usually set at 95% giving Z statistical of 1.96.
- **P**=proportion of the study population 0.019 (1.9%) (Busia County, 2021)
- **Q**=**1-p** = (1- 0.019) = **0.081**
- **D**=level of statistical significance set, usually set as 0.05
- = $(1.96^2 * 0.019 * 0.018) / 0.05^2 = 237$
- Hence the actual study size was be;
- **nf** = $237 / (1 + 237 / 400) = 148 + (5\% \text{ non-response rate})$
= $148 + (148 * 0.05) = 155$

3.6 Data Collection Instruments

A close ended structured questionnaires were administered to diabetes patients at BCRH. The questionnaire captured demographic factors (age, gender, level of education), health system factors (distance from the health facility, drug supply, attitude from the health provider) and individual factors (presence of a comorbidity, self-medication, physical activity, nutrition lifestyle, drug use).

The questionnaire captured patients' hospitalization information for six months. The questionnaire was translated to Kiswahili for those who couldn't comprehend English (Appendices).

3.7 Pretest Study

A pretest study was done at Bungoma County Referral Hospital which is also located in a rural setup with same level socio-economic status and disease prevalence. This helped in foreseeing the challenges with the questionnaire, gauge time of filling the questionnaire and understand the relevance of the data collected to the study's objectives. At the end of the pretest study, the questionnaire was adjusted to bring clarity to the participants and aligned to the objectives and a reliability coefficient test done using the findings from the 15 participants.

3.8 Reliability of the Data Collection Tool

Reliability refers to the extent to which the same or similar results can be obtained under different circumstances, at different times and using different respondents or interviewers. This was addressed by the multi-method approach of data collection, backed by reliable conventional research and statistical analytical techniques. Reliability was established using, test retest with 15 respondents which is 10% of the study sample and reliability coefficients computed. The result for the structured questionnaire showed high reliability coefficient (0.86) which is above the minimum threshold (0.70) implying reasonable reliability.

3.9 Validity of the Data Collection Tool

Validity is the extent to which the research design measures what it purports to measure and therefore meets the study objectives. To further enhance interpretive validity the following approaches were observed consistently throughout the study: contextual completeness, awareness of the researcher's influence, and reliability in reporting from transcripts.

3.10 Data Management and Analysis

3.10.1 Data Management

The data collected was entered in Microsoft Excel in a password secured computer. The data was cleaned for consistency before analysis was done.

3.10.2 Data Analysis Procedure

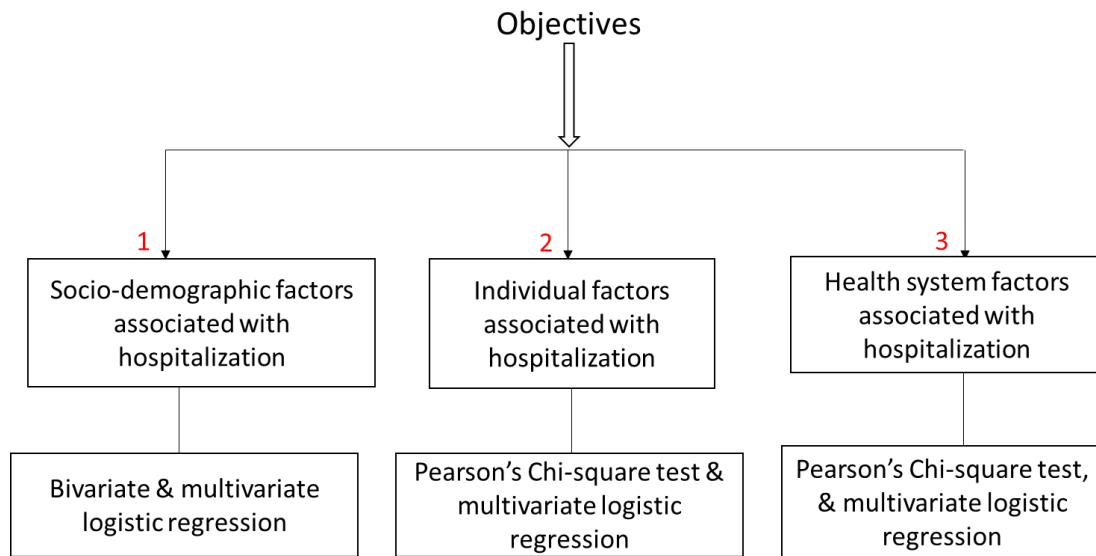


Figure 3.1 *Data Analysis Procedure*

3.11 Ethical Considerations

Ethical standards outlined in the 1964 Declaration of Helsinki and its later amendments were upheld throughout the study. The study was authorized by the Board of postgraduate Studies at JOOUST then approved by JOOUST ERC, National Commission for Science, Technology and Innovation (NACOSTI) and the administration of BCRH (Appendices).

- **Informed consent**

Written informed consent was provided to the study participants. Translation was done to Kiswahili.

- **Rights of the study participants**

Participation in the study was strictly voluntary and one was free to withdraw from the study at any time. Participants had the freedom to ask question during the interview and to stop the interview when they felt distressed. Participation or withdrawal from this study by diabetes persons did not affect the how one received services and care at the facility.

- **Confidentiality**

Any information or data disclosed during the interview remained confidential and was only to be used for the purpose of this study. The identity of participants was anonymous as each was a given unique participant identification number and one was not to be personally identified in the publication of this study. All the data and information were kept securely and only accessible by the investigator.

- **Risks**

This study posed minimal potential risk since it only required filling in of a questionnaire without collection of blood or any other human samples. The study only involved an interview through a questionnaire.

- **Benefits**

The study aimed to improve general public awareness of diabetes and in the longer term strengthen the management and control measures of diabetes. There were no monetary benefits for participation in this study.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the results regarding the hospitalization status of persons living with diabetes as well as the factors associated with the hospitalization at BCRH. The outcome of hospitalization was measured in two different ways. First, participants were categorized as having at least one diabetes-related hospital admission (in-patient care), and second, participants were categorized as having attended at least 3 or less clinic visits within the past six months.

4.2 Socio-Demographic Characteristics of the Respondents

There was a 100% response rate from the participants. Table 4.1 shows the characteristics of the participants interviewed. Majority of the participants, 67 (43.2%) were at least 60 years old. Majority of the participants enrolled, 89 (57.4%) were female. Those who were married were 92 (59.4 %). Less than half, 60 (38.7%) of the respondents had primary education, while only 36 (23.2%) had a tertiary level of education. Most of the participants, 113, (72.9%) were unemployed. One-third of the enrolled participants had an income of less than Kshs. 15,000 per month.

Table 4. 1: Socio-demographic characteristics of the respondents, N=155

	Total (%)	Visited health facility at least 3 times		Ever admitted in the last six months	
		No n=53 (%)	Yes n=102 (%)	Non=73 (%)	Yes n=82 (%)
Age group (years)					
20-39	22(14.2)	16(30.2)	6(5.9)	16(21.9)	6(7.3)
40-59	66(42.6)	22(41.5)	44(43.1)	35(48.0)	31(37.8)
60+	67(43.2)	15(28.3)	52(51.0)	22(30.1)	45(54.9)
Gender					
Male	66(42.6)	27(50.9)	39(38.2)	30(41.1)	36(43.9)
Female	89(57.4)	26(49.1)	63(61.8)	43(58.9)	46(56.1)
Marital Status		No	Yes		
Single	14(9.0)	4(7.6)	10(9.8)	7(9.6)	7(8.5)
Married	92(59.4)	33(62.3)	59(57.8)	47(64.4)	45(54.9)
Divorced/Separated/ Widowed	49(31.6)	16(30.2)	33(32.4)	19(26.0)	30(36.6)
Education					
None	16(10.3)	7(13.2)	9(8.8)	5(6.4)	11(13.4)
Primary	60(38.7)	13(24.5)	47(46.1)	31(42.5)	29(35.4)
Secondary	43(27.7)	20(37.7)	23(22.6)	24(32.9)	19(23.2)
Tertiary	36(23.2)	13(24.5)	23(22.6)	13(17.8)	23(28.1)
Employment status					
Employed	42(27.1)	8(15.1)	34(33.3)	20(27.4)	22(26.8)
Unemployed	113(72.9)	45(84.9)	68(66.7)	53(72.6)	60(73.2)
Household monthly income					
< 15000	54(34.8)	19(35.9)	35(34.3)	21(28.8)	33(40.2)
15000-30000	44(28.4)	15(28.3)	29(28.4)	24(32.9)	20(24.4)
30000-45000	19(12.3)	7(13.2)	12(11.8)	10(13.7)	9(11.0)
45000-60000	23(14.8)	8(15.1)	15(14.7)	12(16.4)	11(13.4)
60000 and above	15(9.7)	4(7.6)	11(10.8)	6(8.2)	9(11.0)

Proportion of participants who visited hospital at least 3 times in six months by socio-demographic factors

Figure 4.2, shows that half (51%) of the participants who visited BCRH at least three times in a period of six months were aged 60 years and above, 43.1% were aged 40 to 59 years while 5.9% were 20 to 39 years old.

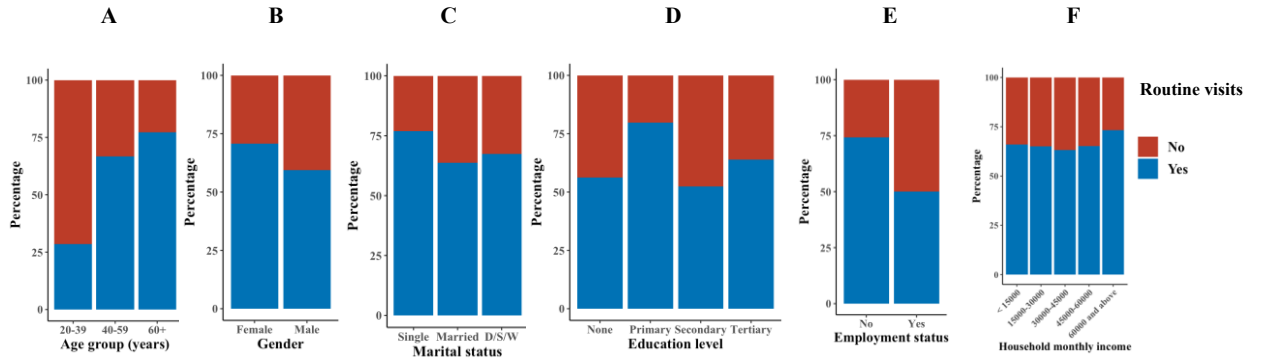


Figure 4. 2: *Proportion of participants who visited hospital at least 3 times in six months by socio-demographic factors:*

Panel A, B, C, D, E and F represent the proportion of participants by age group in years, gender, marital status, education level, employment status, and household monthly income, respectively. Blue colour represents proportion of participants who had at least 3 routine visits within 6 months while red colour shows proportion of participants with less than 3 routine clinic visits to the hospital.

Proportion of participants ever admitted to the hospital in the last six months socio-demographic factors

In Figure 4.3, 54.9% of the participants who ever got admitted to the hospital within a period of six months were aged 60 and above years.

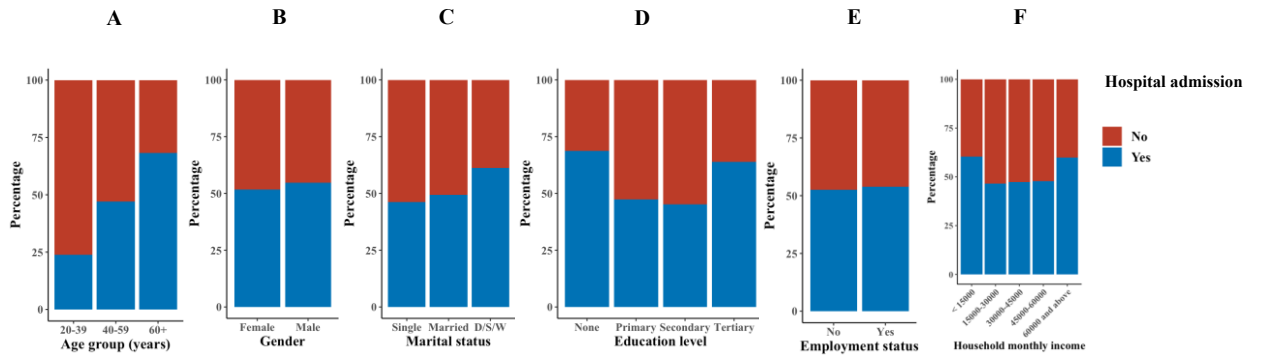


Figure 4. 3:Proportion of participants ever admitted to the hospital in the last six months by socio-demographic factors:

Panel A, B, C, D, E and F represent the proportion of participants by age group in years, gender, marital status, education level, employment status, and household monthly income, respectively. Blue colour represents proportion of participants who at least reported hospital admission within last 6 months of the study while red colour shows proportion of participants who did not report hospital admission within the last 6 months of the study.

4.3 Hospitalization Status among Persons with Diabetes in Busia County

Table 4.2 shows hospitalization status by participants’ age group and gender. Majority 102, (65.8%) of the participants attended at least three diabetes clinic visits. Female participants who visited the hospital monthly for routine clinic visits were 30 (62.5%). Slightly more than half 82 (52.9%) of all enrolled participants were admitted at least once within a period of six months by the time of recruitment. The proportion of gender to hospitalization had a p-value = 0.403 for routine clinic visits.

One-half of the participants with at least three routine diabetes clinic visits were aged 60 years and above. More than one-half of the participants admitted at least once within six months by the time of enrolment were aged 60 years and above. The relationship between participants' age and routine clinic visits had a p-value = 0.003, while the p-value=0.002 for admissions.

Table 4. 2: *Hospitalization status by age and gender*

	Routine clinic in the last six month					Admitted within the last six months		
	Once, n=10 n(%)	Twice, n=43 n(%)	Thrice, n=54 n(%)	Monthly , n=48 n(%)	p-value	No, n=73 n(%)	Yes, n=82 n(%)	p-value
Overall	10(6.5)	43(27.7)	54(34.8)	48(31.0)	-	73(47.1)	82(52.9)	
Gender					0.403			0.724
Male	4(40.0)	23(53.5)	21(38.9)	18(37.5)		30(41.1)	36(43.9)	
Female	6(60.0)	20(46.5)	33(6.1)	30(62.5)		43(58.9)	46(56.1)	
Age group					0.003			0.002
20-39	4(40.0)	12(27.9)	2(3.7)	4(8.3)		16(21.9)	6(7.3)	
40-59	4(40.0)	18(41.9)	24(44.4)	20(41.7)		35(48.0)	31(37.8)	
60+	2(20.0)	13(30.2)	28(51.9)	24(50.0)		22(30.1)	45(54.9)	

n= number of participants, % = percentages representing proportions

4.3.1 Frequency of Admission to the Hospital within a Period of Six Months

Figure 4.4 shows frequency for hospital admission within the past six months among enrolled participants (82). Majority 55 (67.1%) had one hospital admission recorded.

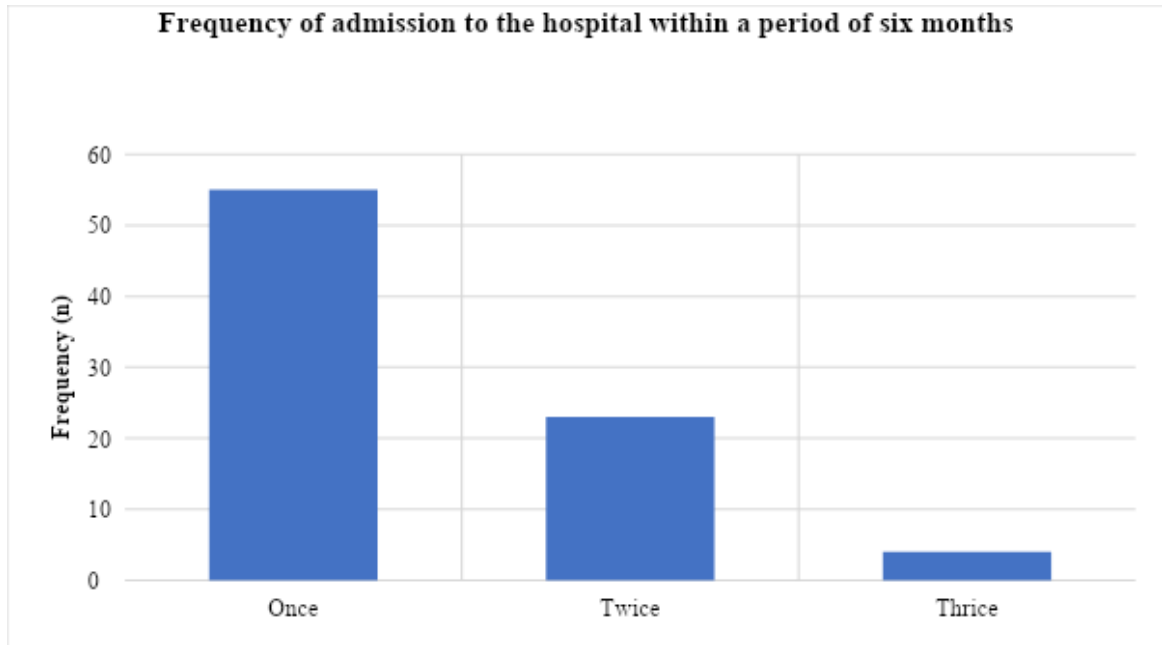


Figure 4.4: Summary of hospital admission among study participants in Busia

4.4 Socio-Demographic Factors Associated with Hospitalization

Table 4.3 shows both bivariate and multivariate analysis at 95% confidence level. In bivariate logistic regression analysis, age and employment status had a significant association with hospitalization p -value < 0.05 .

In multivariate analysis, participants aged 40-59 years old had higher odds of visiting the clinic the clinic at least every 2 months as compared to participants aged 20-39 years old (AOR=4.49, 95% CI= 1.22-16.58, p -value <0.010). In addition, participants aged 60+ years old were more likely to visit hospital at least every 2 months (AOR=16.07, 95% CI= 4.47-57.72, p -value <0.001). For hospital admission, participants aged 40-59 years old (AOR=3.50, 95% CI= 1.16-10.61, p -value <0.010) and those aged 60+ years old were more likely to be admitted to the hospital as compared to the participants aged 20-39 years old (AOR=7.30, 95% CI= 2.35-22.62, p -value <0.010).

Moreover, participants' employment status was found to be significantly associated with clinic visits. Unemployed participants were less likely to visit health facilities at least every 2 months as compared to employed participants (AOR=0.15, 95%CI= 0.05-0.46, p-value<0.001).

Table 4. 3: Association between socio-demographic characteristics and hospitalization

	Bivariate analyses		Multivariate analyses	
	Clinic visit at least every 2 months OR (95%CI)	Admitted to hospital OR (95%CI)	Clinic visit at least every 2 months AOR (95%CI)	Admitted to hospital AOR (95%CI)
Age group				
20-39	ref	ref	ref	ref
40-59	5.33(1.83-15.53)***	2.36 (0.82-6.79)	4.49(1.22-16.58)**	3.50(1.16-10.61)**
60+	9.24(3.08-27.78)***	5.45 (1.87-15.87)***	16.07(4.47-57.72)***	7.30(2.35-22.62)***
Gender				
Male	ref	ref	ref	ref
Female	1.68(0.86-3.28)	0.89(0.47-1.69)	1.65(0.67-4.04)	0.67(0.31-1.43)
Marital Status				
Single	ref	ref	ref	ref
Married	0.72(0.21-2.46)	0.96(0.31-2.95)	0.57(0.13-2.59)	0.90(0.21-3.83)
Divorced/ Separated/ Widowed	0.83(0.22-3.04)	1.58(0.48-5.22)	0.75(0.14-4.11)	1.50(0.30-7.56)
Education				
None	ref	ref	ref	ref
Primary	2.81(0.88-9.00)	0.43(0.13-1.37)	4.04(0.78-20.79)	0.63(0.15-2.54)
Secondary	0.89(0.28-2.84)	0.36(0.11-1.21)	1.08(0.20-5.71)	0.68(0.15-2.99)
Tertiary	1.38(0.41-4.57)	0.80(0.23-2.83)	1.17(0.16-8.88)	2.42(0.36-16.22)
Employed status				
Employed	ref	ref	ref	ref
Unemployed	0.36(0.15-0.84)**	1.03(0.51-2.09)	0.15(0.05-0.46)***	0.74(0.30-1.81)
Monthly income				
< 15000	ref	ref	ref	ref
15000-30000	1.05(0.45-2.42)	0.53(0.24-1.19)	1.31(0.46-3.76)	0.48(0.19-1.19)
30000-45000	0.93(0.31-2.76)	0.57(0.20-1.64)	0.92(0.17-4.90)	0.33(0.08-1.33)
45000-60000	1.02(0.37-2.83)	0.58(0.22-1.56)	1.06(0.21-5.42)	0.19(0.04-0.88)*
60000 and above	1.49(0.42-5.33)	0.95(0.30-3.07)	1.83(0.22-15.30)	0.41(0.09-1.84)

* = P-value < 0.05, **= P-value <0.01, ***= P-value < 0.001

AOR=adjusted odds ratio, OR=crude odds ratio, CI=confidence interval, NA=not available, ref=reference category

4.5 Individual Factors Associated With Hospitalization

4.5.1 Comorbidities among Patients with Diabetes

Figure 4.5 presents the concurrence of diabetes and other comorbidities in terms of frequency of persons having the different comorbidities. The most prevalent comorbidity among persons with diabetes was hypertension (63.2%), the prevalence of malaria was 29.7%, tuberculosis was 1.9% and HIV was 20.0%.

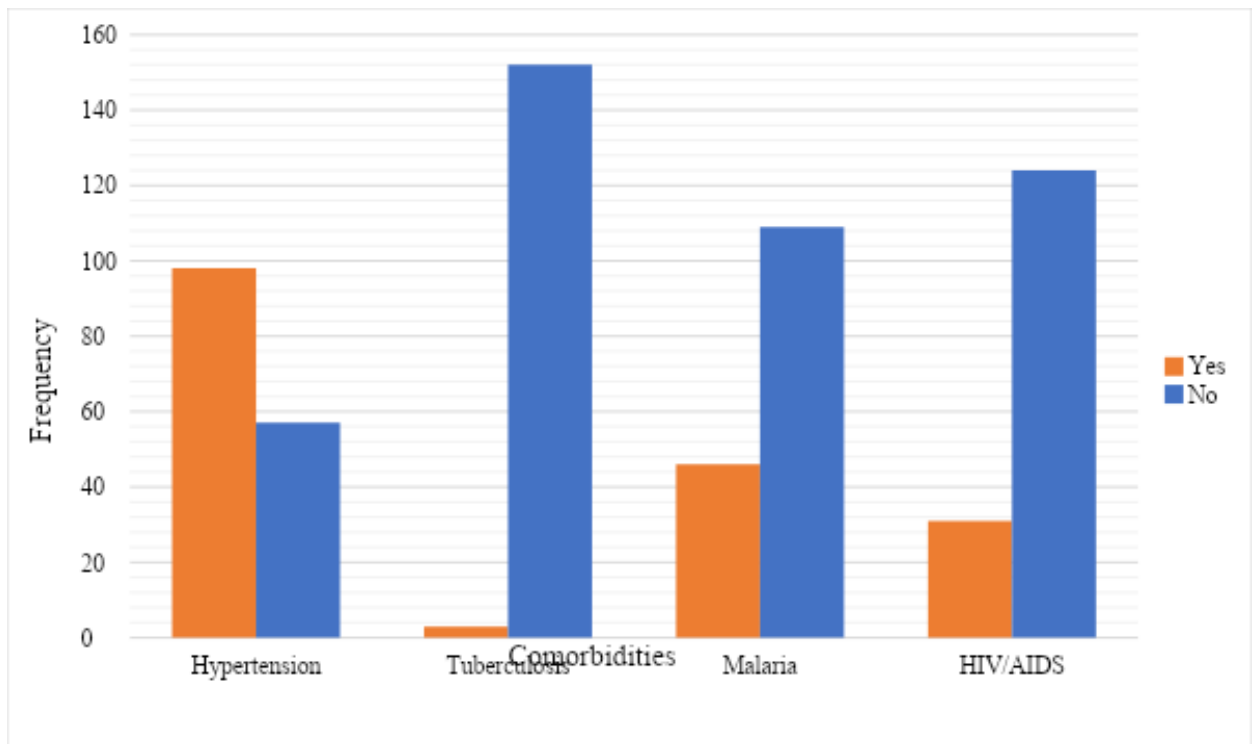


Figure 4. 5: *Comorbidities among patients with diabetes in Busia County.*

4.5.2 Individual Factors among Persons with Diabetes

Using Chi-square test, HIV positive compared to HIV negative diabetes persons were significantly associated with clinic visits (p-value= 0.005) and not hospital admissions, Table 4.4. Moreover, extreme diabetes (p-value< 0.001) and alcohol consumption (p-value=0.004) were significantly associated with admission to the hospital.

Table 4. 4: Association between Individual Factors and Hospitalization

		Routine clinic visit			Admitted to the hospital		
	Overall n=155	No, n=53	Yes, n=102		No, n=73	Yes, n=82	
Individual factors	n(%)	n(%)	n(%)	p-value	n(%)	n(%)	p-value
Duration of diabetic				0.149	No	Yes	0.213
< 1 year	24(15.5)	9(37.5)	15(62.5)		10(41.7)	14(58.3)	
1 year	15(9.7)	6(40.0)	9(60.0)		5(33.3)	10(66.7)	
2 years	34(21.9)	6(17.7)	28(82.3)		13(38.2)	21(61.8)	
3yrs +	82(52.9)	32(39.0)	50(61.0)		45(54.9)	37(45.1)	
Extreme diabetes condition				0.237			<0.001
No	49(31.6)	20(40.8)	29(59.2)		36(73.5)	13(26.5)	
Yes	106(68.4)	33(31.1)	73(68.9)		37(34.9)	69(65.1)	
Drug use: Taking alcohol				0.750			0.004
No	125(80.6)	42(33.6)	83(66.4)		66(52.8)	59(47.2)	
Yes	30(19.4)	11(36.7)	19(63.3)		7(23.3)	23(76.7)	
Smoking tobacco				0.470			0.344
No	154(99.4)	53(34.4)	101(65.6)		73(47.4)	81(52.6)	
Yes	1(0.6)	0(0.0)	1(100.0)		0(0.0)	1(100.0)	
Smoking bhang				0.048			0.179
No	153(98.7)	51(33.3)	102(66.7)		73(47.7)	80(52.3)	
Yes	2(1.3)	2(100.0)	0(0.0)		0(0.0)	2(100.0)	
Presence of comorbidity: Hypertension				0.113			0.959
No	57(36.8)	24(42.1)	33(57.9)		27(47.4)	30(52.6)	
Yes	98(63.2)	29(29.6)	69(70.4)		46(46.9)	52(53.1)	
Tuberculosis				0.207			0.099
No	152(98.1)	53(34.9)	99(65.1)		73(48.0)	79(52.0)	
Yes	3(1.9)	0(0.0)	3(100.0)		0(0.0)	3(100.0)	
Malaria				0.787			0.240
No	109(70.3)	38(34.9)	71(65.1)		48(44.0)	61(56.0)	
Yes	46(29.7)	15(32.6)	31(67.4)		25(54.3)	21(45.7)	
HIV/AIDS				0.005			0.171
No	124(80.0)	49(39.5)	75(60.5)		55(44.4)	69(55.6)	
Yes	31(20.0)	4(12.9)	27(87.1)		18(58.1)	13(41.9)	

n = number of participants, % = percentages representing proportions

4.5.3 Dietary Practices among Diabetic Patients

In Table 4.5, the majority (n= 120, 77.4%) of the respondents in normal occasions took porridge for breakfast and there was a significant association between porridge and admission to the hospital (p-value=0.035). 81.9% of the enrolled participants reported to be taking sugarless tea for breakfast, 61.9% arrowroots, 14.2% potatoes and 81.9% bread for breakfast in normal occasions. With regards to other meals, 15.6% reported a regular consumption of wheat, 80.0% fish, 50.3% chicken and 32.9% reported regular consumption of meat. Vegetable consumption among the patients on normal occasions was 99.4%. Fish consumption (p-value=0.024) and meat consumption (p-value=0.006) among persons with diabetes were found to be significantly associated with admission to the hospital.

Table 4. 5: Association between Dietary Practices and Hospitalization

	Overall	Routine clinic visit			Admitted to the hospital		
		No	Yes	p-value	No	Yes	p-value
Types of food	n(%)	n(%)	n(%)		n(%)	n(%)	
Porridge				0.990			0.035
No	35(22.6)	12(34.3)	23(65.7)		11(31.4)	24(68.6)	
Yes	120(77.4)	41(34.2)	79(65.8)		62(51.7)	58(48.3)	
Sugarless tea				0.132			0.620
No	28(18.1)	13(46.4)	15(53.6)		12(42.9)	16(57.1)	
Yes	127(81.9)	40(31.5)	87(68.5)		61(48.0)	66(52.0)	
Sugary tea				0.058			0.371
No	141(91.0)	45(31.9)	96(68.1)		68(48.2)	73(51.8)	
Yes	14(9.0)	8(57.1)	6(42.9)		5(35.7)	9(64.3)	
Arrowroots				0.952			0.055
No	59(38.1)	20(33.9)	39(66.1)		22(37.3)	37(62.7)	
Yes	96(61.9)	33(34.4)	63(65.6)		51(53.1)	45(46.9)	
Potatoes				0.473			0.530
No	133(85.8)	44(33.1)	89(66.9)		64(48.1)	69(51.9)	
Yes	22(14.2)	9(40.9)	13(59.1)		9(40.9)	13(59.1)	
Bread				0.488			0.080
No	28(18.1)	8(28.6)	20(71.4)		9(32.1)	19(67.9)	
Yes	127(81.9)	45(35.4)	82(64.6)		64(50.4)	63(49.6)	
Ugali				0.164	No	Yes	0.288
No	1(0.6)	1(100.0)	0(0.0)		1(100.0)	0(0.0)	
Yes	154(99.4)	52(33.8)	102(66.2)		72(46.8)	82(53.2)	
Rice				0.687			0.334
No	129(83.2)	45(34.9)	84(65.1)		63(48.8)	66(51.2)	
Yes	26(16.8)	8(30.8)	18(69.2)		10(38.5)	16(61.5)	
Wheat				0.401			0.100
No	131(84.5)	43(32.8)	88(67.2)		58(44.3)	73(55.7)	
Yes	24(15.6)	10(41.7)	14(58.3)		15(62.5)	9(37.5)	
Fish				0.310			0.024
No	31(20.0)	13(41.9)	18(58.1)		9(29.0)	22(71.0)	
Yes	124(80.0)	40(32.3)	84(67.7)		64(51.6)	60(48.4)	
Chicken				0.055			0.576
No	77(49.7)	32(41.6)	45(58.4)		38(49.4)	39(50.6)	
Yes	78(50.3)	21(26.9)	57(73.1)		35(44.9)	43(55.1)	
Meat				0.379			0.006
No	104(67.1)	38(36.5)	66(63.5)		57(54.8)	47(45.2)	
Yes	51(32.9)	15(29.4)	36(70.6)		16(31.4)	35(68.6)	
Vegetables				0.47			0.288
No	1(0.6)	0(0.0)	1(100.0)		1(100.0)	0(0.0)	
Yes	154(99.4)	53(34.4)	101(65.6)		72(46.7)	82(53.3)	

4.5.4 Multivariate Logistic Regression Analysis to Determine Individual Factors Associated With Hospitalization

In Table 4.6, multivariate logistic regression was done to determine the effects of individual factors that were significant in the chi-square test of association on admission. Participants who had an extreme diabetes condition were more likely to be admitted to the hospital as compared to those with no extreme diabetes condition (AOR=4.02, 95%CI=1.84-8.82, p-value=0.001). Participants who were drinking alcohol had higher odds of being admitted to the hospital as compared to those who were not drinking alcohol (AOR=2.73, 95%CI=1.03-7.27, p-value=0.044). Participants took porridge (AOR=0.43, 95%CI=0.19- 0.75, p-value=0.038) for breakfast and fish (AOR=0.38, 95%CI=0.15-0.98, p-value=0.044). for major meals in normal occasions were less likely to be admitted to the hospital. Although taking meat was not significant in multivariate analysis, participants who took meat in normal occasions had higher odds to be admitted to the hospital (AOR=2.07, 95%CI=0.96-4.48, p-value=0.065).

Table 4. 6: *Effects of Individual Factors among Person with Diabetes on Admission to the Hospital*

	Admitted to the hospital		Multivariate logistic regression		
	No, n=82 n(%)	Yes, n=73 n(%)	AOR	95%CI	p-value
Extreme diabetes condition					
No	36(73.5)	13(26.5)	Ref	-	-
Yes	37(34.9)	69(65.1)	4.02	1.84-8.82	0.001
Take alcohol					
No	66(52.8)	59(47.2)	Ref	-	-
Yes	7(23.3)	23(76.7)	2.73	1.03-7.27	0.044
Take porridge for breakfast					
No	11(31.4)	24(68.6)			
Yes	62(51.7)	58(48.3)	0.43	0.19- 0.75	0.038
Take meat for normal meal					
No	57(54.8)	47(45.2)	Ref	-	-
Yes	16(31.4)	35(68.6)	2.07	0.96-4.48	0.065
Take fish for normal meal					
No	9(29.0)	22(71.0)	Ref	-	-
Yes	64(51.6)	60(48.4)	0.38	0.15-0.98	0.044

CI=confidence interval, Ref=reference category, AOR = Adjusted Odds Ratio

4.6 Health System Factors Associated with Hospitalization

In Table 4.7, Pearson's chi-square test was used to determine health system factors that were significantly associated with hospitalization. Distance to the health facility, guidance and counseling on the diagnosis day, Satisfaction with the hospital services were found to be significantly associated with routine visit to the health facility (p-value=0.008). Place of diagnosis, guidance and counseling at the time of diagnosis and health facility that is providing diabetes care were associated with admission to the hospital (p-value <0.05). About one half (41.9%) of the participants lived < 10 km away from the hospital, 53.6% of the respondents were diagnosed in BCRH and half (51.0%) were diagnosed on their first day of the hospital visit. Most of the participants (85.8%) reported that they were taught and counseled about diabetes management on their diagnosis day. More than eighty percent (82.6%) of the participants were receiving diabetes management care at the BCRH and only 6.6% were receiving care at private hospitals. Almost half of the participants (49.0%) were not satisfied with the hospital services.

Table 4. 7: Health System Factors by Hospitalization

	Visited facility			Admitted to the hospital			Total
	No	Yes	χ^2	No	Yes	χ^2	
	n(%)	n(%)	p-value	n(%)	n(%)	p-value	
Distance from home to the hospital			0.001				
< 10 km	15(23.1)	50(76.9)		26(40.0)	39(60.0)	0.320	65(41.9)
10-30	17(30.9)	38(69.1)		29(52.7)	26(47.3)		55(35.5)
30+ km	21(60.0)	14(40.0)		18(51.4)	17(48.6)		35(22.6)
Place of diagnosis			0.479			0.019	
BCRH	26(31.3)	57(68.7)		47(56.6)	36(43.4)		83(53.6)
Routine testing	3(23.1)	10(76.9)		7(53.8)	6(46.2)		13(8.4)
Screening camps	4(33.3)	8(66.7)		2(16.7)	10(83.3)		12(7.7)
Other	20(42.6)	27(57.4)		17(36.2)	30(63.8)		47(30.3)
Number of hospital visits with signs before diagnosis made			0.846			0.846	
Zero	27(34.2)	52(65.8)		27(34.2)	52(65.8)		79(51.0)
Once	11(42.3)	15(57.7)		11(42.3)	15(57.7)		26(16.8)
Twice	7(33.3)	14(66.7)		7(33.3)	14(66.7)		21(13.6)
Thrice	3(25.0)	9(75.0)		3(25.0)	9(75.0)		12(7.7)
More than three	5(29.4)	12(70.6)		5(29.4)	12(70.6)		17(11.0)
Taught and counseled on the diagnosis day			0.008			0.044	
No	13(59.1)	9(40.9)		6(27.3)	16(72.7)		22(14.2)
Yes	40(30.1)	93(69.9)		67(50.4)	66(49.6)		133(85.8)
Health facility giving care			0.071			0.002	
BCRH	28(28.0)	72(72.0)		56(56.0)	44(44.0)		100(82.6)
County health facility	1(7.7)	12(92.3)		2(15.4)	11(84.6)		13(10.7)
Private health facility	0(100.0)	8(100.0)		1(12.5)	7(87.5)		8(6.6)
Satisfied with facility services			<0.001				
No	37(48.7)	39(51.3)		35(46.1)	41(53.9)	0.798	76(49.0)
Yes	16(20.3)	63(79.7)		38(48.1)	41(51.9)		79(51.0)
<i>n = number of participants, % = percentages representing proportions</i>							

4.6.1 Health system factors associated with hospitalization among persons with diabetes in Busia County

In Table 4.8, bi-variate analysis shows that participants who lived < 10 km from the health facility were more likely (OR=5.0, 95%CI=2.06-12.16, p-value< 0.001) to visit health facility than those who lived > 30 km from the facility, those who lived 10 – 30 kms from the facility the odds of visiting health facility had higher odds (OR=3.35, 95%CI=1.38-8.13, p-value=0.007) than those who lived more than 30 kms. Participants who were taught and counseled on the diagnosis day had higher odds of visiting a health facility for routine care than those not counseled (OR=3.36, 95%CI=1.33-8.49, p-value=0.010). Those who reported that they were satisfied with the services at the hospital were more likely (OR=3.74, 95%CI=1.84-7.59, p-value <0.001) to go for routine hospital visits than those who were not satisfied.

For the hospital admission, place of diagnosis, number of hospital visits with signs before diagnosis, guidance and counseling and health facility providing diabetes care were found to be significant at 5% level of significance. Participants that were diagnosed at the screening camps and other places had (OR=6.53, 95%CI=1.35-31.66, p-value=0.020) and (OR=2.30, 95%CI=1.10-4.81, p-value=0.026) respectively more likely to be admitted to the hospital as compared to those that were diagnosed at the BCRH. The analysis also found that the odds of being admitted to the hospital among diabetes patients who visited health facility more than three times with signs before diagnosis had higher odds (OR= 5.30, 95%CI=1.41-19.89, p-value=0.014) than those who were diagnosed on their first day to the health facility with the signs of diabetes. Participants who were taught and counseled were less likely to be admitted to the hospital (OR=0.37, 95%CI=0.14-1.00, p-value=0.05). Those that were diagnosed at other County hospitals (OR=7.0, 95%CI=1.47-33.23, p-value=0.014) and those that were diagnosed at private hospitals (OR=8.91, 95%CI=1.06-75.13, p-value=0.044) were also found to be more likely to be admitted in the hospital as compared to those that were diagnosed at the BCRH.

Table 4. 8: *Bivariate analysis of health system factors associated with diabetes in Busia County, N=155*

	Visited health facility			Admitted to the hospital		
	OR	95% CI	p-value	OR	95% CI	p-value
Distance from home to the hospital						
< 10 km	5.00	2.06-12.16	<0.001	1.59	0.69-3.64	0.273
10-30 km	3.35	1.38-8.13	0.007	0.95	0.41-2.22	0.904
30+ km	Ref	-	-	Ref	-	-
Place of diagnosis						
BCRH	Ref	-	-	Ref	-	-
Routine testing	1.52	0.39-5.99	0.549	1.12	0.35-3.62	0.851
Screening camps	0.91	0.25-3.30	0.889	6.53	1.35-31.66	0.020
Other	0.62	0.29-1.29	0.200	2.30	1.10-4.81	0.026
Number of hospital visits with signs before diagnosis made						
Zero	Ref	-	-	Ref	-	-
Once	0.71	0.29-1.75	0.455	0.71	0.29-1.75	0.457
Twice	1.04	0.37-2.88	0.942	1.84	0.69-4.94	0.223
Thrice	1.56	0.39-6.23	0.531	2.27	0.63-8.16	0.209
More than three	1.25	0.40-3.90	0.706	5.30	1.41-19.89	0.014
Taught and counseled on the diagnosis day						
No	Ref	-	-	Ref	-	-
Yes	3.36	1.33-8.49	0.010	0.37	0.14-1.00	0.050
Health facility giving care						
BCRH	Ref	-	-	Ref	-	-
County health facility	4.67	0.58-37.59	0.148	7.00	1.47-33.23	0.014
Private health facility	1.00	NA	NA	8.91	1.06-75.13	0.044
Satisfied with facility services						
No	Ref	-	-	Ref	-	-
Yes	3.74	1.84-7.59	<0.001	0.92	0.49-1.73	0.798

OR=odds ratio, CI=confidence interval, NA=not available, Ref=reference category

4.6.2 Health system factors associated with hospitalization among persons with diabetes in Busia County

The multivariate analysis result in Table 4.9 shows that participants who lived less than 10 km from the hospital had higher odds (AOR=3.07, 95%CI=1.18-7.98, p-value=0.021) of visiting the health facility than those lived at least 30 km from the health facility. The odds of visiting a health facility among participants who were taught and counseled on the diagnosis day had higher odds (AOR=2.21, 95%CI=1.80-6.11, p-value=0.026) than those who were not taught and counseled. Participants who were satisfied with the health facility services had higher odds of visiting the health facility for routing care than those who were not satisfied with the services (AOR=2.81, 95%CI=1.32-5.95, p-value=0.007). Participants who visited health facility more than 3 times before diagnosis were found to be more likely to be admitted to the hospital as compare to those who were diagnosed the first day they went to the hospital (AOR=10.52, 95%CI=1.70-65.24, p-value=0.012). Participants who were receiving diabetes care at county health facility and private health facility had higher odds (AOR=10.29, 95%CI=1.51-70.08, p-value=0.017) and (AOR=13.69, 95%CI=1.12-167.55, p-value=0.041) of being admitted to the hospital as compared to those who were getting diabetes care at the BCRH.

Table 4. 9: *Multivariate analysis of health system factors associated with diabetes in Busia County, N=155*

	Visited health facility			Admitted to the hospital		
	AOR	95% Conf.	p-value	AOR	95% Conf.	p-value
Distance from home to the hospital						
< 10 km	3.07	1.18-7.98	0.021	2.31	0.57-9.47	0.243
10-30	2.43	0.95-6.21	0.064	1.29	0.31-5.42	0.725
30+ km	Ref	-	-	Ref	-	-
Taught and counseled on the diagnosis day						
No						
Yes	2.21	1.80-6.11	0.026	1.43	0.27-7.66	0.678
Satisfied with facility services						
No	Ref	-	-	Ref	-	-
Yes	2.81	1.32-5.95	0.007	0.75	0.32-1.81	0.528
Place of diagnosis						
BCRH	Ref	-	-	Ref	-	-
Routine testing	1.39	0.22-8.70	0.722	0.93	0.21-4.09	0.926
Screening camps	1.00	NA	NA	0.59	0.05-7.00	0.677
Other	0.59	0.18-2.00	0.401	1.15	0.37-3.52	0.810
Number of hospital visits with signs before diagnosis made						
Zero	Ref	-	-			
Once	0.50	0.15-1.76	0.283	0.98	0.31-3.07	0.967
Twice	0.79	0.20-3.05	0.730	2.39	0.73-7.80	0.149
Thrice	2.28	0.22-23.34	0.487	5.21	0.88-30.81	0.068
More than three	1.03	0.18-5.97	0.970	10.52	1.70-65.24	0.012
Health facility giving care						
BCRH						
County health facility	9.38	0.85-103.76	0.068	10.29	1.51-70.08	0.017
Private health facility	1.00	NA	NA	13.69	1.12-167.55	0.041

AOR=adjusted odds ratio, CI=confidence interval, NA=not available, Ref=reference category

4.6.3 Challenges at the health facility

Figure 4.6, presents the challenges of dissatisfied diabetes persons (n=76) with the service delivery at the facility. Majority of the participants (94.7%) reported unreliable drug supply at the hospital, 69.7% reported waiting for long in the line before they received health care services.

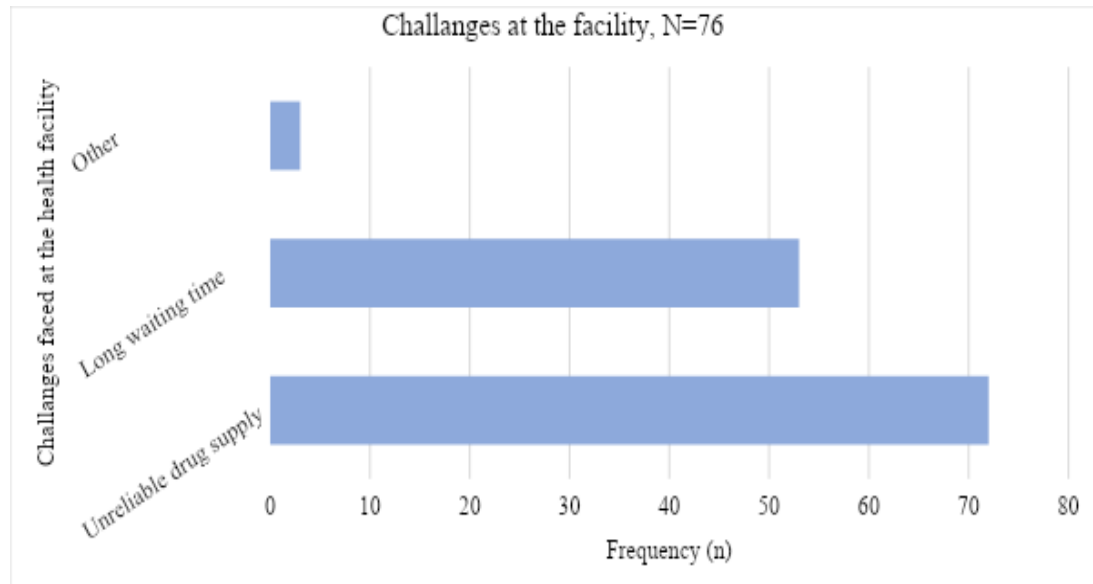


Figure 4. 6: *Challenges some participants face at the facility, n=76*

4.6.4 Recommendations by the Participants

Figure 4.7, presents recommendations made by the 155 participants on how to improve services at the health facility. The majority of the participants recommended adequate drug supply to the health facilities, 43.2% recommended strengthening of primary health care, 33.5% recommended adequate employment of health care personnel and 9.0% recommended improved infrastructure.

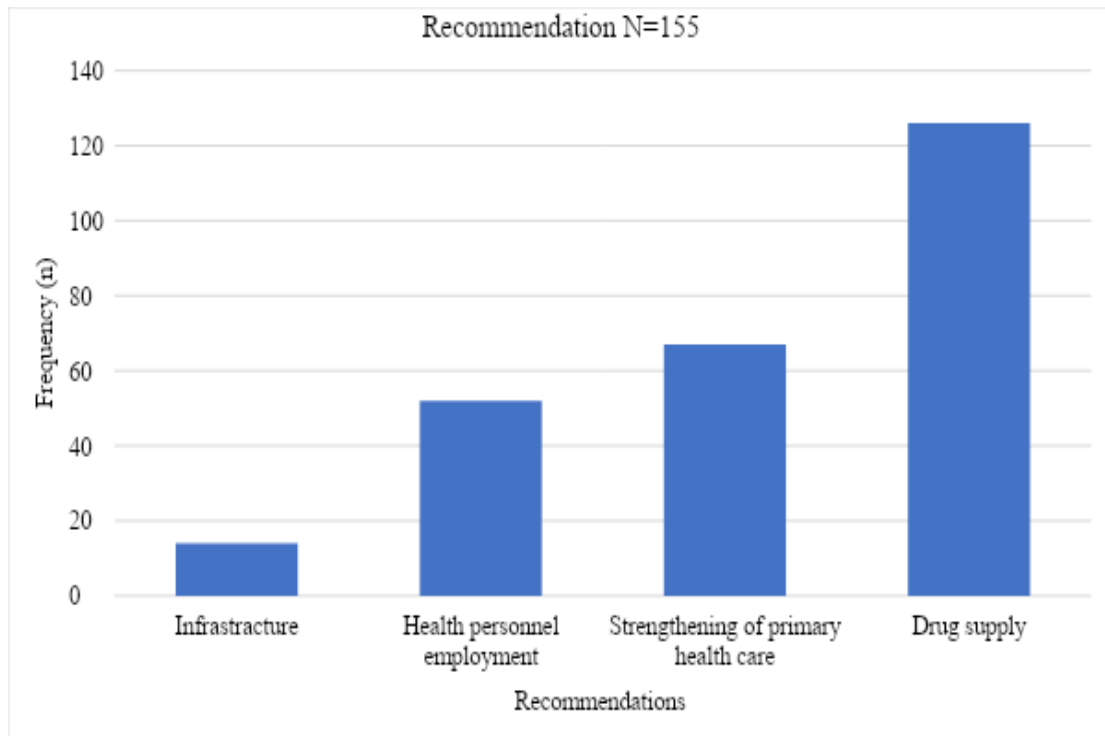


Figure 4. 7: Recommendations by the Study Participants, N=155

CHAPTER FIVE: DISCUSSIONS

5.1 Introduction

This section presents a discussion of the results for the different objectives. The results are explained in relation with other findings in the current available literature.

5.2 Hospitalization Status

This study described hospitalization as a visit to hospital by a diabetes person for either routine clinic visits or medication resulting in admission. Therefore, routine clinic visits and hospital admission were the two main outcome variables for the study. The threshold for routine clinic visits among diabetes persons in this study was aimed at the individual-based program guided by the physician which was in line with the national guidelines. This study used a standard threshold for follow-ups among known diabetes patients where one is expected to visit the facility at least once in two months for routine clinic to have their clinical progression monitored (Guidelines *et al.*, 2010).

A total of 155 participants were systematically enrolled in the study during their visit at BCRH. The study findings showed that 65.8% of the overall participants visited the hospital at least three clinic visits for six months and 62.5% of this number were female. In this study, the majority (51.9%) of those who visited the facility at least three times within the six months were at least 60 years old. This could be attributed to the increased risk of developing diabetes-related complications due to their decreased immunity thus need for regular monitoring of the progression of diabetes.

More than half of the total participants (52.9%) were admitted at least once to the facility within six months. As expected, age was significantly associated with hospital admission as 54.9% of the admissions were registered from participants of 60 years and above. This finding mirrors the report by WHO, 2022 on the association of aging and diabetes. Increase in age has been associated with degenerated body immunity thus predisposing one to diseases for this case diabetes and progression of its related complications and this could explain the increased hospital admissions among participants aged 60years and above.

There was no proportional difference on hospitalization based on gender meaning being a male/female does not protect one from being hospitalized

5.3 Socio-Demographic Factors Associated with Hospitalization

The study identified the sociodemographic characteristics that have an association with hospitalization among diabetes patients. Proportionally, the majority of the participants were aged at least 40 years (85.8%), this is in line with the current literature on how one gets vulnerable to diabetes as from 40 years going forward (WHO, 2022b). However, a study on health-seeking behavior using secondary data among adult diabetes persons had a contrary report that an increase in age reduced the probability of one seeking for health care services (Waweru *et al.*, 2016). The variance on age findings with this study could be attributed to the type of data used. This study used primary data collected from participants.

Studies have reported that marital status could be associated with hospitalization. Studies have showed that married diabetes individuals were more likely to seek diabetes-related healthcare services compared to unmarried diabetes persons (Karinja *et al.*, 2019). These reports are in agreement with the current study where more than one-half of the enrolled participants were married (59.4%). The high proportion of those married seeking for health care services could be attributed to having moral support or even financial support from the spouses compared to their counterpart. Though at a significance level of 5% being married had no statistical significance with hospitalization in this study. Gender was also not statistically significant to hospitalization thus gender cannot be attributed as a risk factor for hospitalization according to this study. A done in study in Baniyani Village, Nepal didn't find any significant association between gender and marital status with hospitalization among diabetes persons (Thapa *et al.*, 2018).

Despite the study enrolling a majority of participants with primary education, the current analysis doesn't show any evidence in the relationship between education status and hospitalization among persons with diabetes. This finding is contrary to a study which revealed that secondary education had a proportional significance with health facility

visits. The study which used secondary data showed that those with secondary education were more likely to present to a health facility.

The employment status was statistically significant to hospitalization with unemployed participants being less likely to visit the health facility at least every 2 months as compared to employed participants. This finding could be related to that of Karinja *et al.*, 2019 who reported that patients running businesses had irregular visits to the health facility due to the fear of losing daily income. This finding should be interpreted with caution as being unemployed does not protect one from being hospitalized but rather being unemployed could result to lack of money to facilitate hospital visits. The same study by also reported that besides those in business, unemployed diabetes persons could be having quite low income to support their visit to the hospital. In this study, one third of the participants had an income of KShs. 15000 and below, though this had no significance on hospitalization.

5.4 Individual Factors Associated with Hospitalization

This study captured individual factors associated with hospitalization among patients with diabetes. Participants who have lived with diabetes for a period of at least 3 years were the majority for both clinic visits and hospital admission. The majority of clinic visits could be associated with clinical progression of diabetes over time that requires them to have regular monitoring. The high proportion of hospital admission could be attributed to the potential of having developed related complications leading to increased hospitalization. On bivariate logistic regression, there was no significant association between time span one has lived with diabetes and hospitalization. Majority of the participants (68.4%) reported to have experienced severe hyperglycemia attacks (extreme diabetes conditions) at some point that called for urgent facility visits for close monitoring of the blood sugars. Moreover, this was associated with admission to the hospital (p-value= 0.001) as participants who experienced this had higher proportions of being admitted to the hospital as compared to those without the hyperglycemic attacks.

Use of drug substances especially alcohol has previously been reported in studies as a risk factor for instability of sugars and it has even been highlighted as part of the non-

pharmacological therapy for diabetes (Sun *et al.*, 2022). This study showed that diabetes persons with alcohol consumption were nearly 3 times more likely to be admitted to the hospital as compared to those with no alcohol consumption. This could indicate that alcohol consumption inhibits the proper cells generation as required for a diabetes patient as it hinders the functioning of the drugs. This finding mirrored report of a study in Nepal on health seeking behavior among diabetes patients which also found alcohol consumption to be a determinant of health seeking. The study related this finding to the side effects of alcohol resulting to its consumers seeking health services more often (Thapa *et al.*, 2018).

Concurrence of diabetes with other conditions have been reported, hypertension has been consistently reported among diabetes persons. This study has also shown a majority of participants (63.2%) had hypertension this mirrored a report by Karinja *et al.*, 2019 who reported 222 diabetes participants of the enrolled 768 had hypertension as a comorbidity. A study in Northern Tanzania, reported high incidences of hospitalization among persons living with both diabetes and hypertension (Julian *et al.*, 2019). The co-existing of hypertension and diabetes can be attributed to both of them being predisposed by almost similar risk factors. They both call for almost the same management and control measures. This can explain why in majority of diabetes patients have hypertension as a comorbidity.

A qualitative study done in South Africa on participants seeking primary health care (PHC) services in two provinces with high prevalence of HIV (25.2% & 17.6%) reported diabetes to be among the chronic comorbidities in PLWH (Godongwana *et al.*, 2021). The qualitative study highlighted the need for intensive PHC services for PLWH and diabetes since a combination of the two poses a higher risk of decreased life expectancy. In Kenya, PLWH benefit from management and care programs outlined in the bid to manage their infection. These programs encourage PLWH on the need for strict adherence to routine clinic visits for close monitoring of their disease progression. In this study, 20% of participants were reported to have HIV as a comorbidity and this was statistically significant for routine clinic visits ($p\text{-value} < 0.05$). The significance of

association on hospitalization among diabetes patients with HIV as a comorbidity could be attributed to ongoing programmes on management and care for PLWH.

Proper adherence to dietary practices is key in the management of diabetes. Adherence to diet which includes intake of carbohydrates according to the recommended measures depending with type of diabetes aids to better control of blood sugars (WHO, 2022a). This study looked at the dietary practice of the participants. It reported that the majority (77.4%) of the respondents in normal occasions took porridge for breakfast, about 80.0% of the total participants were taking sugarless tea for breakfast. About 80% of the participants reported to be taking fish with about 32.9% taking meat and 99% taking vegetables for lunch and dinner. This study has shown, participants taking porridge for breakfast and fish for major meals in normal occasions were less likely to be admitted to the hospital while those taking meat were 2 times more likely to be admitted.

5.5 Health System Factors Associated with Hospitalization

The study assessed the health system related factors influencing hospitalization among diabetes patients. It revealed that the majority of the respondents lived <10kms from BCRH and were more likely to visit the facility than those living 30 Kms away from the facility. This implies that living nearer to the facility has a lesser cost of getting to the facility than those away thus increased frequency of facility visit. Also, BCRH being the County referral hospital other respondents could seek for services at the other county facilities around them or the private clinics and only report to BCRH on referral basis. This explains the higher proportion of hospital admissions in this study among diabetes patients who reported to be seeking their routine management and care services from other facilities. This study showed that the diabetes patients receiving diabetes care services at the other facilities were 10 times more likely to be admitted than those who receive care services at BCRH.

Early detection of any disease is key for its better management and treatment. According to WHO, NCDs are recommended for regular screening in order to enable detection of the predisposing risk factors early enough. Diabetes in this case being predisposed to several risk factors, early detection saves a lot on the management plan as late diagnosis

predisposes one to developing further complications like diabetes foot ulcer. This study revealed that participants who were detected with diabetes at first presentation to the facility or during screening camps were less likely to be admitted to the hospital. On the other hand, those who presented to a health facility more than three times with similar symptoms before being diagnosed had a higher proportion of being admitted. In Kenya, after diagnosis of diabetes, health education on how the patient should manage their sugar levels should be provided by the health care provider. As it's through health education that one is taught on how best to manage their blood sugar levels through diet, physical activity and medication adherence. A study done in Kenya on determinant of non-adherence among diabetes patients showed that health education influenced the adherence to medication and other recommended measures (Barasa Masaba & Mmusi-Phetoe, 2020) According to this study, participants who were counseled on the diagnosis day were 3 times more likely to visit the health facility for routine care than those not counseled. These participants who were counseled were less likely to be admitted to the hospital. This finding could be laid on account that diabetes patients who were counselled on diagnosis day were adhering to the recommended measures of management and only visited the hospital for monitoring of their clinical progression.

Management of diabetes is broadly categorized in two; that is non-pharmacological therapy and pharmacological therapy. Pharmacological therapy in this includes OGLAs and the insulin therapy depending with the type of diabetes in question. This implies that diabetes patients on pharmacological therapy need to have reliable supply of their required drugs. This study showed that 94.7% of the enrolled participants were dissatisfied with the unreliable drug supply at the facility and this could affect their presentation to the facility of routine visits.

Finally, this study captured the recommendations made by the respondents on how the health system could be improved in their benefit. Majority of the participants recommended adequate drug supply to the health facilities, 43.2% strengthening of primary health care, 33.5% adequate employment of health care personnel and 9.0% recommended improved infrastructure. Like the study done in South Africa strengthening of PHC would aid in better management of diabetes patients and even ease the burden

they pose on the hospital in terms of costs of management (Godongwana *et al.*, 2021). The majority of participants enrolled in this study recommended employment of more health professionals at the facility as they reported long waiting time for service delivery. These recommendations by diabetes patients in this study were clearly aimed at reducing the cost of management of their diabetes through health system related factors, for instance regular drug supply at the facility will have the patients acquire their drugs at the subsidized government prices at BCRH compared to acquiring from other private entities.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This section presents a summary of the implications of this study and the recommendations for the future.

6.2 Conclusions

The study concludes that hospitalization at BCRH is significantly associated with;

- i. Age as enrolled participants aged at least 40years and above in this study had increased risks of being hospitalized. Level of income and unemployment as socio-demographic factors were associated with hospitalization.
- ii. Presence of comorbidity HIV significantly increased the odds of routine clinic visits among the diabetes patients. Nutrition lifestyle and behavioral lifestyle in this case alcohol consumption were the individual factors associated with hospitalization.
- iii. Distance from the health facility and health service delivery were health system factors associated with hospitalization. Service delivery according to this study includes; drug supply, early detection, waiting time and distance covered to the facility. Health education broadly encompasses counseling on the diagnosis day since this will directly influence dietary practices and medical adherence which are key in the management of diabetes.

6.4 Recommendations

For public health practice

- i. Strengthening of PHC. Strengthening of PHC at the county level should be aimed at empowering the community workers so as to have measures like regular screening and monitoring of blood sugars available at the community level and household unit level.
- ii. Education and intensified awareness on diabetes including its risk factors and the related management and control measures. The awareness should encompass the need to adhere to the recommended measures of management and control.
- iii. Strengthening of existing policies on diabetes management especially on pharmacological provision to diabetes persons.

6.5. For Future Research

This study was limited with funding thus experienced challenges on having a bigger sample size that would have allowed further analysis in order to tease out specific participants characteristics and check out how they impact on hospitalization. Therefore, it recommends a rigorous funded cohort study that would investigate further the impact of the variables on hospitalization directly and would also involve a large sample size.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

Study title: Factors associated with hospitalization among people with diabetes at Busia County Referral Hospital

INTRODUCTION

Thank you for agreeing to participate in our study investigating hospitalization among persons with diabetes in Busia County. These questions will help us understand the factors associated with hospitalization among people with diabetes. These will help in informing better intervention strategies for the management of diabetes.

The response you provide will be stored anonymously and confidential, thus not affecting your current or future care from the health facility.

PART A: DEMOGRAPHIC INFORMATION

1. Age (years) 18 – 29;
 30 – 39;
 40 – 49;
 50 – 59;
 60 – 69;
 70 +;
2. Sex: Male; Female; Unspecified;
3. Marital status:
 - Single;
 - Married;
 - Widowed/ Divorced/ Separated;
4. Level of education;
 - Primary;
 - Secondary;
 - Tertiary;
 - None;
5. Occupation;
 - Employed
 - Unemployed

- I. If employed, which position do you hold at work?
 - Managerial;
 - Technical;
 - Casual;
- II. If employed, are you in?
 - Government sector;
 - Private sector;
- III. If unemployed, are you;
 - A retired employee;
 - A business person;
 - Others (specify);
- 6. Household income;
 - 0 – 15,000;
 - 15,000 – 30,000;
 - 30,000 – 45,000;
 - 45,000 – 60,000;
 - Above 60,000;

PART B: HEALTH SYSTEM FACTORS

- 1. Where do you stay?
 - a. Ward;
 - b. Sub-county;
- 2. What's the distance from your home to BCRH?
 - 0 – 10kms;
 - 10 – 20 kms;
 - 20 – 30 kms;
 - 30 – 40 kms;
 - More than 40 kms;
- 3. Where did you first get diagnosed with diabetes?
 - BCRH
 - Routine testing
 - Screening camps

- Others Specify;
4. After how many visits to the facility with similar signs was the diagnosis made?
- Zero;
 - Once;
 - Twice;
 - Thrice;
 - More than three
5. On that diagnosis day, were you taught and counseled on how to take care of yourself?
- Yes;
 - No;
- I. If yes, what are some of the key things you were counseled on?
- Proper diet;
 - Physical activity;
 - Medical adherence;
 - Use of substances;
 - Others (specify);
6. Do you have regular visits to the facility?
- Yes;
 - No;
- I. If yes, which is this facility that you go to?
- BCRH;
 - County health facilities;
 - Private health facilities;
- II. If not, where do you get your medication from?
- Commercial pharmacy;
 - Traditional practice;
 - Others;
7. During the visit to the facility are you satisfied with the services?
- Yes;
 - No;
- I. If not satisfied, what are the challenges that you face at the facility?

- Unreliable drug supply;
 - Long waiting time for service;
 - Others (specify);
8. What would you recommend to be improved in healthcare for the benefit of diabetes persons?
- Regular screening camps;
 - Infrastructure;
 - Health personnel employment;
 - Strengthening of primary health care;
 - Drug supply;

PART C: INDIVIDUAL FACTORS

1. For how long have you had diabetes? (After medical diagnosis)

- 0 – 1 year
- 1 - 2 years
- 2 – 3 years
- Over 3 years

I. If over 3 years, when was the diagnosis done?

2. During this time, do you experience any extreme effects that require you to visit the facility?
- Yes;
 - No;

I. If yes, how often in a year does this occur?

- Once;
- Twice;
- Thrice;
- More than 3 times;

3. Which among these do you take?

- Alcohol
- Tobacco
- Bhang
- Others (Specify);

- None of the above;

4. Have you had or have any of the following? (with medical diagnosis)

- Hypertension
- Tuberculosis
- Malaria
- HIV/AIDs
- None of the above

5. On normal occasions,

I. If you are having breakfast, what do you take?

- Porridge;
- plain maize;
- Maize + cassava;
- Cassava + millet;
- Millet;
- Others (specify);
- Sugarless tea;
- Tea with sugar;
- Arrowroots;
- Sweet potatoes ;
- Bread ;

II. If having other meals, what do you take?

- Ugali;
- plain maize
- Maize + cassava
- Cassava + sorghum
- Maize + cassava + sorghum
- Rice
- Wheat
- Fish
- Chicken
- Meat
- Vegetables

PART D: HOSPITALIZATION STATUS

1. In the last 6 months, how many times have you visited the facility?

- Once
- Twice
- Thrice
- Monthly
- None

2. What were the reasons for the facility visit?

- Routine visits;
- Medication;

I. During the visit, is there a time you were admitted?

- Yes;
- No;

II. If yes, how many times have been admitted within the last 6 months?

- Once
- Twice
- Thrice
- Monthly
- Others (specify);

DODOSO

Kichwa cha utafiti: Mambo yanayohusiana na kulazwa hospitalini miongoni mwa watu wenye kisukari katika Hospitali ya Rufaa ya Kaunti ya Busia

UTANGULIZI

Asante kwa kukubali kushiriki katika utafiti wetu unaochunguza kulazwa hospitalini miongoni mwa watu walio na kisukari katika Kaunti ya Busia. Maswali haya yatatusaidia kuelewa mambo yanayohusiana na kulazwa hospitalini kati ya watu wenye ugonjwa wa kisukari. Haya yatasaidia katika kufahamisha mikakati bora ya uingiliaji kati kwa usimamizi wa ugonjwa wa kisukari.

Majibu utakayotoa yatahifadhiwa bila kujulikana na kwa siri, hivyo basi kutoathiri huduma yako ya sasa au ya baadaye kutoka kwa kituo cha afya.

SEHEMU A: HABARI ZA KIDEMOGRAFIA

1. Umri (miaka) 18 - 29;

30 - 39;

40 - 49;

50 - 59;

60 - 69;

70 +;

2. Jinsia: Mwanaume; Mwanamke; Haijabainishwa;

3. Hali ya ndoa:

- Mtu Mmoja;
- Aliyeolewa;
- Mjane/Mtalikiana/ Kutengwa;

4. Kiwango cha elimu;

- Msingi;
- Sekondari;
- Elimu ya Juu;
- Hakuna;

5. Kazi;

- Kuajiriwa;
- Wasio na kazi;

I. Ikiwa umeajiriwa, unashikilia nafasi gani kazini?

- Utawala;
- Kiufundi;
- Kawaida;

II. Ikiwa umeajiriwa, uko ndani?

- Sekta ya Serikali;
- Sekta ya kibinafsi;

III. Ikiwa huna kazi, je!

- Mfanyakazi aliyestaafu;
- Mfanyabiashara;
- Nyingine (Taja);

6. Mapato ya kaya;

- 0 - 15,000;
- 15,000 - 30,000;
- 30,000 - 45,000;
- 45,000 - 60,000;
- Zaidi ya 60,000;

SEHEMU B: MAMBO YA MFUMO WA AFYA

1. Unakaa wapi?

- a) Wadi;
- b) Kaunti ndogo;

2. Umbali gani kutoka nyumbani kwako hadi BCRH?

- 0 – Kilomita 10;
- Kilomita 10 – 20;
- Kilomita 20 – 30;
- Kilomita 30 - 40;
- Zaidi ya kilomita 40;

3. Ulipima wapi ugonjwa wa kisukari kwa mara ya kwanza?

- BCRH;
- Upimaji wa kawaida;

- Kambi za uchunguzi;
 - Kwengine (Taja);
4. Utambuzi ulifanywa baada ya mara ngapi kutembelea kituo na dalili zinazofanana?
- Sufuri;
 - Mara moja;
 - Mara mbili;
 - Mara tatu;
 - Zaidi ya tatu;
5. Siku hiyo ya uchunguzi, ulifundishwa na kushauriwa jinsi ya kujitunza?
- Ndiyo;
 - Hapana;
- I. Kama ndiyo, ni baadhi ya mambo gani muhimu uliyopewa ushauri?
- Mlo sahihi;
 - Shughuli za kimwili;
 - Ufuasi wa matibabu;
 - Matumizi ya vitu;
 - Nyingine (Taja);
6. Je, unatembelea kituo mara kwa mara?
- Ndiyo;
 - Hapana;
- I. Kama ndiyo, ni kituo kipi ambacho unaenda?
- BCRH;
 - Vituo vya afya vya kaunti;
 - Vituo vya afya vya kibinafsi;
- II. Ikiwa sivyo, unapata wapi dawa yako?
- Duka la dawa la kibiashara;
 - Mazoezi ya kimila;
 - Kwengine (Taja);
7. Je, wakati wa kutembelea kituo hicho umeridhika na huduma?
- Ndiyo;
 - Hapana;

I. Ikiwa haujaridhika, ni changamoto gani unakumbana nazo kwenye kituo?

- Ugavi wa dawa usioaminika;
- Muda mrefu wa kusubiri huduma;
- Nyingine (Taja);

8. Je, ungependekeza nini kuboreshwa kwa huduma za afya kwa manufaa ya watu wa kisukari?

- Kambi za uchunguzi wa mara kwa mara;
- Miundombinu;
- Ajira kwa wahudumu wa afya;
- Kuimarishwa kwa huduma ya afya ya msingi;
- Usambazaji wa dawa;

SEHEMU C: MAMBO BINAFSI

1. Umekuwa na kisukari kwa muda gani? (Baada ya utambuzi wa matibabu)

- 0 - 1 mwaka;
- Miaka 1 – 2;
- Miaka 2 – 3;
- Zaidi ya miaka 3;

I. Ikiwa zaidi ya miaka 3, utambuzi ulifanyika lini?.....

2. Katika wakati huu, unapata athari zozote mbaya ambazo zinahitaji utembelee kituo?

- Ndiyo;
- Hapana;

I. Ikiwa ndiyo, hii hutokea mara ngapi katika mwaka?

- Mara moja;
- Mara mbili;
- Mara tatu;
- Zaidi ya mara 3;

3. Je, unatumia nini kati ya hizi?

- Pombe;
- Tumbaku;
- Bangi;

- Nyingine (Taja);
- Hakuna kati ya zilizo hapo juu;

4. Je, umewahi kupata au unayo yoyote kati ya yafuatayo? (na utambuzi wa matibabu)

- Shinikizo la damu;
- Kifua kikuu;
- Malaria;
- UKIMWI;
- Hakuna kati ya zilizo hapo juu;

5. Katika matukio ya kawaida,

I. Ikiwa unapata kifungua kinywa, unakula nini?

- Uji;
 - Mahindi ya kawaida;
 - Mahindi + mihogo;
 - Muhogo + mtama;
 - Mtama;
 - Nyingine (taja);
- Chai isiyo na sukari;
- Chai yenye sukari;
- Nduma;
- Viazi vitamu;
- Mkate;

II. Ikiwa una milo mingine, unachukua nini?

- Ugali;
 - Mahindi ya kawaida
 - Mahindi + mihogo
 - Mihogo + mtama
 - Mahindi + mihogo + mtama
- Mchele;
- Ngano;
- Samaki;
- Kuku;

- Nyama;
- Mboga;

SEHEMU YA D: HALI YA HOSPITALIZWA

1. Katika miezi 6 iliyopita, umetembelea kituo mara ngapi?

- Mara moja;
- Mara mbili;
- Mara tatu;
- Kila mwezi;
- Hakuna;

2. Ni sababu gani za kutembelea kituo hicho?

- Ziara za kawaida;
- Matibabu;

I. Wakati wa ziara, kuna wakati ulilazwa?

- Ndiyo;
- Hapana;

II. Kama ndiyo, ni mara ngapi wamekubaliwa ndani ya miezi 6 iliyopita?

- Mara moja
- Mara mbili
- Mara tatu
- Kila mwezi
- Nyingine (Taja);

APPENDIX 2: APPROVAL LETTERS



**JARAMOGI OGINGA ODINGA
UNIVERSITY OF SCIENCE AND TECHNOLOGY
DIVISION OF RESEARCH, INNOVATION AND OUTREACH
JOOUST-ETHICS REVIEW OFFICE**

Tel. 057-2501804
Email: erc@jooust.ac.ke
Website: www.jooust.ac.ke

P.O. BOX 210 - 40601
BONDO

OUR REF: JOOUST/DVC-RIO/ERC/E4

10th February, 2023

Tessy M. Achieno
SHS
JOOUST

Dear Ms. Achieno,

RE: APPROVAL TO CONDUCT RESEARCH TITLED "FACTORS ASSOCIATED WITH HOSPITALIZATION AMONG PERSONS LIVING WITH DIABETES IN BUSIA COUNTY, KENYA"

This is to inform you that JOOUST ERC has reviewed and approved your above research proposal. Your application approval number is **ERC 36/02/23-9/15**. The approval period is from 10th January, 2023– 09th January, 2024.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations and violations) are submitted for review and approval by JOOUST IERC.
- iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to NACOSTI IERC within 72 hours of notification.
- iv. Any changes, anticipated or otherwise that may increase the risks of affected safety or welfare of study participants and others or affect the integrity of the research must be reported to NACOSTI IERC within 72 hours.
- v. Clearance for export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days upon completion of the study to JOOUST IERC.

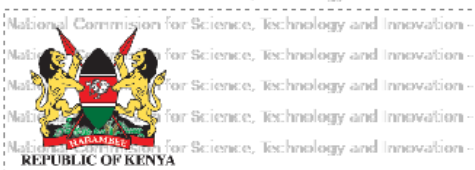
Prior to commencing your study, you will be expected to obtain a research permit from National Commission for Science, Technology and Innovation (NACOSTI) <https://oris.nacosti.go.ke> and also obtain other clearances needed.

Yours sincerely,

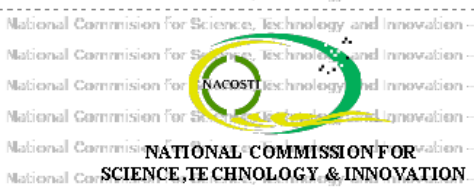
Prof. Francis Anga'wa
Chairman, JOOUST ERC

Copy to: Deputy Vice-Chancellor, RIO Director, BPS DEAN, SHS

Atm



National Commission for Science, Technology and Innovation
Ref No: **904451**



Date of Issue: **16 March 2023**

RESEARCH LICENSE



This is to Certify that Ms. Achieno Matilda Tussy of Jaramogi Oginga Odinga University of Science and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev 2014) in Busia on the topic: **Factors associated with hospitalization among persons living with diabetes in Busia County, Kenya for the period ending : 16/March/2024.**

License No: **NACOSTI/P/23/23811**

Applicant Identification Number
904451

Walter M...

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code



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See overleaf for conditions



COUNTY GOVERNMENT BUSIA
 County Director of Health
 Health & Sanitation Department
 P.O. BOX 1040 - 10400
 BUSIA, KENYA



CG/BSA/HL/56/V.II/84

DATE: 24th March 2023

THE MEDICAL SUPERINTENDENT
 BUSIA COUNTY REFERRAL HOSPITAL
 P.O. BOX 87
 BUSIA (K)

Dear Sir/Madam,

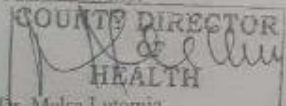
RE: RESEARCH APPROVAL – ACHIENO M. TESSY (HI53/P/2420/21)

This is to confirm that the above-named study entitled “Factors Associated with Hospitalization among Persons Living with Diabetes in Busia County, Kenya” has been authorized to take place at Busia County Referral Hospital.

The Research Approval documents from NACOSTI and JOUST/IERC from Jaramogi Oginga Odinga University of Science and Technology have been attached for your perusal.

Kindly accord the Research team any support they may require.

Yours faithfully,


 COUNTY DIRECTOR
 HEALTH
 Dr. Melsa Lutomia
 County Director of Health.....
 Department of Health & Sanitation
 Busia County

Cc CE.C.M. – Department of Health and Sanitation

Chief Officer – Department of Health and Sanitation



DEPARTMENT OF HEALTH AND SANITATION
OFFICE OF THE MEDICAL SUPERINTENDENT



Telegram: 'MEDICAL', Busia
Telephone: 055 22126, /22136
Fax: 05522136
E-mail: busiahts@mail@gmail.com
When referring please quote

OFFICE OF THE MEDICAL SUPERINTENDENT
BUSIA COUNTY REFERRAL HOSPITAL
P. O. BOX 87
BUSIA (K)

REF. : BSA/CRH/R/5 VOL.II/146

Date: 28th March, 2023

ACHIENO M. TESSY (H153/P/2420/21)
JARAMOGI OGINGA ODINGA UNIVERSITY
OF SCIENCE & TECHNOLOGY
P.O. BOX 210 - 40601
BONDO

Dear Sir,

RE: RESEARCH AUTHORIZATION

I hereby authorize **ACHIENO M. TESSY** to carry out research activities in this hospital on **FACTORS ASSOCIATED WITH HOSPITALIZATION AMONG PERSONS LIVING WITH DIABETES IN BUSIA COUNTY, KENYA.**

I would also like to request the Family Physician and the Medical Officer in-charge of Internal Medicine to work closely with her during the study period.

The student is expected to observe the laid-out rules and regulations.

I wish her well in her academic pursuits.

Thank you.

Yours faithfully,

DR. EMMA NAMULALA
AG. MEDICAL SUPERINTENDENT
BUSIA COUNTY REFERRAL HOSPITAL.

