THE BURDEN AND OUTCOMES OF HEMODIALYSIS CATHETER-RELATED INFECTIONS AMONG HEMODIALYSIS PATIENTS AT MUHIMBILI NATIONAL HOSPITAL FOR THE PAST TWO YEARS

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MSc (Nursing Nephrology) Dissertation
Muhimbili University of Health and Allied Sciences
October, 2024

Muhimbili University of Health and Allied Sciences

Department of Clinical Nursing

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By

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A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Science (Nursing Nephrology) of

Muhimbili University of Health and Allied Sciences
October, 2024

CERTIFICATION

The undersigned certifies that she has read and at this moment recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **‘‘The burden and outcomes of hemodialysis catheter-related infections among hemodialysis patients at Muhimbili National Hospital for the past two years’’,** in (partial) fulfillment of the requirements for the degree of Master of Science (Nephrology Nursing) of Muhimbili University of Health and Allied Sciences.

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Date

DECLARATION AND COPYRIGHT

I, **Joyce Kokubanza Kaiza**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature…… **Date**……

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ACKNOWLEDGMENT

I want to express my sincere gratitude to my supervisors, Dr Khadija Yahya Malima and Mr. Samwel Kisakeni. Despite their busy schedules with academic and family commitments, they provided me with invaluable assistance and guidance from the proposal development stage to the final report writing.

I would also like to thank the head of the renal unit, Sr. Sabitina Mrisho Mzava, and other staff members for their strong encouragement and support during my residency program.

My heartfelt thanks to all the other members of the Nephrology Unit at MNH, as well as the secretaries at the office of the Deputy Vice-Chancellor (Academic, Research, and Consultancy-MUHAS) for their cooperation during my study.

Last, I want to express my deep gratitude to my lovely family for their understanding and endless support.

DEDICATION

This dissertation is dedicated to my lovely husband Johaiven Joas, my beautiful daughters Careen, Jolyn, and Kathleen, my sister Jovitha, and my mom Generose Kahwa.

ABSTRACT

Background: Given the increasing burden of kidney diseases, hemodialysis as the primary method of renal replacement therapy is a lifesaver, elongates the survival of patients, reduces morbidity, and improves the quality of life. Increased need for hemodialysis among patients with End Stage Renal Disease (ESRD), and Hemodialysis (HD) catheter-related infections have shown a significant role in hospitalizations, morbidity, and death and raise significant concerns about the costs of treatments or premature removal and replacements of HD catheters. Approximately 50% of hemodialysis catheters fail within 1 year and many patients die within 6 months of the initiation of Hemodialysis (HD), which may be related to, among others, vascular-access-related complications (1)

Aim of the study: The study aimed to assess the Burden and outcomes of Hemodialysis Catheter-related infections among hemodialysis patients who received maintenance HD services at Muhimbili National Hospital for the past two years.

Methodology: A Retrospective Cohort single-center hospital-based study with a quantitative approach involving 360 end-stage renal disease participants, aged above 18 years was conducted at Muhimbili National Hospital to determine the Prevalence and outcomes of hemodialysis catheter infections among hemodialysis patients who received maintenance HD services from January 2022 to December 2023. Kaplan-Meir & log-rank tests were used to evaluate the effect of infection on survival by type of catheter. The prevalence of HD-Catheter infections was presented in % and 95% Confidence intervals. Cox regression analysis was used to estimate the effect of the various factors on the outcomes of the HD catheter-related infection. Mann Whitney U test was used to compare the effect of the CVC and TCC on the CRIs.

Results: 360 hemodialysis participants with a mean age of 53 ± 14 years participated in the study. The prevalence of HD catheter-related infection was found to be 51.1%, 56.4%, and 80.8% mainly based on the cause of Fever, Blood/Pus cultures results, and Types of Vascular access respectively. 51.4% of the patients suffered from both Hypertension and Diabetes

Mellitus as the main underlying illness for ESRD, and 80.8% used a Central Venous Catheter while only 19.2% had Tunneled Central Venous Catheters. Outcomes of the CRIs were mortality (9.8%), Re-catheterization (75%), Readmissions (12%), and ICU admissions (17.9%). Mann Whitney U test showed that CVC had a slightly higher effect (33344) on a Catheter-related infection than TCC (SumR-31636) although it was not statistically significant (p-0.89). Also, the Kaplan-Meir test found no significant difference in effect between CVC and TCC on Catheter-related infections hence the curves (CVC & TCC) were parallel regarding the time of Catheter device in the body ($p > 0.05$).

Conclusion: The study found that infections are common complications in individuals with end-stage renal disease (ESRD) undergoing long-term hemodialysis with the Prevalence of Catheter-Related Bloodstream Infections (CRBSI) based on fever cause (51.1%), Blood/ Pus Culture (Bacteria growth) results (56.4%), and type of vascular access (80.8%). Among the participants population, males were the most frequently affected gender. Several clinical outcomes were associated with HD catheter-related infections, including admissions to Intensive Care Units (ICUs), a high rate of re-catheterization, hospital readmissions due to sepsis-related to hemodialysis catheters, mortality rates, and the duration of catheter placement in hemodialysis patients, which ranged from 30 to 90 days. The only factors that demonstrated a significant impact both positively and negatively on mortality and ICU admissions for participants with HD catheter-related infections were vocational training and adherence to treatment protocols. Additionally, being retired emerged as a positive predictor for the likelihood of re-catheterization among these participants.

Recommendation

Prospective longitudinal studies with a high sample size should be conducted in Tanzanian Hemodialysis Centers to determine the true prevalence, incidence, complications, and outcomes of HD catheter-related infections among hemodialysis patients.

Improvement in the proper documentation of the patient’s diagnosis through a combination of observed symptoms, clinical signs, and quantitative culture methods and early diagnosis of CRBSI can help prevent complications and fatalities associated with the infection as most of

the important variables were not included thus leading to insufficient information and loss of records.

Infections can be reduced and entirely prevented by implementing stringent hygiene protocols, ensuring that all healthcare personnel receive proper training, providing high-quality individual patient care Utilizing sterile barrier precautions, and maintaining skin asepsis to minimize contamination from normal flora. Additionally, it is widely accepted that routinely changing catheters helps lower levels of colonization.

While it's reasonable to use IV antibiotics in these patients, most causes of the infections were not ruled out as most of the blood culture was negative caused by early initiation of antibiotic therapies before culture growth was done. Therefore, initial antibiotic therapy should only be given after sample collection and results are available to be able to target the appropriate species of the bacteria. We strongly recommend that, blood cultures should be taken promptly from all participants suspected to have bacteremia associated with central venous catheterization.

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LIST OF ACRONYMS AND ABBREVIATIONS

AKI:	Acute Kidney Injury
CDC:	Centers for Disease Control and Prevention
CKD:	Chronic Kidney Disease
CRIs:	Catheter-Related Infections
CRB:	Catheter-Related Bacteremia
CVC:	Central Venous Catheters
CVD:	Cardiovascular Disease
GFR:	Glomerular Filtration Rate
HD:	Hemodialysis
HIV:	Human Immunodeficiency Virus
MNH:	Muhimbili National Hospital
MUHAS:	Muhimbili University College of Health Sciences
RRT:	Renal Replacement Therapy
SIRS:	Systemic Inflammatory Response Syndrome
SPSS:	Statistical Package for Social Sciences

DEFINITIONS OF COMMON TERMS

A central venous catheter (CVC) is a type of catheter that is inserted directly into a large vein, such as the internal jugular, femoral vein, or subclavian vein.

A tunnelled Centro venous catheter (TCC) is a type of CVC that is implanted under the skin and tunnelled to a vein, typically in the chest or neck. Tunnelled catheters are designed to reduce the risk of infection compared to CVCs by providing a barrier between the skin and the catheter.

Arteriovenous fistula (AVF) is a surgical procedure that involves connecting an artery directly to a vein, allowing for the direct flow of blood from the artery to the vein, bypassing the capillaries, and creating a new pathway for blood flow in patients with kidney disease, who require hemodialysis.

Complications of HD catheter-related infections: Refer to adverse outcomes and health problems that arise as a consequence of infections associated with the use of catheters.

Outcomes of Hemodialysis catheter-related infections:

Hemodialysis catheter-related infections: Refers to the type of infections that arise in connection with the use of a Hemodialysis catheter. These infections can be defined as follows;

1. Centers for Disease Control (CDC) Laboratory diagnosis and definition of hemodialysis Catheter-Related Infections (HD CRIs)
    i. Recognized pathogens from 1 or more blood cultures OR
    ii. The patient has at least one of the following – fever, chills, or hypotension associated with positive blood culture with common skin contaminants (like CONS, Diphtheria, and species) from 2 separate blood cultures
    iii. AND no other source of infection

2. Clinical definition of HD CRIs
    i. The patient has at least one of the following – fever or hypotension and no organism can be cultured and the physician treated for sepsis
    ii. AND no other source of infection

These HD CRIs can also occur in one of two general locations: either in the skin around the catheter insertion site or inside the bloodstream and include**:**

a. **Exit-site infection** A type of infection that can be diagnosed when there is erythema, discharge, crusting, and tenderness at the skin exit site, but no tunnel tenderness or purulence (2)
b. **Tunnel infection** is infection along the subcutaneous tunnel extending proximal to the cuff toward the insertion site and venotomy. Typically, there is marked tenderness, swelling, and erythema along the catheter tract in association with purulent drainage from the exit site (2)
c. Catheter-related bloodstream infection (CRBSI). Patients present with signs and symptoms of systemic infection, which may range from minimal to severe. Milder cases present with fever or chills, whereas more severe cases exhibit hemodynamic instability

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Hemodialysis catheter-related infections rank second in terms of mortality among dialysis patients following cardiovascular events (3). Given the increasing burden of kidney diseases, hemodialysis as the primary method of renal replacement therapy is a lifesaver, elongates the survival of patients, reduces morbidity, and improves the quality of life. Chronic kidney disease (CKD) is widely acknowledged as a significant public health concern on a global scale. The prevalence of CKD worldwide is estimated to be around 13.4% (4), leading to an increased need for renal replacement therapy among CKD patients is estimated to be between 4.902 and 7.083 million. Chronic kidney disease (CKD) impacts numerous individuals, with prevalence rates of 8-16% in Sub-Saharan Africa (5)

In Tanzania, a household survey of randomly selected adults that was conducted in Northern Tanzania found that chronic kidney disease (CKD) affects 7% of the total population with 3.0% in its rural area (6), and 938 patients with CKD receiving HD services at 28 facilities, 66.4% at Muhimbili National Hospital, and others attend at one of the 15 facilities (7). Of the 368 patients with ESRD or AKI who receive HD services at Muhimbili National Hospital on a monthly average, 22 patients die from HD catheter infections and other factors related to their disease (8).

For Hemodialysis, a regular and dependable entry to the bloodstream, which can be achieved through either a central venous catheter or a surgically established arteriovenous communication, such as an autologous fistula or a synthetic graft is required (9). Long-term access with a central venous catheter raises the risk of infection and malfunction, which might lead to catheter-induced infections and complications (10). Vascular access (VA) complications account for 16 to 25% of hospital admissions in patients with chronic kidney disease undergoing renal replacement therapy (Dialysis) (11).

The major complications of HD catheters include: Infections, Mortality among new and existing dialysis patients, Hospital admissions, Re-catheterization, thrombosis, and approximately 50% of hemodialysis catheters fail within 1 year (12). HD catheter infections are linked to poor health outcomes and significant healthcare expenses (1), in particular, sepsis resulting from HD catheter use stands as a primary cause of death among individuals undergoing hemodialysis (11). The study aimed to assess the Burden and outcomes of Hemodialysis catheter-related infections among hemodialysis patients who received maintenance HD services at Muhimbili National Hospital for the past two years.

1.2 Problem statement

Chronic kidney disease (CKD) is widely acknowledged as a significant public health concern on a global scale (13). The prevalence of CKD worldwide is estimated to be around 13.4%, with a range between 11.7% and 15.1% leading to increased need for renal replacement therapy among CKD patients to be estimated to be between 4.902 and 7.083 million (14). In Tanzania, a household survey of randomly selected adults that was conducted in Northern Tanzania found that chronic kidney disease (CKD) affects 7% of the total population and 3.0% in its rural areas (15) and 938 patients with CKD receive HD services at 28 facilities and 66.4% at Muhimbili National Hospital. Others attend at one of the 15 facilities (7).

With the increased need for hemodialysis among patients with ESRD or AKI in Tanzania, 368 patients with ESRD or AKI who receive HD services at Muhimbili National Hospital on a monthly average use HD central venous catheter and Tunneled cuffed central venous catheter-TCC (permcath) as their main access and 22 patients die from HD catheter infections and other factors related to their disease (16).

HD catheter-related infections have shown a significant role in hospitalizations, morbidity, and death and raise significant concerns about the costs of treatments or premature removal and replacements of HD catheters. Approximately 50% of Hemodialysis catheter failure can be influenced by multiple factors, including but not limited to infection, thrombosis, dispositioning, and mechanical issues (17). Vascular access infections occur frequently and

are the leading cause of dialysis-related morbidity Each year, persons on hemodialysis are hospitalized two times on average, with 1 in 10 hospitalizations caused by vascular access infection (18).

Despite the government's efforts, growth in technology, and the increased numbers of trained healthcare workers, infections and complications among HD patients remain surprisingly high and the burden of this condition and its outcomes remain poorly understood as there are no National registries for these conditions.

Therefore, this study will assess the burden and outcomes of hemodialysis catheter-related infections among hemodialysis patients who received maintenance HD services at Muhimbili National Hospital for the past two years as findings from this study will be used to improve the quality of care provided, patient safety, Research, and Innovation aimed at developing new technologies, protocols, and interventions to prevent and manage these infections more effectively to improve patient outcomes and reduce the burden on healthcare systems.

1.3 Conceptual Framework

This study was guided by the conceptual framework for prognostic research adopted from Hemingway H et, al 2013, which describes the natural history and Clinical Course of infections among HD patients with HD catheters, Investigates Variables Associated with Health Outcomes of Interest, and the clinical application of Prediction Models and determinants of recovery for the patient (19).

Through the use of this tool, I was able to utilize available information about the patient to formulate an association about the burden of disease, including its prevalence, mortality rates, and associated risk factors through investigation of variables associated with health outcomes.

This tool also established an evidence-based understanding of an individual's probability of developing different outcomes, such as mortality, morbidities, re-admissions, re-catheterization, ICU admissions, and length of hospital stays among those undergoing HD which can inform the development of interventions and policies to improve the diagnosis and management of patients.

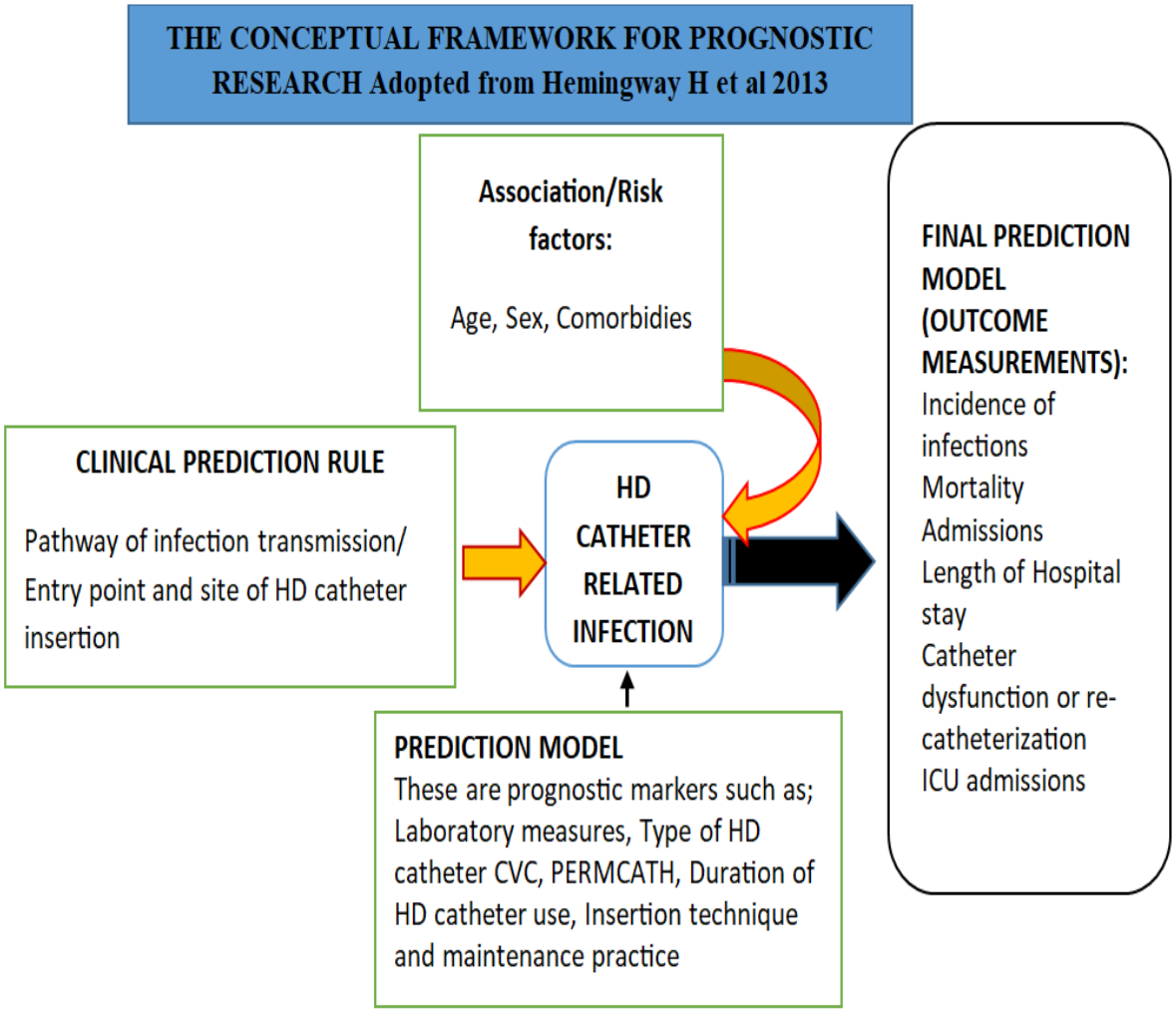


Figure 1: Conceptual framework

1.4 Rationale of the study

The results of this study will be essential because hemodialysis catheter-related infections are a significant concern in the management of patients undergoing hemodialysis

By studying the burden of these infections, healthcare professionals can identify risk factors, develop targeted interventions, provide valuable insights into the clinical implications of these infections, and monitor the impact of quality improvement initiatives.

1.5 Research questions

1.5.1 Broad question

What is the prevalence and outcomes of HD catheter-related infections among patients who received maintenance HD services at Muhimbili National Hospital for the past two years?

1.5.2 Specific Research Questions

1. What is the prevalence of HD catheter-induced infections among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years?
2. What factors are associated with outcomes for HD Catheter-related infections among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years?
3. What are the outcomes among patients with HD catheter-related infections among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years?

1.6 Research objectives

1.6.1 Broad objective

To assess the prevalence and outcomes of HD catheter-related infections among patients who received maintenance HD services at Muhimbili National Hospital for the past two years.

1.6.2 Specific objectives

1. To determine the prevalence of HD catheter-induced infections among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years.
2. To determine the factors associated with outcomes for HD Catheter-related infections among patients among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years.
3. To describe the outcomes among patients with HD catheter-related infections among HD patients who received maintenance HD services at Muhimbili National Hospital for the past two years.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Chronic kidney disease (CKD) is a prevalent global health issue that impacts a significant portion of the world's population. It is estimated to affect approximately 11% to 13% of people worldwide (20). CKD is characterized by the gradual loss of kidney function over time, leading to complications such as high blood pressure, anemia, bone disease, and cardiovascular problems, and between 4.902 and 7.083 million cases of End-stage renal disease (ESRD) patients require renal replacement therapy (RRT) (21). In Sub-Saharan Africa, the burden of CKD is unknown but studies have estimated it to be between 12-23% in adults (22). Recent studies in East Africa reported a CKD prevalence as high as 21% in communities (17). As a consequence, patients with kidney failure often require hemodialysis as a life-sustaining treatment which can be achieved through an arteriovenous fistula or a central venous catheter (CVC).

Vascular access is a critical aspect of hemodialysis (HD) treatment, and its importance goes beyond its commonly known challenges but the complications that arise from its use have led to it being referred to as the "Achilles heel" of HD (23). The use of CVC is frequently associated with complications such as venous stenosis and infections and these complications can lead to hospitalizations, reduced treatment effectiveness, and even mortality as many of them die within 1 to 6 months of the initiation of Hemodialysis (HD) (17)(18). However, vascular access also plays a less visible role in trends of patient outcomes. For instance, the type of vascular access a patient has an impact on their dialysis adequacy, morbidity, and mortality rates. A study published in the American Journal of Kidney Diseases found that patients with arteriovenous fistulas (AVF), the preferred type of vascular access, had better survival rates than those with other types of access (24)

Renal replacement therapy (RRT) -Dialysis refers to the process of removing excess water, solutes, and toxins from the blood in people whose kidneys can no longer perform these functions and it involves blood being removed from the body, filtered through a dialysis machine, and then returned to the body (2). The indications to initiate renal replacement therapy (RRT) in acute kidney injury (AKI) are not specific and should be individualized by nephrology consultation. Accepted indications to start RRT include refractory fluid overload not responding to diuretics, hyperkalemia (plasma potassium concentration >6.5 mEq/L) or rapidly rising potassium levels, signs of uremia such as pericarditis, neuropathy, or an otherwise unexplained decline in mental status, metabolic acidosis (pH less than 7.1), and certain alcohol and drug intoxications (25). The quality of dialysis is a critical factor in determining patient outcomes for those undergoing dialysis treatments. The amount of dialysis, measured in terms of the dose of ultrafiltration (removal of fluid) and the duration of the treatment, is a key determinant of patient survival and recovery.

Renal replacement therapy (RRT) can be applied intermittently or continuously using hemodialysis or peritoneal dialysis methods (7). It is widely accepted that dialysis cannot be administered without proper access. While this fact should not be overlooked, in most instances, establishing such access is feasible. On the other hand, creating and maintaining a single dependable dialysis entry point that lasts long with minimal complications remains a significant challenge (3). The successful establishment of such an access point is linked to improved patient clinical outcomes, enhanced quality of life, and reduced costs. Therefore, there is a need for a shift in mindset towards focusing on understanding the unique short- and long-term requirements of each individual with end-stage kidney disease (ESKD) that require lifetime dialysis sessions that make up the primary indications for Renal Replacement Therapy (18).

Dialysis access planning should start in CKD stage IV (glomerular filtration rate [GFR] 15–30 mL/min. There are three types of dialysis access: Permanent access that includes; arteriovenous (AV) fistulas and arteriovenous (AV) grafts, Temporary accesses; Central venous catheters(CVC) and semi-permanent access; Tunneled cuffed central venous catheter

(TCC)/Permcath (18). An AV fistula is considered the gold standard for dialysis access. It involves surgically connecting an artery to a vein, typically in the arm. Over time, this connection causes the vein to become larger and stronger, allowing for repeated needle insertions during dialysis sessions (3). AV fistulas have been shown to have better long-term outcomes compared to other forms of access because AV fistula requires less anticoagulation, reduces infection risk, and gives access to the bloodstream without danger of shunt disconnection (3).

Subsequently, several synthetic materials have been introduced to create internal AV fistulae (grafts). AV grafts are an alternative when an AV fistula cannot be created due to small or weak veins. Central venous catheters (CVCs) are temporary access devices that are inserted into large veins in the neck, chest, or groin (18). These provide immediate access to dialysis but are associated with higher rates of infection and complications. CVCs are typically used when urgent dialysis is required or when other forms of access are not feasible (26).

HD access complications such as infection, clotting, and stenosis (narrowing of the blood vessel) hinder the attainment and maintenance of reliable dialysis access. Infection at the access site can lead to serious complications and may require removal of the access altogether (27). Clotting within the access can result in reduced blood flow and inadequate dialysis treatment. Stenosis can occur due to scarring or narrowing of the blood vessel, further impeding proper dialysis (12). To address these challenges, healthcare providers employ various strategies. Regular monitoring and surveillance of dialysis accesses are crucial to detect complications early on. This includes physical examination, monitoring blood flow rates, and performing imaging studies such as ultrasound or angiography (28).

2.2 The Prevalence of HD catheter-related infections

Despite the known risks associated with the use of HD catheters, the prevalence of HD catheter-related infections remains unknown as there is a lack of comprehensive data on the prevalence of these infections among patients receiving maintenance hemodialysis. This lack of data makes it challenging for healthcare providers and researchers to fully understand the

scope of the issue and implement effective strategies for prevention and management (29). The prevalence is highest when central venous catheters are utilized and may even exceed what has conventionally been reported (12).

In Sub-Saharan Africa (SSA) the prevalence of HD catheter-related infections in hemodialysis patients remains largely unknown but studies estimated it to be between 13% and 25% (30). The prevalence of CVC use in hemodialysis patients is high, with up to 80% of patients using a CVC at some point during their treatment (25) as this is primarily due to the scarcity and limited generalizability of epidemiological data, variations in reporting practices, differences in surveillance methods, and inconsistencies in diagnostic criteria across healthcare facilities (31). Additionally, underreporting of CRBSIs may occur due to a lack of standardized protocols for monitoring and documenting these infections. The lack of uniformity in cohort selection inconsistency in study populations makes it difficult to make direct comparisons and draw accurate conclusions about the prevalence of CRIs in SSA and most of the available data comes from a few countries or hospitals, which may not accurately represent the situation across the entire SSA (32). The incidence of CVC-related bloodstream infections (BSIs) in hemodialysis patients ranges from 1.6 to 5.5 episodes per 1000 catheter days, with a higher incidence in intensive care unit (ICU) patients (9).

2.3 Factors associated with HD catheter-induced infections

Several studies have investigated the factors for HD catheter-associated infections. These infections can occur in both the short-term and long-term use of HD catheters, and the incidence of catheter-related bloodstream infections (CRB) ranges from 0.6 to 6.5 episodes per 1000 catheter days (33) and the risk factors can vary depending on the site of insertion and duration of use (34), patient hygiene deficiencies, prior history of CRB, recent hospital stays, prolonged catheter usage, suboptimal dialysis procedures, low levels of albumin in the blood (hypoalbuminemia), nasal colonization by Staphylococcus organisms with high mortality rates, accounting for 20.6% of all deaths and leading to metastatic complications (12), diabetes mellitus, compromised immune system, atherosclerosis, and hypertension (33). These factors are discussed below as follows:

2.3.1 Patient-related factors

Poor personal hygiene, use of occlusive transparent dressing, and accumulation of moisture around the exit site are among the local factors that have been described as risk factors for HD catheter-related infections (31). These factors create an environment conducive to bacterial growth and increase the likelihood of infection.

Additionally, nasal and skin colonization with Staphylococcus aureus, as well as bacterial colonization of hemodialysis (HD) catheters, have been reported as risk factors for systemic infection (12). The presence of these bacteria on the skin or in the nasal passages can lead to their introduction into the bloodstream through the catheter, increasing the risk of HD CRBIs.

The relationship between age and the risk of HD catheter-related infections in dialysis patients is not well-established. Previous studies have produced conflicting results, while some studies found no association between age and a higher risk of bacteremia, others suggest that older individuals may be at an increased risk of hospitalized septicemia (35)

Several systemic factors have also been identified as contributing to the risk of HD catheter infections (36). Immunocompromised individuals, such as those undergoing immunosuppressive therapy, are at an increased risk of developing HD-related infections due to their weakened immune response (34). Diabetes mellitus has also been associated with an elevated risk, likely due to compromised immune function and impaired wound healing. Furthermore, antimicrobial therapy can disrupt the normal balance of microorganisms in the body, potentially leading to an increased risk of CRI. Low albumin levels and high ferritin levels are associated with an increased risk of CRI, indicating that certain biochemical markers may serve as indicators of susceptibility to catheter-related infections (3).

2.3.2 Catheter-related factors

The vascular access used in hemodialysis (HD) has become a significant concern due to its association with a high risk of infection and bacteremia (37). Studies have shown that the vascular access site is implicated in a substantial percentage, ranging from 48% to 73%, of all bacteremia related to HD infections as well as the Duration of catheter use, insertion

technique, and maintenance practices (12) Femoral catheters are more susceptible to infections than thoracic catheters, this may be due to the accumulation of sweat and moisture around the exit site, which can provide a favorable environment for bacterial growth (38). In contrast, thoracic catheters are less likely to be exposed to such moisture and are therefore less likely to become infected (17). The duration of catheter use is also an important risk factor for HD catheter infections as the risk of infection increases linearly with time, meaning that the longer the catheter is in place, the higher the risk of infection (39). This is because bacteria have more time to colonize the catheter and the surrounding tissue, leading to a greater likelihood of infection (17).

2.4 Type of catheter and mortality rates

Patients with end-stage renal disease (ESRD) and comorbidities like diabetes mellitus (DM) who utilized an arteriovenous fistula (AVF) exhibited lower mortality risks in comparison to those using a central venous catheter (CVC) or a tunneled cuffed central venous catheter (TCC) (27). Among prevalent DM patients undergoing hemodialysis, the adjusted hazard ratios for mortality favored individuals with an AVF (11). Additionally, there was a notable interaction between age and vascular access type, highlighting that older patients aged 65 years and above faced an increased mortality risk when relying on CVC or TCC (40). Among prevalent DM patients undergoing hemodialysis, the adjusted hazard ratios for mortality favored those with an AVF (33). Furthermore, there was a significant interaction between age and vascular access type, indicating that older patients (aged 65 years and above) faced a heightened mortality risk when utilizing CVC or TCC (1).

2.5 Outcomes of Catheter-Related Infections

Infectious complications of bacteremia are a frequent occurrence in HD patients. And includes; Catheter dysfunction or loss, ICU admissions, mortality, re-admissions, length of hospital stay, recurrence of bacteremia, endocarditis, epidural abscess, purulent pericarditis, septic arthritis, septic pulmonary emboli, liver abscess, endophthalmia have all been reported as complications of bacteremia (41)(12). Catheter-related exit site infections are a common

complication of hemodialysis catheter use, affecting 8 to 21% of cases and these infections are significant contributors to catheter loss in patients undergoing hemodialysis (34).

In summary, tunnelled catheters are associated with a lower risk of infection compared to CVCs in hemodialysis patients. This is likely due to the barrier provided by the tunnelled design, which reduces the risk of skin colonization and subsequent bacterial migration to the catheter. However, it is important to note that both types of catheters carry a risk of infection, and appropriate infection control measures should be implemented to minimize this risk.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This Retrospective Cohort single-center hospital-based study with a quantitative approach was conducted to determine the burden of HD catheter-related infections and outcomes among patients with HD catheters who received maintenance HD services at Muhimbili National Hospital for the past two years.

3.2 Study Setting

The study was conducted at Muhimbili National Hospital (MNH); a public tertiary National Referral Hospital in Tanzania in the capital city of Dar es Salaam. MNH receives referral patients from both public and private hospitals from all over the country. MNH renal unit has a total of 48 dialysis machines, attending to approximately 90-120 patients a day for HD services that are sorely delivered by the nurses and nephrologists assigned to the unit accounting for approximately 66.4% of the total patients with ESRD that require maintenance HD services in Tanzania.

3.3 Study population and data sources

Using administrative records, we identified patients aged 18 years or older with end-stage kidney disease (ESKD) on hemodialysis (HD) who received maintenance HD services via HD catheters at MNH in the past two years. We also included those who were managed at the facility for having a fever of 37.8 °C or a history of fever and chills, as well as symptoms and signs of infection such as purulent discharge from the catheter exit site, malaise, alteration in mental status, or unexplained hypotension (systolic blood pressure).

3.4 Exposure and Case Definitions

Exposure was defined as receiving HD via CVC from the study unit. As most patients had a CVC in place at the beginning of the study period, their start date for computing patient days

at risk began the first day of the device insertion. The suspicion of bacterial infection among patients was based on clinical definitions from The 2014 National Healthcare Safety Network Dialysis Event (42) as the presence of one or more axillary temperatures at 37.8 °C or a history of fever and/or chills, symptoms and signs of infection such as purulent discharge from CVC exit site, malaise, alteration in mental status or unexplained hypotension (systolic blood pressure <90mmHg)

3.4.1 Hemodialysis catheter-related infections: were defined as positive blood/pus cultures with concurrent exit site or tunnel infection, or without another identifiable source of infection (43). These infections were also defined as:

1. CDC Laboratory diagnosis and definition of HD CRIs
    I. Recognized pathogens from 1 or more blood cultures OR
    II. The patient has at least one of the following – fever, chills, or hypotension associated with positive blood culture with common skin contaminants (like CONS, Diphtheria, and species) from 2 separate blood cultures
    III. AND no other source of infection
2. Clinical definition of HD CRIs
    I. The patient has at least one of the following – fever or hypotension and no organism can be cultured and the physician treated for sepsis
    II. AND no other source of infection

3.4.2 Complications of HD catheter-related infections: Refer to adverse outcomes and health problems that arise as a consequence of infections associated with the use of catheters such as mortality, morbidities, re-admissions, re-catheterization, ICU admissions, and length of hospital stays among those undergoing HD.

3.5 Sample Size Calculation

The sample size for the required cohort study with a proportion group of the patients with HD Catheters who received maintenance HD services at Muhimbili National Hospital for the past two years was calculated according to the formula (44) as follows:

$$n = \frac{P1\,(1 - P1) + P2(1-P2)\,C}{(P1-P2)^2}$$

Where by n- The sample size needed to achieve the desired statistical power with the given confidence level and error margin

C= 7.85(at 95%Cl and power of 90%, $Z\alpha/2 = Z0.05^{/2}$=1.96 at type 1 with ε = Marginal error, 5%

P1= Prevalence of catheter-related bacteremia in the control group, P = 76.5% (42)

P2= Prevalence of catheter-related bacteremia in case groups 69.8% (42)

P1-P2= Difference in the proportion of events between the two groups

Based on the formula, and 90% statistical power to detect the meaningful difference in infection rates among the two groups with HD catheters (those with CVC and Tunnelled cuffed central venous catheter (TCC/ Perm-Cath)), the calculated sample size was 360.

By conducting a retrospective study, it was possible to analyze past data and medical records to investigate the association between the type of HD central venous catheter used and the incidence of infections in each group of selected individuals as well as assess the outcomes and identify potential risk factors associated with a specific type of HD catheter used.

3.6 Selection criteria

3.6.1 Inclusion Criteria

All participants > 18 years of age, undergoing hemodialysis through HD Venous catheters (CVC) and HD catheter in situ for more than 3 days.

The study was based on documented data rather than physical participants observation.

3.6.2 Exclusion Criteria

1. All patients with AVF as their venous access lines.

3.7 Sampling Technique

Participants meeting the study's eligibility criteria were recruited from January 2022 to December 2023 using systematic sampling. This method was advantageous as it minimized selection bias, leading to more reliable findings. Participants were chosen based on a specific interval (Kth) from the larger population (N), with a random starting point. The sampling interval (Kth) was determined by dividing the total population (N) by the targeted sample size (n). Ultimately, individuals aged 18 years or older with end-stage renal disease (ESRD) undergoing hemodialysis (HD) who had received maintenance HD services in the past 2 years were identified through hospital administrative and medical records.

Baseline information about patient demographics (age, sex, and employment status), duration of dialysis treatment, frequency of HD sessions per week, comorbidities (diabetes mellitus, human immunodeficiency virus, and cancer), history of bloodstream infections (BSI) since starting HD, and current medications (iron supplementation and intravenous antibiotics) was collected from medical records.

3.8 Data collection tool

Data was collected by extraction of a database and guided by a developed data extraction checklist. Demographic and medical history data was extracted (dialysis initiation, access, site of dialysis access, duration of dialysis, duration of dialysis catheter in situ, and dialysis sessions per week from the patient’s medical record. Pre and Post-dialysis blood workups and Blood culture reports were accessed through the hospital information management system (Jeeva).

3.9 Data collection procedure

All files meeting the inclusion criteria were collected for the sampling process.

The first participant was selected randomly before the Kth value, excluding zero. Following that, participants were selected at Kth interval levels until the desired sample size of 360 was achieved.

Demographic, sociological, and clinical information was collected retrospectively from medical records, including hardcopy (patient files, dialysis records books/charts) and softcopy (JEEVA system) clinical information for participants on maintenance dialysis via HD Catheters before the study.

Data was extracted from patient records and imported into a data collection checklist. From there, the data was exported to an Excel file, coded, and analyzed using SPSS version 26 Software.

From the participant's medical records and database, follow-up was done to determine their outcomes after HD catheter-related infections.

3.10 Quality control

The data collected was carefully crosschecked for error reduction to maintain completeness and internal consistency. Maximum confidentiality and privacy were upheld.

3.11 Pilot study

I made the following adaptations: The checklist used in this study was adapted from Sangeti et al., 2017 and then modified to fit the specific requirements of the current study. Subsequently, the tool underwent a pilot test involving 36 participants obtained from the hospital medical records, which represents 10% of the sample size. This was done to assess the applicability and validity of the study before the actual research commenced. It's important to note that the results of the pilot test were not included in the main study.

3.12 Data Analysis

Data was analyzed using SPSS version 26 Software. Kaplan-Meir & log-rank tests were used to evaluate the effect of infection on survival by type of catheter**.** The burden of HD- catheter-associated infections was presented in % and 95% Confidence intervals, Mann-Whitney U tests were used to compare infection rates of the two groups of patients with different catheters**.** Cox proportional hazard regression analysis was used to calculate crude and adjusted hazard ratios and their 95% CI for all causes and outcomes associated with CRI.

3.15 Ethical issues and ethical consideration

The ethical approval for this study was obtained from the Muhimbili University of Health and Allied Sciences (MUHAS), Research and Ethical Committee before the study commenced. The Hospital research committee approved this study at Muhimbili National Hospital under the Directorate of Training and Research. Written permission to access data was requested from MNH and a waiver of consent was also sought at MUHAS IRB. All the information encountered in the patient's medical files was handled with confidentiality.

3.16 Limitations of the Study

1. Censored data that had incomplete information and those with missed data
2. Susceptible to information bias as those not in the system were not included due to incomplete registration and feeding of data into the database

3.17 Dissemination plan

This study's findings will be disseminated to the MUHAS Directorate of Postgraduate Studies, to the MNH management, MUHAS Research and Publication Committee, and the MUHAS library for students' access.

CHAPTER FOUR

4.0 RESULTS

In this chapter, we present the analysis of the study findings. 360 hemodialysis participants participated in the study, with a mean age of 53 ± 14 years. 51.4% of the participants suffered from both hypertension and diabetes mellitus as the underlying cause of End Stage Renal Disease. About 80.8% used a CVC (Central Venous Catheter) while only 19.2% used a TCC (Tunnelled Cuffed Catheter). The prevalence of HD (Hemodialysis) catheter-related infection was 51.1%, 56.4%, and 80.8% mainly based on the cause of fever, blood/pus culture results, and types of vascular access.

The outcomes of the CRIs (Catheter-Related Infections) were mortality (9.8%), re-catheterization (75%), readmissions (12%), and ICU admissions (17.9%) respectively.

Descriptive analysis was used to describe and summarize the normal characteristics of participants. Kaplan-Meir, log-rank, and Mann-Whitney U tests were used to evaluate the effect of infection on survival by type of catheter and to compare the effect of the CVC and TCC on the CRIs. Cox regression analysis was used to estimate the effect of various factors on the outcomes of the HD catheter-related infection.

The prevalence of HD-catheter infections was presented in percentage and 95% confidence intervals.

4.1 Socio-demographic and Clinical characteristics of the study participants

A total of 360 hemodialysis participants participated in the study. The mean age of the study participants was 53 ± 14 years, where maximum and minimum were 86 and 18 respectively while (the 60-73) year group was highly prominent (36.2%) than those above 30 years. About 51.4% of the patients suffered from both Hypertension and Diabetes Mellitus. 80.8% of the patients used Central Venous Catheters while only 19.2% used Tunnelled Central Venous Catheter respectively.

Additionally, the data from Table 4.2 summarizes various characteristics of participants undergoing Hemodialysis (HD) services. The majority of participants (67.2%) have been on HD for less than a year, with smaller percentages in the 1-5 years (27.5%) and over 5 years (4.2%) categories. Smoking history indicates that 93.9% never smoked, 1.9% are current smokers, and 4.2% quit smoking. Regarding alcohol consumption, 73.6% never drank, 7.5% currently drink, and 18.9% have stopped. Among underlying illnesses, a significant portion (51.4%) suffered from both Hypertension (HTN) and Diabetes Mellitus (DM), followed by 30.8% with HTN only. Hospital stay duration varied, with 38.3% staying over 10 months. Central venous catheters (CVC) were the predominant type of vascular access (80.8%), with the internal jugular vein (42.2%) being the most common site. This data highlights key demographic and clinical factors in the HD patient population.

Table 1: Socio-demographic and Clinical characteristics of the study participants

Variables	Category	Frequency (n)	Percent (%)
Age group	18-31	25	6.9
	32-45	93	25.8
	46-59	98	27.2
	60-73	130	36.1
	74-87	14	3.9
Gender	Male	214	59.4
	Female	146	40.6
Marital status			
	Married	212	58.9
	Unmarried	73	20.3
	Divorced/separated	17	4.7
	Cohabiting	15	4.2
	Widowed	43	11.9
Religion			
	Muslim	212	58.9
	Christian	148	41.1
Residency			
	Dar es salaam	323	89.7
	Other regions	37	10.3
Education level			
	No education	3	.8
	Primary	46	12.8
	Secondary	168	46.7
	Vocational	35	9.7
	University	108	30.0
Occupation			
	Peasant	70	19.4
	Public Servant	71	19.7
	Unemployed	90	25.0
	Retired	73	20.3
	Business	26	7.2
	Student	13	3.6
	Others	17	4.7

Table 2: Clinical parameters of the study participants

Variables	Category	Frequency (n)	Percent (%)
Number of years on Hemodialysis services	Less than 1	242	67.2
	1-5 years	99	27.5
	More than 5	15	4.2
	Not reported	4	1.1
History of smoking			
	No	338	93.9
	Yes	7	1.9
History of alcohol consumption			
	No	265	73.6
	Yes	27	7.5
Other underlying illness			
	Hypertension	111	30.8
	Diabetic Mellitus	12	3.3
	HIV/AIDS	4	1.1
	Both HTN and DM	185	51.4
	Both HTN, DM, and HIV	39	10.8
	HTN and HIV/AIDS	6	1.7
Duration of Hospital stay (months)			
	0-1	72	20.0
	Less than 5	59	16.4
	More than 5	91	25.3
	More than 10	138	38.3
Type of vascular access			
	Central venous catheter (CVC)	291	80.8
	Tunneled Central Venous Catheter/ Permcath	69	19.2
Site for vascular access	Internal Jugular Vein	152	42.2
	Femoral Vein	138	38.3
	Subclavian artery	70	19.4

4.2 Prevalence of HD catheter-induced infections among HD participants who received maintenance HD services at Muhimbili National Hospital for the past two years.

The prevalence of HD catheter-related infection was reported to be 51.1%, 56.4%, and 80.8% mainly based on the cause of Fever, Blood/Pus cultures, and Types of Vascular access respectively. HD catheter-related infections were the most common cause of fever, reported by 51.1% of participants, followed by other causes at 22.5%, with 20.8% having no fever episodes and 5.6% not reporting the cause. Blood or pus cultures were conducted for 56.4% of participants, while 43.6% did not undergo these tests. Regarding the type of vascular access, the majority (80.8%) utilized Central Venous Catheters (CVC), with 19.2% using Tunneled Central Venous Catheters. This data underscores the prevalence of HD catheter-related infections and the widespread use of CVC among HD patients.

Table 3: Prevalence of HD catheter-induced infections among HD participants

Infections	Categories	Frequency (n)	Percentage %
Fever cause	HD Catheter-related infections	184	51.1
	Other causes	81	22.5
	Not reported	20	5.6
	No fever episodes	75	20.8
Blood/pus culture	Done	203	56.4
	Not done	157	43.6
Type of vascular access	Central venous catheter (CVC)	291	80.8
	Tunneled Central Venous Catheter	69	19.2

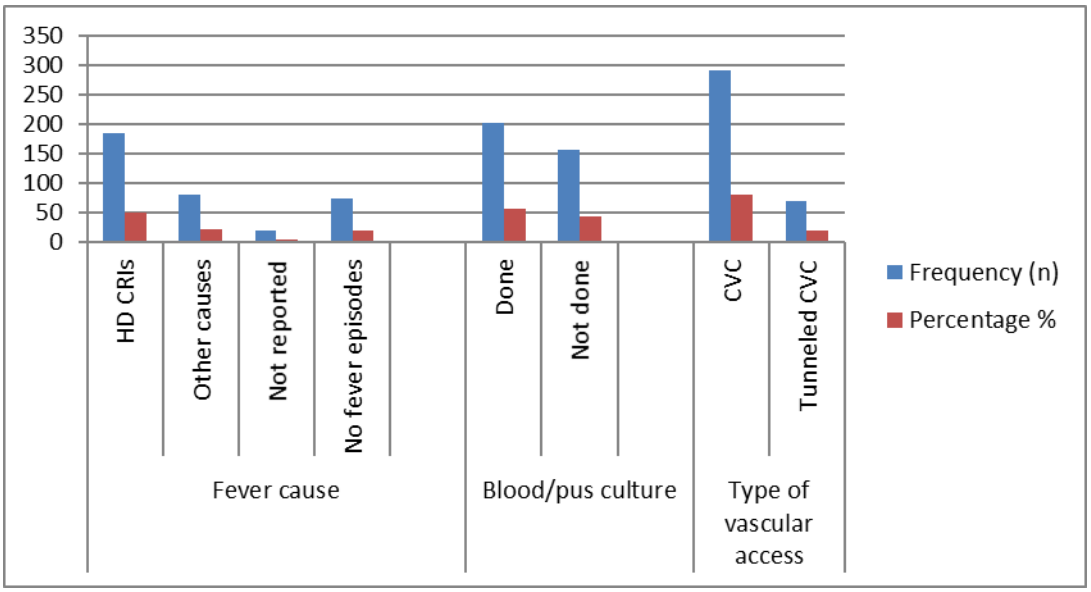


Figure 2: Prevalence of HD catheter-induced infections among HD participants

Prevalence of Fever among HD participants for some selected variables

The prevalence of primary causes of fever among participants indicates that renal disease/condition is more common in males (75.0%) and unmarried individuals (68.8%), with no significant differences among smoking and alcohol consumption histories, as all participants with renal disease/condition reported no smoking or alcohol use. Other causes of fever are predominantly found in males (57.8%) and married individuals (61.2%), with a significant proportion having a history of alcohol consumption but having stopped (20.5%). Congenital abnormalities as a cause of fever are rare observed only in males (100.0%) and among participants who have stopped alcohol consumption (100.0%). This suggests a significant influence of gender and marital status on the primary causes of fever, with lifestyle factors playing a notable role in other causes.

Table 4: Prevalence of Fever among HD participants for some selected variables

Variable		The primary cause of fever					
		Renal disease/ condition		Other causes other than renal		Congenital abnormalities	
		Count	Percentage %	Count	Percentage %	Count	Percentage %
Gender	Male	24	75.0	189	57.8	1	100.0
	Female	8	25.0	138	42.2	0	0.0
Marital status	Married	10	31.3	200	61.2	1	100.0
	Unmarried	22	68.8	51	15.6	0	0.0
	Divorced/separated	0	0.0	17	5.2	0	0.0
	Cohabiting	0	0.0	15	4.6	0	0.0
	Widowed	0	0.0	43	13.1	0	0.0
History of smoking	No	32	100.0	305	93.3	1	100.0
	Yes	0	0.0	7	2.1	0	0.0
History of alcohol consumption	No	32	100.0	233	71.3	0	0.0
	Yes	0	0.0	27	8.3	0	0.0

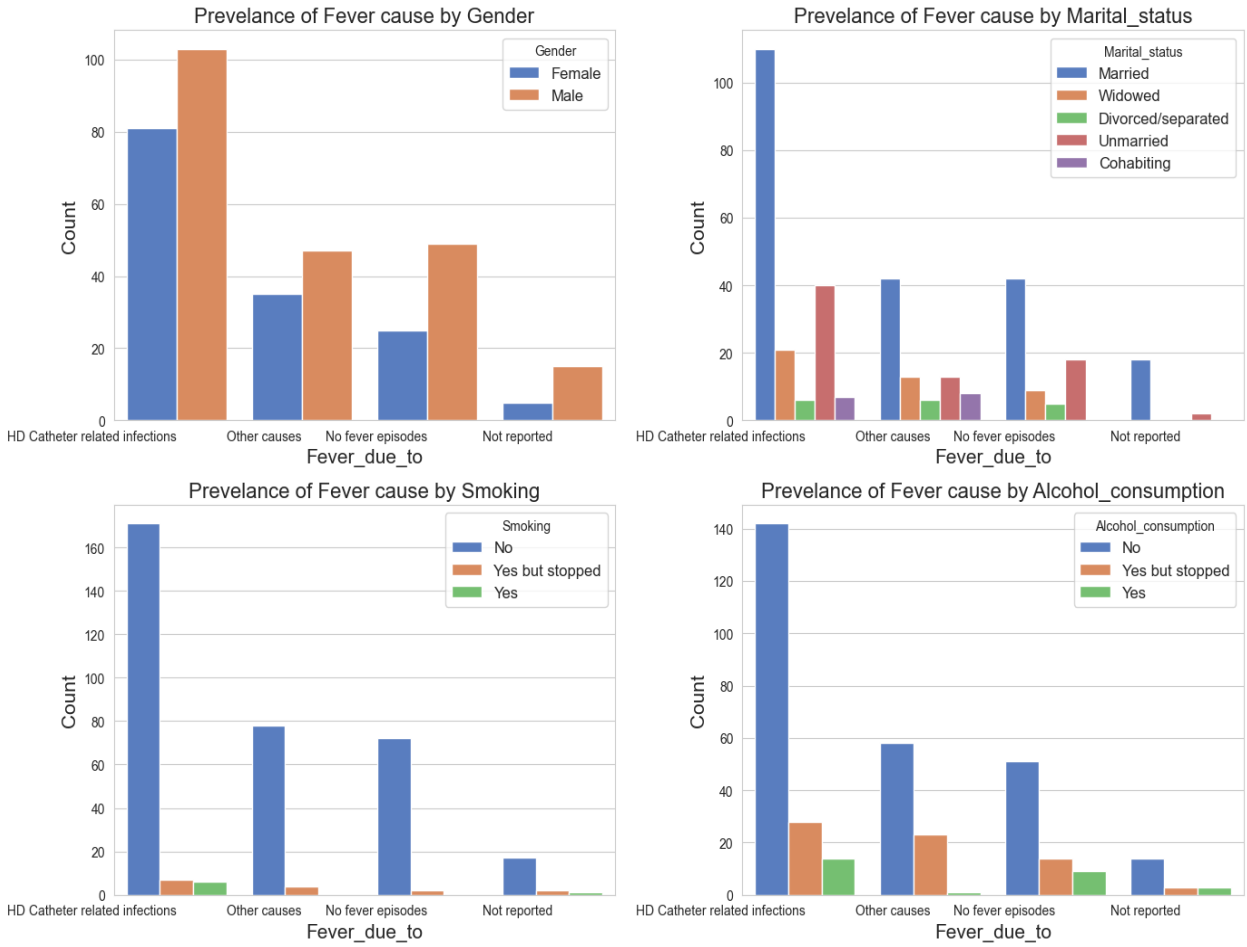


Figure 3: Prevalence of Fever cause among selected demographic variables

Prevalence of Bacterial growth among HD participants for some selected variables

The prevalence of bacterial growth among HD participants, based on blood/pus culture results, shows that a higher proportion of males (56.0%) and females (44.0%) had cultures done compared to those not done (males 63.1%, females 36.9%). Married individuals were more likely to have cultures done (60.0%) than not done (56.1%). Among those with no smoking history, 93.5% had cultures done, and 94.3% did not. Non-drinkers also showed a higher prevalence of having cultures done (80.5%) compared to not done (64.3%), while those who had stopped drinking had a notable increase in the not done category (28.0%). This data highlights the prevalence of bacterial growth about gender, marital status, smoking, and alcohol consumption history among HD participants.

Table 5: Prevalence of Bacterial growth among HD participants for some selected variables

Variable		Blood/pus culture					
		Done		Not done		Not reported	
		Count	Percentage %	Count	Percentage %	Count	Percentage %
Gender	Male	112	56.0	99	63.1	0	0.0
	Female	88	44.0	58	36.9	0	0.0
Marital status	Married	120	60.0	88	56.1	0	0.0
	Unmarried	40	20.0	33	21.0	0	0.0
	Divorced/separated	7	3.5	10	6.4	0	0.0
	Cohabiting	7	3.5	8	5.1	0	0.0
	Widowed	25	12.5	18	11.5	0	0.0
History of smoking	No	187	93.5	148	94.3	0	0.0
	Yes	6	3.0	1	0.6	0	0.0
History of alcohol consumption	No	161	80.5	101	64.3	0	0.0
	Yes	15	7.5	12	7.6	0	0.0

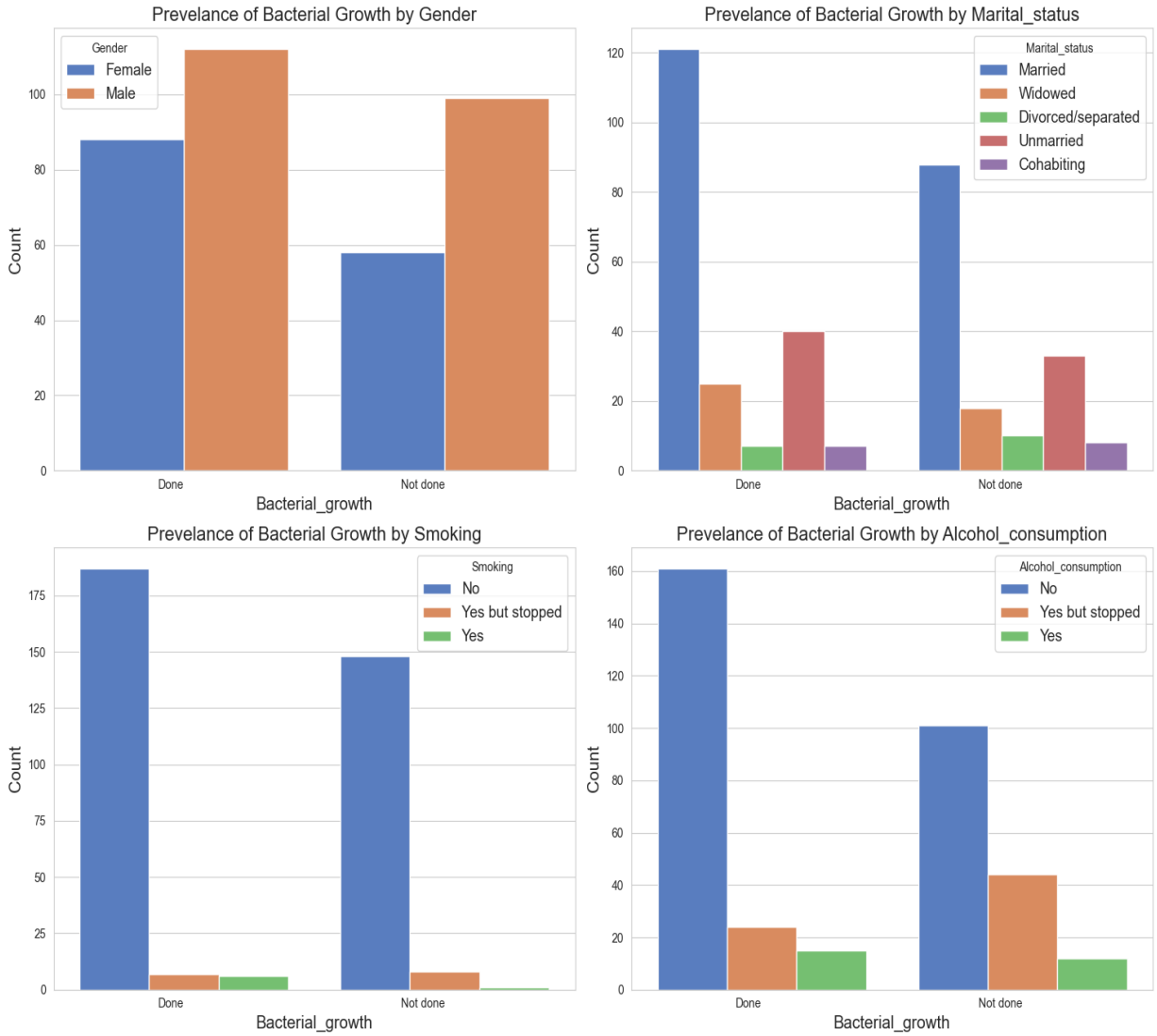


Figure 4: Prevalence of Bacterial Growth among selected demographic variables

Prevalence of the type of Vascular access among HD participants for some selected variables

The following table shows the prevalence of different types of vascular access among selected demographic variables of HD participants.

Table 6: Prevalence of the type of Vascular access among HD participants for some selected variables

Variable		Type of vascular access			
		Tunneled Central Venous Catheter/ Permcath		Central venous catheter (CVC)	
		Count	Percentage %	Count	Percentage %
Gender	Male	41	59.4	173	59.5
	Female	28	40.6	118	40.5
Marital status	Married	47	68.1	164	56.4
	Unmarried	8	11.6	65	22.3
	Widowed	9	13.0	34	11.7
	Divorced/separated	4	5.8	13	4.5
	Cohabiting	0	0.0	15	5.2
History of smoking	No	67	97.1	271	93.1
	Yes but stopped	2	2.9	13	4.5
	Yes	0	0.0	7	2.4
History of alcohol consumption	No	52	75.4	213	73.2
	Yes but stopped	13	18.8	55	18.9
	Yes	4	5.8	23	7.9

The prevalence of different types of vascular access among HD participants shows that both males and females had a similar distribution for tunneled central venous catheter (Permcath) and central venous catheter (CVC), with males accounting for 59.4% and 59.5%, and females for 40.6% and 40.5%, respectively. Married participants predominantly used both types of access (68.1% for Permcath and 56.4% for CVC), while unmarried participants used Permcath less frequently (11.6% compared to 22.3% for CVC). Among non-smokers, a high prevalence of both Permcath (97.1%) and CVC (93.1%) usage was observed. Participants with no history of alcohol consumption also showed a similar trend with 75.4% for Permcath and 73.2% for CVC. Those who had stopped drinking alcohol accounted for 18.8% of Permcath and 18.9% of CVC.

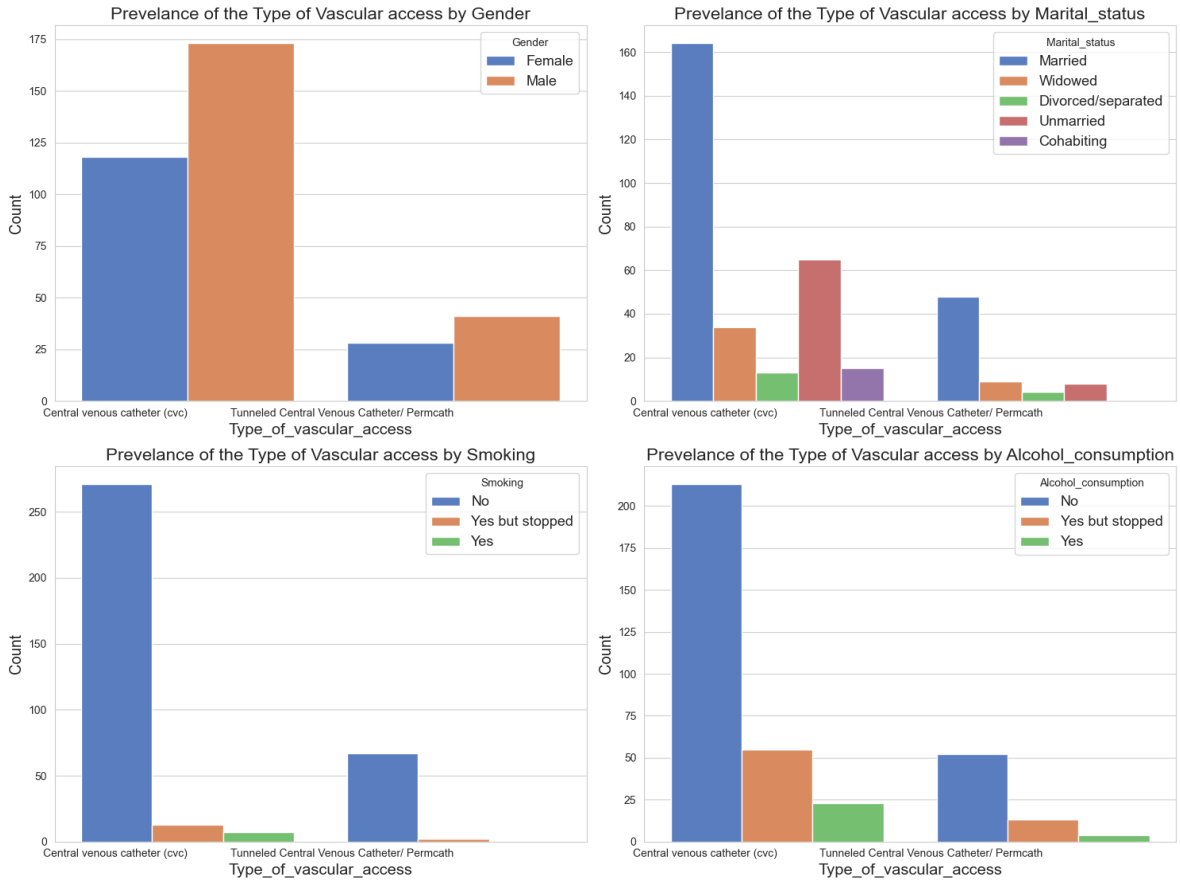


Figure 5: Prevalence of the Type of Vascular access among selected demographic variables

4.3 Outcomes among participants with HD catheter-related infections at Muhimbili National Hospital

The outcomes among participants with HD catheter-related infections are presented in terms of hospital stay, ICU admissions, re-catheterization, readmissions, cause of mortality, and duration of the device in the body. The majority of participants had a hospital stay of more than 10 days (45.7%), with fewer staying 0-1 days (10.9%), less than 5 days (19.0%), or more than 5 days (24.5%). ICU admissions were relatively low at 17.9%, with 82.1% of participants not requiring ICU care. A significant number of participants (75.0%) required re-catheterization, while 25.0% did not. Readmissions due to HD catheter-related sepsis accounted for 12.0% of cases, other causes for 71.7%, and 16.3% of participants had no readmissions. Mortality due to HD catheter-related infections was reported in 9.8% of participants, other causes in 8.7%, and 81.5% of participants were alive. Regarding the duration of the device in the body, the vast majority (92.9%) had the device for 30 to 90 days, while only 7.1% had it for less than 30 days.

Figure 6: Outcomes among participants with HD catheter-related infections

Outcome	Categories	Frequency (n)	Percentage
Duration of Hospital stay	0-1	20	10.9
	Less than 5	35	19.0
	More than 5	45	24.5
	More than 10	84	45.7
ICU admissions	Yes	33	17.9
	No	151	82.1
Re-catheterization	Yes	138	75.0
	No	46	25.0
Readmissions	HD catheter-related sepsis	22	12.0
	Other causes	132	71.7
	No	30	16.3
The cause of mortality	HD catheter-related infections	18	9.8
	Other causes	16	8.7
	Alive	150	81.5
The duration of the device in the body	Less than 30 days	13	7.1
	30 to 90 days	171	92.9

4.4 To determine the factors associated with clinical care outcomes for HD Catheter-related infections among participants at Muhimbili National Hospital.

The Cox regression analysis identified several factors associated with the mortality outcome of catheter-related infections (CRI) among hemodialysis participants. Marital status did not significantly impact mortality, with hazard ratios (HR) for married, unmarried, divorced, and cohabiting participants not showing statistically significant differences compared to widowed participants. Education level was a notable predictor; vocational education was significantly associated with higher mortality risk (HR = 4.751, p = 0.026), while other educational levels did not show significant differences. Occupational status did not significantly influence mortality, although peasant, public servant, unemployed, retired, business, and student categories were compared against a reference group with no significant findings.

Type of vascular access (CVC vs. TCC) did not significantly impact mortality (HR = 0.642, p = 0.425). Treatment success was highly significant, with successful treatment reducing the mortality risk substantially (HR = 0.005, $p < 0.001$). The number of hemodialysis sessions per week (once or twice) did not significantly affect mortality compared to the reference category of three sessions per week. The results are shown in Table 4.

Table 7: Factors associated with Mortality outcome of the CRI

Predictors	Group	B	p-Value	HR	95.0 C. I Lower	Upper
Education						
	Illiterate	-11.348	0.992	0.000	0.000	0.0
	Primary	1.521	0.133	4.576	0.629	33.276
	Secondary	1.095	0.185	2.988	0.593	15.063
	Vocational	1.558	0.026	4.751	1.201	18.792
	University		Reference			
Occupation						
	Peasant	0.907	0.330	2.478	0.400	15.366
	Public Servant	1.404	0.213	4.072	0.447	37.069
	Unemployed	0.143	0.882	1.154	0.175	7.626
	Retired	-0.642	0.518	0.526	0.075	3.679
	Business	-13.041	0.975	0.000	0.000	0.0
	Student	0.963	0.428	2.620	0.242	28.387
	Other		Reference			
Type of vascular assess						
	CVC	-0.444	0.425	0.642	0.216	1.909
	TCC		Reference			
Number of HD sessions per week						
	Once	0.032	0.983	1.032	0.056	19.000
	Twice	- 0.024	0.966	0.977	0.333	2.862
	Three		References			

Cox regression analysis

Table 8: Factors associated with ICU admission outcome of the CRI

Predictors	Group	B	p-Value	HR	95.0 C. I Lower	Upper
Education						
	Illiterate	- 3.316	0.944	0.036	0.000	3.205E38
	Primary	- 2.070	**0.028**	0.126	0.020	0.800
	Secondary	- 1.364	0.122	0.256	0.045	01.443
	Vocational	5.721	**0.001**	305.338	11.520	8.093E3
	University		Reference			
Occupation						
	Peasant	0.967	0.459	2.630	0.204	33.983
	Public Servant	- 4.639	**0.007**	0.010	0.000	0.277
	Unemployed	- 0.603	0.537	0.547	0.081	3.713
	Retired	0.359	0.684	1.431	0.254	8.076
	Business	- 5.956	0.588	0.003	0.000	5.907E6
	Student	- 0.172	0.881	0.842	0.088	8.085
	Other		Reference			
Type of vascular assess						
	CVC	- 4.926	0.941	0.007	0.000	2.499E54
	TCC		Reference			
Treatment success						
	Yes	-1.958	**0.020**	0.141	0.027	0.739
	No		Reference			
Site of HD catheter						
	Internal Jugular vein	6.278	0.925	532.975	0.000	1.765E59
	Femoral	6.949	0.917	1.042E3	0.000	3.463E59
	Subclavian artery		Reference			

The table above presents results from a study examining factors associated with ICU admission outcomes in participants with chronic renal insufficiency (CRI). Several predictors showed significant associations with ICU admission outcomes. For marital status, being unmarried was strongly associated with a higher hazard ratio (HR) of ICU admission compared to those who were cohabiting (HR = 18.635, p = 0.040), indicating unmarried individuals had a significantly increased risk. Education level also played a role; vocational education showed a notably high HR (HR = 305.338, p = 0.001) compared to university education. Occupation had varied impacts; being a public servant had a protective effect (HR = 0.010, p = 0.007), significantly lowering the risk compared to other occupations. The type of vascular access and site of HD catheter also influenced outcomes significantly, with specific types and sites showing markedly different HRs, indicating varying risks associated with these factors.

Table 9: Factors associated with Re-catheterization outcome of the CRI

Predictors	Group	B	p-Value	HR	95.0 C. I Lower	Upper
Marital status	Married	- 0.127	0.733	0.881	0.426	1.822
	Unmarried	0.238	0.564	1.268	0.565	2.847
	Divorced	- 0.037	0.955	0.964	0.264	3.519
	Cohabiting	- 0.314	0.615	0.731	0.215	2.480
	Widow		Reference			
Education						
	Illiterate	- 0.180	0.815	0.835	0.185	3.781
	Primary	- 0.457	0.231	0.633	0.300	1.338
	Secondary	- 0.326	0.245	0.722	0.416	1.251
	Vocational	0.727	0.263	2.069	0.580	7.385
	University		Reference			
Occupation						
	Peasant	1.113	0.058	3.044	0.961	9.641
	Public Servant	0.258	0.689	1.294	0.366	4.567
	Unemployed	0.971	0.069	2.641	0.928	7.515
	Retired	1.228	**0.035**	3.413	1.088	10.709
	Business	1.033	0.097	2.810	0.828	9.531
	Student	0.928	0.127	2.528	0.768	8.323
	Other		Reference			
Type of vascular assess						
	CVC	- 0.103	0.932	0.902	0.085	9.533
	TCC		Reference			

Table 6 presents the Cox regression analysis results on factors associated with re-catheterization outcomes among participants with chronic renal insufficiency (CRI). Marital status did not show significant associations with re-catheterization risk, nor did education levels. Retired individuals exhibited a significantly higher risk of re-catheterization (HR = 3.413, p = 0.035), while peasants showed a borderline association (HR = 3.044, p = 0.058). Type of vascular access, treatment type, and treatment success did not significantly influence re-catheterization risk. This suggests that while certain occupational factors may impact re-catheterization outcomes in CRI participants, further research is needed to comprehensively understand these associations and their implications for participant management.

4.5 Comparison of the mean difference of HD Catheter-related infections among participants with Central Venous Catheter and Tunneled cuffed central venous catheter (TCC) at Muhimbili National Hospital

The Mann-Whitney U test showed that CVC has a slightly higher effect (33344) on a Catheter-related infection than TCC (SumR-31636) although was not statistically significant (p-0.89). Also, the Kaplan-Meir test found no significant difference in effect between CVC and TCC on Catheter-related infections hence the curves (CVC & TCC) were parallel regarding the time of Catheter device in the body.

Table 10: Comparison of the Rank difference of HD Catheter-related infections among participants with CVC and TCC

Type of Vascular Access	N	Mean Rank	Sum of Rank	U	p-Value
TCC	176	179.75	31636.00	16060	0.89
CVC	184	181.22	33344.00		

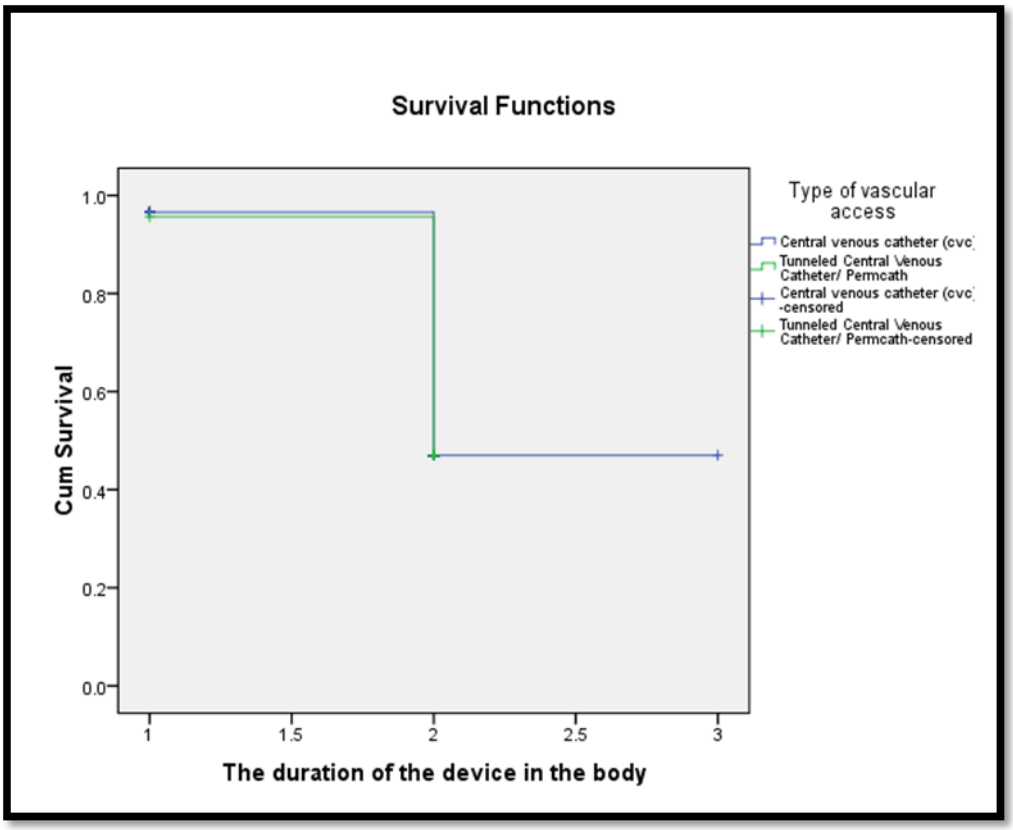


Figure 7: Kaplan-Meir test for comparing a hazard effect between CVC and TCC toward CRIs

In general, the analysis of catheter-related infections (CRIs) in participants with central venous catheters at Muhimbili National Hospital found no significant difference between the Central Venous Catheter (CVC) and Tunneled Cuffed Central Venous Catheter (TCC). While the Mann-Whitney U test showed a slightly higher effect for CVC, the p-value indicated no statistical significance. Similarly, the Kaplan-Meier curves for CVC and TCC were parallel, suggesting a similar hazard of CRIs over time for both catheter types. These results suggest that both CVC and TCC carry a similar risk of CRIs.

CHAPTER FIVE

5.0 DISCUSSION

Hemodialysis is a crucial life-sustaining treatment for many patients with end-stage renal disease (ESRD), and central venous catheters (CVCs) are commonly used for hemodialysis access in patients who lack adequate vascular access or have unsuccessful maturation of arteriovenous fistulas or grafts. However, CVCs are associated with increased risks of complications, including catheter-related bloodstream infections. The current study observed the burden and outcomes of hemodialysis catheter-related infections among hemodialysis patients at Muhimbili National Hospital. The study included a total of 360 participants, with the majority being in the 60-73 years age group, which may be due to complications of non-communicable diseases (NCDs) like diabetes and hypertension (45).

The prevalence of HD catheter-related infections

In the study, there was a high prevalence of catheter-related infections noted, which were based on fever as a cause (51.1%), blood/pus culture showing bacteria growth (56.4%), and the type of vascular access (80.8%). This finding was similar to a comparable study where the overall prevalence of catheter bloodstream infection was 58.8%. Mother Theresa Hospital had a slightly higher prevalence compared to American hospitals (46). Additionally, the prevalence was much higher than the study findings from Ghana (47).

Factors associated with HD catheter-related infections

In this study, we also observed only vocational training had shown a significant association with the Mortality of infected Catheter-related patients. It was the same with the reported study by Morton et al (2016) in one way where decreasing education level was reported as the cause of the vascular event but also contradicted in another way by which the current study a reversible effect of the illiterate to the CRIs (48). This is because vocational training may not provide enough knowledge about health studies and mostly deals with engineering and business studies in Tanzania. Treatment success was also detected as the strong negative association factor for Mortality in the present study and hence can reduce the mortality rate

among Hemodialysis patients affected with Catheter-related infection. This may be due to the Compliance of these patients to medical adherence that can reduce the risk of death among ESRD and hence can be treated accordingly. Same as to Mortality, ICU admission was also observed to be significantly affected by vocational training and treatment access. The present study also observed that Re-catheterization was only affected with Retirement from the job. It may be due to failure to afford hemodialysis costs per week and also the vulnerability age of the diseases.

On comparing the effect of the CVC and TCC on Catheter-related infections, we did not see any significant effect between them even though CVC has a slightly higher effect on CRIs than TCC.

Outcomes of HD catheter-related infections

More than 10 days of hospital stay, ICU admissions, high frequency of re-catheterization, Hospital readmissions due to HD catheter-related sepsis, mortality, and 30 to 90 days of catheter stay in the body of HD was observed as the outcome of the Catheters related infection regardless of the type of catheter being used. The finding was in line with the other study where mortality was also observed as one of the outcomes of the catheter-related infection (49). Furthermore, one of the studies conducted in Malaysia agreed with the current findings where metastatic infection and Septic shock were also observed (50). The reason for our findings may be due to the conundrum posed by Catheters where the patients can develop a multitude of complications, including thrombosis, infections, formation of a fibrin sheath, and central vein stenosis (51).

5.1 Strength of the Study

The current extensive application of hemodialysis in our country has created an opportunity for prolonging the lives of individuals suffering from end-stage renal disease. Despite the prevalence of presumed infections in hemodialysis catheters, these research findings are crucial and timely additions to the existing knowledge base.

The outcomes of this research will be crucial as infections related to hemodialysis catheters pose a significant challenge in the care of hemodialysis patients. Understanding the impact of these infections is vital for healthcare providers and policymakers to implement effective preventive measures and interventions, enhance patient care, improve clinical decision-making, and boost patient safety within the hemodialysis environment. By investigating the burden of these infections, healthcare professionals can pinpoint risk factors, create targeted interventions, gain valuable insights into the clinical consequences of these infections, and assess the effectiveness of quality improvement efforts. The empirical use of antibiotics among hemodialysis patients is a common practice that can also be monitored through such studies.

5.2 Study Limitation

The study was carried out in a single hemodialysis unit in Tanzania. Therefore, the results are only applicable to patients with end-stage renal disease (ESRD) who attended that specific unit. Since it is a referral center, only patients who were identified and could afford transportation and treatment costs away from their homes were included in the study. As a result, the findings may not accurately reflect the true burden of ESRD in the community.

The severity of illness was not measured as the fever reported was obtained from history and this may have varied according to individual perception. However, although this was a large study, the results may not be generalizable due to the participation of a single center at a national referral hospital.

Several patients were already receiving both oral and IV antibiotics before blood culture sampling, so the number of CRBSIs may be an underestimate. Timely blood sample collection for culture growth typing was not performed to prove the identity of strains isolated from blood and catheter and therefore caution needs to be considered in its interpretation.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study found that infections are common complications in individuals with end-stage renal disease (ESRD) undergoing long-term hemodialysis with the Prevalence of Catheter-Related Bloodstream Infections (CRBSI) based on fever cause (51.1%), Blood/ Pus Culture (Bacteria growth) results (56.4%), and type of vascular access (80.8%). Among the patient population, males were the most frequently affected gender. Several clinical outcomes were associated with HD catheter-related infections, including admissions to Intensive Care Units (ICUs), a high rate of re-catheterization, hospital readmissions due to sepsis-related to hemodialysis catheters, mortality rates, and the duration of catheter placement in hemodialysis patients, which ranged from 30 to 90 days. The only factors that demonstrated a significant impact both positively and negatively on mortality and ICU admissions for patients with HD catheter-related infections were vocational training and adherence to treatment protocols. Additionally, being retired emerged as a positive predictor for the likelihood of re-catheterization among these patients.

6.2 Recommendation

Prospective longitudinal studies with a high sample size should be conducted in Tanzanian Hemodialysis Centers to determine the true prevalence, incidence, complications, and outcomes of HD catheter-related infections among hemodialysis patients.

Improvement in the proper documentation of the patient’s diagnosis through a combination of observed symptoms, clinical signs, and quantitative culture methods and early diagnosis of CRBSI can help prevent complications and fatalities associated with the infection as most of the important variables were not included thus leading to insufficient information and loss of records.

Infections can be reduced and entirely prevented by implementing stringent hygiene protocols, ensuring that all healthcare personnel receive proper training, providing high-quality individual patient care Utilizing sterile barrier precautions, and maintaining skin asepsis to minimize contamination from normal flora. Additionally, it is widely accepted that routinely changing catheters helps lower levels of colonization.

While it's reasonable to use IV antibiotics in these patients, most causes of the infections were not ruled out as most of the blood culture was negative caused by early initiation of antibiotic therapies before culture growth was done. Therefore, initial antibiotic therapy should only be given after sample collection and results are available to be able to target the appropriate species of the bacteria. We strongly recommend that, blood cultures should be taken promptly from all patients suspected to have bacteremia associated with central venous catheterization.

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APPENDICES

Appendix 1: Data Extraction Checklist

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

DIRECTORATE OF RESEARCH AND PUBLICATIONS

A CHECKLIST TOOL FOR THE STUDY: THE BURDEN AND OUTCOMES OF CATHETER-RELATED INFECTIONS AMONG HEMODIALYSIS PATIENTS AT MUHIMBILI NATIONAL HOSPITAL.

Participants ID NO: ……

PART A: DEMOGRAPHIC DATA

1. Participants' age…….
2. Gender:
    1. Male
    2. Female
2. Number of years on Dialysis
    1. Less than 1
    2. 2- 5
    3. More than 5
3. Marital status
    1. Single
    2. Married
    3. Cohabiting
    4. Divorced/ separated
    5. Widowed
4. Religion
    1. Muslim
    2. Christian
    3. Others
5. Residency
    1. Dar es Salaam
    2. Other regions
6. Education level
    1. No education
    2. Primary

3. Secondary,
4. Vocational,
5. University

7. Occupation
    1. Peasant,
    2. Public servant,
    3. Unemployed
    4. Retired
    5. Student
    6. Business
    7. Others

PART II: SOCIOECONOMIC HISTORY

8. History of smoking?
    1. No
    2. Yes
    3. Yes, but stopped
9. History of alcohol consumption?
    1. No
    2. Yes,
    3. Yes, but stopped
10. Modes of payment for the hemodialysis sessions
    1. Insurance
    2. Cost sharing
    3. IPPM

PART III: MEDICAL AND CLINICAL FACTORS

11. Other underlying illness

    Hypertension?
    1. No
    2. Yes,
    3. I don't know

    Diabetes mellitus.
    1. No
    2. Yes
    3. I don't know

    HIV/AIDS
    1. Yes
    2. No
12. The primary cause of the End Stage Renal Disease
    1. Renal disease/ conditions
    2. Other causes other than renal
    3. Congenital abnormalities
13. History of fever/ chills in the last 48 hours before admission
    1. No,
    2. Yes
    3. If yes, were the participants given

any fever-lowering medicine
    1. No,
    2. Yes

14. Was the fever investigated?
    1. Yes
    2. No
15. Was the cause of the fever found?
    1. Yes
    2. No
16. What was the cause of the fever?
    1. HD catheter-related
    2. Other causes
    3. Not reported
17. How was the patient treated?
    1. Antibiotics
    2. Antimalarial
    3. Antipyretics
    4. Others (specify) …….
18. Bacteria growth/Blood culture
    1. Yes
    2. No
19. Outcomes of infections
    1. Treatment success
        1. Yes
        2. No
    2. Mortality
        1. Yes
        2. No
    3. Duration of hospital stays
        1. 0
        2. 1
        3. >5
        4. >10
    4. ICU admissions
        1. Yes
        2. No
    5. Re-catheterization
        1. Yes
        2. No
    6. Readmissions
        1. HD catheter-related Sepsis
        2. Other causes
    7. Mortality associated with HD catheter-related infections
        1. Yes
        2. No
20. Type of vascular access
    1. Central venous catheter
    2. Tunneled Central venous catheter/Permcath

21. Site for vascular access for Hemodialysis
    1. Jugular vein
    2. Femoral Vein
    3. Subclavian
22. For how long have you been on hemodialysis?
    1. < 6months
    2. 6-12months
    3. >12 months
23. The number of hemodialysis sessions per week?
    1. Once a week
    2. Twice a week
    3. 3 Times a week
24. For how long have you been having this device in your body (Temporary Catheter)?
    1. <30 days
    2. 30-90 days

CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI

KURUGENZI YA UTAFITI NA MACHAPISHO

ZANA YA ORODHA YA KUJIFUNZA: MZIGO NA MATOKEO YA MAAMBUKIZI YANAYOHUSIANA NA KATHETA MIONGONI MWA WAGONJWA WA HEMODIALYSIS KATIKA HOSPITALI YA TAIFA MUHIMBILI.

Nambari ya kitambulisho cha Mshiriki: ……

SEHEMU A: DATA YA DEMOGRAFIA

1. Taarifa za Kibinafsi

Umri: ……

2. Jinsia:

1. Mwanaume
2. Mwanamke

3. Kabila: …….

4. Umri wa kuanzishwa kwa hemodialysis: …….

5. Muda wa hemodialysis: ……

6. Umekuwa kwenye hemodialysis kwa muda gani?

1. chini ya miezi 6
2. Miezi 6-12
3. >miezi 12

7. Je, unafanya hemodialysis mara ngapi kwa wiki?

1. Mara moja
2. Mara mbili
3. Mara tatu
4. >Mara tatu

8. Njia ya malipo ya vipindi vya HD

1. Bima ya Afya
2. Kuchangia gharama
3. IPPM

9. Eneo la mishipa lenye katheta ya hemodialysis?

1. Shingoni
2. Kifuani
3. Pajani

10. Aina ya kifaa cha mishipa unachotumia

1. Catheter ya Kati ya Vena/Katheta ya Muda
2. Katheta ya kati ya vena/Perm-Cath yenye vichuguu

11. Je, umekuwa na kifaa hiki mwilini mwako kwa muda gani (Temporary Catheter)?

1. <Siku 30
2. Siku 30-90
3. > Siku 90

12. Hali ya ndoa

1. Sina ndoa
2. Nimeolewa/ Kuoa
3. Tunaishi pamoja
4. Tumetengana
5. Mjane

13. Dini

1. Muislamu
2. Mkristo
3. Nyengine

14. Makazi

1. Dar es Salaam
2. Nje ya Dar es Salaam

15. Kiwango cha elimu

1. Hakuna elimu
2. Msingi
3. Sekondari,
4. Ufundi,
5. Chuo Kikuu

16. Kazi

1. Mkulima,

2. Mtumishi,

3. Binafsi,

4. Nyingine: bainisha……

SEHEMU YA II: HISTORIA YA MATIBABU

18. Historia ya kuvuta sigara? _____

1. Hapana

2. Ndiyo

3. Ndiyo, lakini imesimama

19. Historia ya unywaji pombe?

1. Hapana

2. Ndiyo,

3. Ndiyo, lakini imesimama

20. Ugonjwa mwingine wa msingi

Shinikizo la damu?

1. Hapana

2. Ndiyo,

3. Sijui

Ugonjwa wa kisukari?

1. Hapana

2. Ndiyo

3. Sijui

VVU/UKIMWI

1. Ndiyo

2. Hapana

21. Historia ya homa/baridi kali katika saa 48 zilizopita kabla ya kulazwa

1. Hapana,

2. Ndiyo

3. Ikiwa ndio, ulichukua dawa yoyote ya kupunguza homa

1. Hapana,

2. Ndiyo

22. Ni majaribio ngapi yalifanywa kabla ya kuwekwa kwa mafanikio kwa kifaa

1. 1-2

2. 3-5

3. >5

23. Je, homa ilichunguzwa?

1. Ndiyo

2. Hapana

24. Je, sababu ya homa ilipatikana?

1. Ndiyo

2. Hapana

25. Mgonjwa alitibiwaje?

1. Antibiotics

2. Antimalaria

3. Antipyretics

4. Nyingine (taja) …….

26. Ukuaji wa bakteria/utamaduni wa damu

1. Ndiyo

2. Hapana

27. Matokeo ya maambukizi

a. Mafanikio ya matibabu

1. Ndiyo

2. Hapana

2. Hapana

c. Muda wa kukaa hospitalini

1. 0

2. 1

3. >5

4. >10

d. Kulazwa ICU

1. Ndiyo

2. Hapana

5. Vifo vinavyohusishwa na maambukizi ya HD catheter

1. Ndiyo

2. Hapana

Appendix 2: Approval for ethical clearance

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

I.MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATIONS

Ref. No.DA.282/298/01.C/2210 Date: 29/04/2024

MUHAS-REC-04-2024-2210
JOYCE KOKUBANZA KAIZA
SHOOL OF NURSING
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: THE BURDEN AND OUTCOMES OF CATHETER-RELATED INFECTIONS AMONG HEMODIALYSIS PATIENTS AT MUHIMBILI NATIONAL HOSPITAL

Reference is made to the above heading.

I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 29/04/2024
EXPIRATION DATE OF APPROVAL: 29/04/2025

STUDY DESCRIPTION:
Purpose:
This retrospective observation cohort study aims to assess the burden and outcomes of catheter-related infections among hemodialysis patients at Muhimbili National Hospital for the past two years.

The apprcved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015532.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations
Box 65001

Dr. Nahya Salim Masoud,

Chairperson, MUHAS Research and Ethics Committee

Appendix 3: Introduction Letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.456/2022 03rd May, 2024

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

RE: INTRODUCTION LETTER OF JOYCE KOKUBANZA KAIZA

We would like to inform you that the carrier of this letter is Joyce Kokubanza Kaiza

with registration number HD/MUH/T.456/2022 a student at Muhimbili University of Health and Allied Science (MUHAS), pursuing MSc. Nephrology Nursing.

As part of her studies, she will be doing an elective research titled **"The Burden And Outcomes Of Catheter-Related Infections Among Hemodialysis Patients At Muhimbili National Hospitals.** She is being supervised by Dr. Khadija Malima from MUHAS and SR. Sabitina Mzava from MNH.

The Ethical Clearance for doing the said research has been given by the University.

Kindly request your assistance and cooperation to our student.

Yours Sincerely,

Mr. Sebe Mohamed
For: DIRECTOR, PCSTGRADUATE STUDIES
cc: Joyce Kokubanza Kaiza

9 United Nations Road, Upanga West, P.O. Box 65001, Dar Es Salaam; Tel. G/Line: +255-22-2150302/6, Ext. 1015; Direct Line:+255-22-2151398;Telefax:+255-22-2150465 E-mail:dpgs@muhas.ac.tz;Web https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.456/2022

MUHIMBILI NATIONAL HOSPITAL
RECEIVED
03 MAY 2024
REGISTRY
File No:.....

03rd May, 2024

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

RE: INTRODUCTION LETTER OF JOYCE KOKUBANZA KAIZA.

We would like to inform you that the carrier of this letter is Joyce Kokubanza Kaiza

with registration number HD/MUH/T.456/2022 a student at Muhimbili University of Health and Allied Science (MUHAS), pursuing MSc. Nephrology Nursing.

As part of her studies, she will be doing an elective research titled **"The Burden And Outcomes Of Catheter-Related Infections Among Hemodialysis Patients At Muhimbili National Hospitals.** She is being supervised by Dr.. Khadija Malima from MUHAS and SR. Sabitina Mzava from MNH.

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Kindly request your assistance and cooperation to our student.

Yours Sincerely,

Mr. Seba Mohamed
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Joyce Kokubanza Kaiza

9 United Nations Road, Upanga West, P.O. Box 65001, Dar Es Salaam; Tel. G/Line: +255-22-2150302/6, Ext. 1015, Direct Line:+255-22-2151378;Telefax:+255-22-2150495;E-mail:dpgs@muhas.ac.tz;Web: https://www.muhas.ac.tz

Appendix 4: Permission Letter

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote:

Ref. No.: MNH/CRTCU/Perm/2024/197 Date: 06th May, 2024

Block Manager
NPC – I
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH

Name of PI	**Joyce Kokubanza Kaiza**
Title	**"The Burden and Outcomes of Catheter-Related Infections Among Hemodialysis Patients at Muhimbili National Hospital"**
Institution	Muhimbili National Hospital
Supervisor	Dr. Khadija Malima (MUHAS)
Co – Investigators	Sr. Sabitina Mzava (MNH)
Period	06th May 2024 to 31st May, 2024

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by Sr. **Sabitina Mzava** (MNH) supervisor.

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Sima Rugarabamu
For: Head of Clinical Research, Training and Consultancy Unit

c.c DNS
c.c Sr. Sabitina Mzava
c.c **Joyce Kokubanza Kaiza**

Upanga West, Kalenga Street, Plot No. 1045/3, P.O. BOX 65000, Dar es Salaam, Tanzania
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

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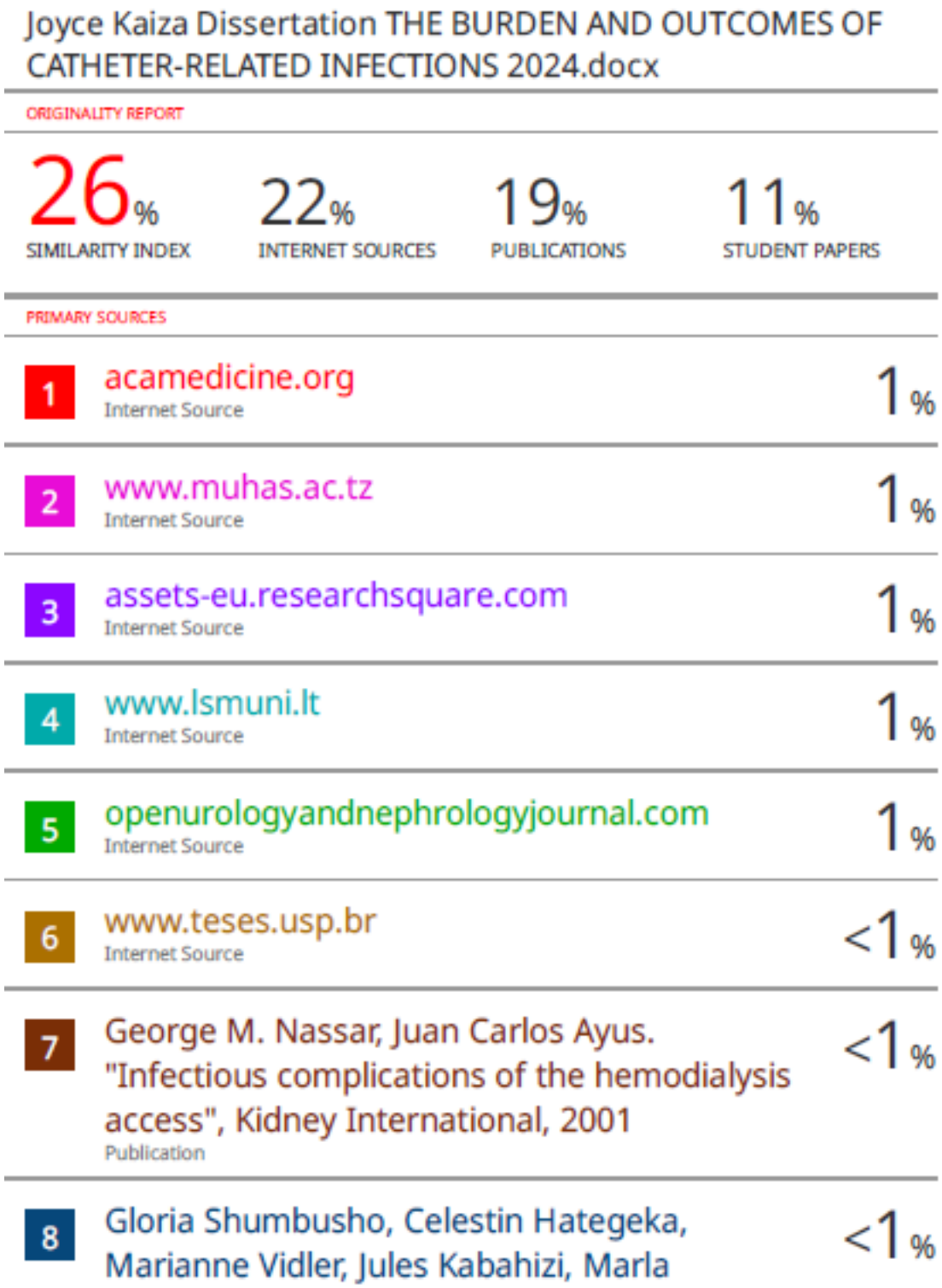
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Appendix 6: Plagiarism Report



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