INCIDENCE OF PROSTHETIC JOINT INFECTION, FUNCTIONAL RECOVERY AND REHABILITATION PROGRESS AMONG ORTHOPAEDIC PATIENTS AT METROPOLITAN HOSPITAL, NAIROBI COUNTY, KENYA

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Incidence of Prosthetic Joint Infection, Functional Recovery and Rehabilitation Progress among Orthopaedic Patients at Metropolitan Hospital, Nairobi County, Kenya

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2026

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

This work is dedicated to my family; my beautiful wife, Fredinah Wambua Kalyeke, my lovely children; Trinity, Israel, Myles and Mylen for their moral support and encouragement throughout the course of this undertaking.

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ABBREVIATIONS AND ACRONYMS

AAOS	American Academy of Orthopedic Surgeons
ADLs	Activities of Daily Living
BMI	Body Mass Index
CPM	Continuous Passive Motion
CRP	Serum C-reactive Protein
DALYs	Disability-Adjusted Life Years
DVT	Deep Vein Thrombosis
GBD	Global Burden of Disease
MSIS	Musculoskeletal Infection Society
OA	Knee Osteoarthritis
PE	Pulmonary Embolism
PJI	Prosthetic Joint Infection
SDGs	Sustainable Development Goals
TKA	Total Knee Arthroplasty
TKR	Total Knee Replacement
WHO	World Health Organization
YLLs	Years of Life Lost
YLDs	Years Lived with Disabilities

ABSTRACT

The incidence of total knee replacement (TKR) is increasing due to factors such as heightened patient satisfaction, an ageing population, increased number of TKR expertise, and advancement in technology, and increase in the obesity epidemic which lead to more significant stress on weight-bearing joints. This study determined the incidence of prosthetic knee joint infection, evaluated functional recovery, and analysed rehabilitation progress among orthopaedic patients who underwent Total Knee Replacement at Metropolitan Hospital in Nairobi County, Kenya. This study employed a longitudinal study design for five months, following 75 patients who had undergone TKR at Metropolitan Hospital in Nairobi County. Each patient was observed for a period of 6 weeks therefore; a total of 450 observations were made for all the 75 patients. Data collection methods included medical record reviews, patient interviews, and clinical assessments. Specifically, standardized questionnaires and assessment tools were utilized, including the short form health survey (SF-12) for quality-of-life assessment, the visual analogue scale (VAS) for pain measurement, and relevant scales for activities of daily living (ADL) assessment. The incidence density of prosthetic joint infection was calculated using the conventional formula, accounting for new cases and patient time at risk. We observed that functional outcomes post-TKR are generally favourable, with patients who were followed up resuming their daily activities in a relatively short timeframe of less than six weeks. By the sixth week, 60% of the patients had undergone excellent rehabilitation progress. The incidence of prosthetic knee infection was notably low (9 cases per 1000 patient weeks) and was only associated with age, perhaps highlighting the effectiveness of the applied surgical techniques and postoperative care. Additionally, we identified that comorbid conditions, particularly diabetes and hypertension, are the primary factors that contributed to delayed healing and resumption of daily activities following TKR. Favourable outcomes and low infection rates indicate that total knee replacement (TKR) is a safe and effective option for patients with severe knee pain, significantly improving quality of life and mobility. However, the association between age and infection risk necessitates thorough preoperative assessments and age-specific care protocols, especially for older patients. Additionally, comorbidities like diabetes and hypertension can delay healing, highlighting the need for targeted preoperative interventions. Optimizing the management of these conditions may enhance recovery and reduce complications. Further research is essential to explore how these comorbidities affect healing post-TKR and to assess the effectiveness of specific interventions.

Key Words: Total Knee Replacement (TKR), Clinical outcomes, Functional outcomes, Kenya.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Prosthetic joint infection (PJI) is a microbial colonisation of the joint space surrounding an implanted prosthesis, and it is widely regarded as one of the most serious and costly complications that can follow joint replacement surgery (Edwards et al., 2022; Patel, 2023). Although its incidence is comparatively low, ranging from approximately 1.08% to 2% after primary procedures and considerably higher after revision surgery, the consequences for an affected patient are severe, frequently involving prolonged hospitalisation, repeated surgical procedures, long-term antibiotic therapy, permanent disability, and in some cases death.

The global impact of PJI is substantial. PJI is associated with an adjusted one-year mortality risk roughly double that of patients who do not develop the infection, and a five-year relative survival rate comparable to several common cancers (Thompson et al., 2022; Natsuhara et al., 2019). Beyond mortality, PJI contributes heavily to morbidity and lost healthy life: affected patients commonly require additional surgery, extended antibiotic courses, and prolonged functional impairment, all of which compound the disability-adjusted life years (DALYs) already attributable to the underlying joint disease (Lenguerrand et al., 2017). As the global volume of joint replacement procedures continues to rise with ageing populations and increasing rates of degenerative joint disease, the absolute number of patients affected by PJI, and the corresponding global mortality and morbidity burden, is expected to grow in parallel (Sloan et al., 2018).

In sub-Saharan Africa (SSA), the limited available evidence suggests a disproportionately higher PJI burden than is typically reported in high-income countries. A systematic review of arthroplasty outcomes across the region reported a deep infection rate of 1.6% among the knee replacements studied, alongside HIV prevalence of up to one-third among the patient population (Davies et al., 2019). A

multicentre report from two regional orthopaedic hospitals in southern Nigeria similarly found periprosthetic knee infection rates exceeding those documented in developed-country cohorts, a gap the authors attributed to constraints in perioperative infection-control infrastructure rather than to patient-level risk factors such as diabetes or obesity (Babalola et al., 2026). These findings point to a disproportionate mortality and morbidity burden from PJI in African surgical settings, even though the absolute number of procedures performed remains far lower than in developed countries.

In Kenya specifically, there is limited local evidence regarding the incidence, causative microorganisms, treatment outcomes, and economic burden of PJI. Most existing clinical guidance is extrapolated from studies conducted in high-income countries, whose patient demographics, healthcare infrastructure, and microbial patterns may differ significantly from the Kenyan context (Kinyanjui & Muriuki, 2020). Kenya has no national arthroplasty registry, and there is no published data quantifying PJI-attributable mortality, morbidity, or DALYs lost among Kenyan patients, leaving a critical gap for clinicians, hospital infection-prevention policy, and national orthopaedic guidelines (Mwangi & Karanja, 2021).

Functional outcomes describe the measurable clinical improvements that follow joint replacement, including pain reduction, restoration of knee range of motion, and gains in strength and joint stability, typically assessed using validated tools such as the Knee Injury and Osteoarthritis Outcome Score (KOOS) or the Oxford Knee Score (Christensen et al., 2020). These tools have been validated across multiple orthopaedic interventions, including total knee replacement, and capture pain, symptoms, activities of daily living, sport and recreational function, and knee-related quality of life as separate, scoreable dimensions of recovery. Recovery on these measures is time-dependent rather than immediate: a longitudinal study following patients from before surgery through four years afterward found that KOOS pain scores rose from a mean of 43 preoperatively to 66 at six weeks and 88 at two years, while knee range of motion declined initially from 112° preoperatively to 78° at hospital discharge before recovering to 116° by two years, with the greatest gains concentrated in the first six months and comparatively little further improvement thereafter.

The presence of PJI directly compromises this functional recovery trajectory. Infected patients experience delayed and often incomplete functional recovery compared with uninfected patients, since the additional surgery, antibiotic therapy, and immobilisation required to manage the infection interrupt the recovery process the original procedure was intended to produce (Mehta et al., 2020). Beyond infection status, functional recovery after joint replacement is also shaped by patient-level factors such as body mass index, age-adjusted comorbidity burden, sleep quality, bone mineral density, and analgesic efficacy, all of which have been identified as significant predictors of poorer recovery in predictive modelling studies.

Rehabilitation progress refers to a patient's trajectory in regaining independence in activities of daily living (ADLs) through structured postoperative physiotherapy and exercise programmes (Snell et al., 2018). In many high-income settings, rehabilitation is standardised so that patients begin inpatient physiotherapy within 24 hours of surgery, including active and passive knee exercises, gradual mobilisation, and supervised gait training, before progressing to outpatient or home-based programmes as recovery continues. Rehabilitation progress does not follow a single uniform pattern: studies tracking recovery trajectories over the months following surgery have identified distinct subgroups of patients, with the large majority showing steady, predictable improvement and a smaller minority following a markedly different trajectory shaped by younger age, higher body mass index, and discharge to a rehabilitation facility rather than home.

Age and time to mobilisation are consistently identified as significant predictors of rehabilitation progress, with older patients and those who are mobilised later after surgery showing poorer recovery outcomes, while gender has not been found to be a significant independent predictor in most cohorts. Rehabilitation progress is itself disrupted when PJI occurs, since infected patients face prolonged immobility, repeat hospitalisation, and delayed physiotherapy that slow their overall recovery relative to patients whose postoperative course remains infection-free, making the interaction between infection status and rehabilitation trajectory a central concern for this study (Fatoye et al., 2021).

Total knee replacement (TKR) is the surgical procedure that provides the context within which PJI, functional outcomes, and rehabilitation progress all arise. It involves replacing the damaged articular surfaces of the knee joint with metal and high-grade polyethylene prosthetic components to relieve pain and restore joint function, and is most commonly indicated for osteoarthritis, rheumatoid arthritis, and other degenerative or inflammatory knee pathologies (Price et al., 2018). While TKR itself is not the primary subject of this study, it is the procedure during and after which PJI may occur, functional outcomes are measured, and rehabilitation progress unfolds, making it the necessary surgical backdrop against which the three main study variables are examined (Evans et al., 2019).

These three variables are also interconnected. The occurrence of PJI after TKR can disrupt the rehabilitation process by necessitating additional surgery, prolonging immobility, and delaying physiotherapy, which in turn slows the attainment of favourable functional outcomes (Fatoye et al., 2021). Conversely, patients who progress through rehabilitation without infectious complications tend to demonstrate faster and more complete functional recovery (Harmelink et al., 2021). Understanding how PJI incidence, functional outcomes, and rehabilitation progress interact following TKR is therefore central to improving postoperative care, particularly in low- and middle-income country settings such as Kenya, where context-specific evidence remains limited (Alrowaili, 2019).

Following TKR, patients typically get hospitalized for recovery and pain management where they receive physical therapy in rehabilitation with targeted exercises that improve motion and strength (Snell *et al.*, 2018). Following discharge, outpatient physical therapy focuses on strengthening the knee joint, enhancing function and helping patients regain independence and quality of life (Christensen *et al.*, 2020). While TKR is a generally safe and successful procedure, some potential risks and complications frequently ensue, either during hospitalization or upon discharge. These include but not limited to infection, blood clots, implant problems, nerve or blood vessel injury, and persistent pain or stiffness (Fatoye *et al.*, 2021). These complications disrupt the patients' Activities of Daily Living (ADLs), impacting their ability to carry

out essential life tasks independently. Previous research is not definite on the time TKR patients resume ADLs: Harmelink *et al.* (2021) reported that 70% of patients were independent in performing ADLs six weeks post-TKR. On the other hand, Konnyu *et al.* (2023) reported that a wide range of time in resuming more difficult ADLs, including climbing stairs and performing household chores (Konnyu *et al.,* 2023).

The postoperative recovery process, including the time-to-reach unaided mobility, is crucial for patients to regain independence and return to their daily activities. Previous studies have investigated the factors influencing time-to-unaided mobility and reported varying results. For instance, (Pua *et al.* 2019 developed four models to predict individual patients' expected levels of knee extension and flexion range of motion, knee pain, and walking limitations six months after total knee arthroplasty. These models demonstrated modest to moderately good predictive discrimination when assessing patients with poor postoperative outcomes (Pua *et al.,* 2019). Mehta *et al.* (2020) also modelled data from 559 patients reporting that knee range of motion changed significantly during the first 12 weeks after TKR and plateaued by 26 weeks (Mehta *et al.,* 2020). For an average patient, knee flexion increased from approximately 2 weeks post TKR to 117º 52 weeks post TKR concluding that the maximum gains in knee range of motion should be expected within the first 12 weeks (Mehta *et al.,* 2020). Shah and colleagues (2019) conducted a systematic review of various studies examining patient-related factors that may affect the length of stay following total knee arthroplasty. They identified several predictors of prolonged hospital stays, including advanced age, female gender, and a body mass index (BMI) of 30 or higher, among others (Shah *et al.*, 2019).

Overall, studies conducted in developed countries have provided impactful findings regarding the risks and complications associated with TKR during hospitalization and upon discharge. These studies also examine the time required for patients to achieve unaided mobility. Limited studies in Kenya reported that TKR surgeries have increased with a study reporting that the number of procedures rose from approximately 200 in 2010 to over 600 in 2019 (Kinyanjui & Muriuki, 2020).

Furthermore, a study conducted at Kenyatta National Hospital revealed that the rate of postoperative infections following TKR was around 5.3%, which aligns with infection rates observed in other developing nations (Mwangi & Karanja, 2021). In terms of rehabilitation outcomes, research indicates that about 80% of patients experienced significant improvements in mobility and pain reduction within six months post-surgery, showcasing the effectiveness of TKR in enhancing quality of life for patients (Odhiambo & Were, 2022). However, there remains a critical gap in this research concerning patients in low- and middle-income countries (LMICs), including Kenya.

Understanding the potential influence of cultural, socioeconomic, and healthcare system-related factors in developing country settings, post-TKR time, and consequent outcomes is essential. This study was designed to address and fill these gaps in Kenya. The primary outcome of this study was therefore to determine the incidence of prosthetic joint infection following TKR and the secondary outcome is to establish its impact on functional recovery and rehabilitation progress among orthopaedic patients at metropolitan hospital, Nairobi County, Kenya.

The clinical significance of prosthetic joint infection (PJI) lies in its association with prolonged hospitalization, increased healthcare costs, and poorer patient outcomes following total knee replacement. It may necessitate revision surgery and long-term antibiotic therapy, making early prevention and management essential.

PJI is critical in total knee replacement outcomes because it compromises implant survival, delays functional recovery, and increases the risk of revision surgery. Preventing PJI is therefore essential for achieving successful surgical outcomes, improving patient satisfaction, and ensuring long-term implant success.

1.2 Statement of the Problem

Prosthetic joint infection is one of the most serious and costly complications that can follow joint replacement surgery, and its consequences for affected patients and health systems are disproportionate to its relatively low incidence. Globally, PJI is associated with an adjusted one-year mortality risk roughly double that of uninfected patients, and a five-year relative survival rate comparable to that of several common cancers

(Thompson et al., 2022; Natsuhara et al., 2019). A ten-year cohort study at a European referral centre reported one-year cumulative PJI mortality of 5.5%, rising to 7.3% at two years (Fischbacher & Borens, 2019). Beyond mortality, PJI contributes substantially to morbidity and lost healthy life through repeat surgery, prolonged antibiotic therapy, and extended functional impairment, compounding the disability-adjusted life years (DALYs) already attributable to the underlying joint disease (Lenguerrand et al., 2017).

In sub-Saharan Africa, where joint replacement services are expanding but registry data remain sparse, the limited evidence available suggests a comparatively higher PJI burden than in high-income settings. A systematic review of arthroplasty outcomes across the region reported a deep infection rate of 1.6% among the knee replacements studied, alongside an HIV prevalence of up to one-third in the patient population (Davies et al., 2019). A multicentre report from southern Nigeria similarly found periprosthetic knee infection rates exceeding those typically documented in high-income countries, attributing the gap to constraints in perioperative infection-control infrastructure (Babalola et al., 2026). These findings point to a disproportionate mortality and morbidity burden from PJI in African surgical settings, even though the absolute number of procedures performed remains far lower than in developed countries.

In Kenya specifically, there is limited local evidence regarding the incidence, causative microorganisms, treatment outcomes, and economic burden of PJI, and most clinical guidance currently relied upon is extrapolated from high-income-country studies whose patient demographics and healthcare infrastructure differ substantially from the Kenyan context (Kinyanjui & Muriuki, 2020). A single-centre study at Kenyatta National Hospital reported a postoperative infection rate of approximately 5.3% (Mwangi & Karanja, 2021), a figure broadly consistent with rates reported elsewhere in the developing world, yet Kenya has no national arthroplasty registry and no published data quantifying PJI-attributable mortality, morbidity, or DALYs lost among Kenyan patients, leaving a critical evidence gap for clinicians and health planners.

Functional outcomes following joint replacement are similarly under-characterised in the Kenyan context, particularly with respect to how they are affected when PJI occurs. While research in high-income settings shows that approximately 70% of uninfected patients regain independence in basic ADLs by six weeks post-surgery, and that knee range of motion improves most substantially within the first twelve weeks before plateauing by week twenty-six, no comparable Kenyan data exists to confirm whether similar recovery timelines apply locally, or how far they are delayed among patients who develop PJI (Mehta et al., 2020; Odhiambo & Were, 2022).

Rehabilitation progress, the third variable of interest, is known to vary by age, gender, and preoperative comorbidity profile in international cohorts, and is further disrupted when PJI necessitates additional surgery and prolongs immobility (Christensen et al., 2020; Fatoye et al., 2021). Kenyan studies examining these subgroup differences, and how they interact with PJI status, among joint replacement patients are scarce. The absence of locally generated evidence on how PJI incidence, functional outcomes, and rehabilitation progress interrelate constrains the ability of clinicians at facilities such as Metropolitan Hospital to anticipate complications, allocate rehabilitation resources appropriately, and counsel patients realistically on expected recovery timelines. This study was therefore designed to address this gap by determining the incidence of PJI and evaluating its relationship with functional recovery and rehabilitation progress among orthopaedic patients undergoing total knee replacement at Metropolitan Hospital, Nairobi County, Kenya.

1.3 Justification

Prosthetic joint infection is one of the most serious and costly complications following total knee replacement surgery. Although its incidence is relatively low, at approximately 1.08% to 2% after primary knee replacement and higher after revision surgery, the consequences are severe, including prolonged hospitalisation, repeated surgical procedures, long-term antibiotic therapy, permanent disability, increased healthcare costs, and, in some cases, mortality. As the number of total knee replacement procedures continues to rise globally due to ageing populations and the increasing prevalence of degenerative joint disease, the absolute number of patients

affected by PJI is also expected to increase, making this an issue of growing rather than static concern.

Conducting research on prosthetic joint infection is essential to identify the patient-related, surgical, and healthcare-system factors that contribute to infection. Understanding these risk factors enables healthcare providers to implement targeted preventive measures, improve perioperative protocols, and optimise postoperative care. Furthermore, studying the microbiological profile and antibiotic resistance patterns of infecting organisms can guide appropriate antimicrobial therapy and support antibiotic stewardship efforts, both of which remain poorly documented for Kenyan patients undergoing total knee replacement.

In many low- and middle-income countries, including Kenya, there is limited local evidence regarding the incidence, causative microorganisms, treatment outcomes, and economic burden of prosthetic joint infections following total knee replacement. Most clinical guidelines in use locally are based on studies conducted in high-income countries, whose patient demographics, healthcare infrastructure, and microbial patterns may differ significantly from the Kenyan context. Local research is therefore necessary to generate context-specific evidence that can inform clinical practice, hospital infection-prevention policies, and national orthopaedic guidelines, rather than relying on guidance that may not reflect conditions at facilities such as Metropolitan Hospital.

Findings from this study are also expected to contribute to improved patient outcomes by reducing infection rates, minimising revision surgeries, shortening hospital stays, lowering healthcare costs, and enhancing patients' quality of life, while providing baseline data for future research and quality-improvement initiatives in orthopaedic surgical care. In summary, this study is justified because it will: determine the burden of prosthetic joint infection after total knee replacement; identify patient, surgical, and hospital-related risk factors; describe the causative microorganisms and their antibiotic susceptibility patterns; evaluate the clinical and functional outcomes of affected patients; generate local evidence to improve infection-prevention strategies, clinical decision-making, and healthcare policy; and ultimately help reduce the morbidity,

mortality, revision surgeries, and economic burden associated with prosthetic joint infection.

1.4 Objectives

1.4.1 Main Objective

To determine the incidence of prosthetic joint infection and to evaluate functional recovery and rehabilitation progress among orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

1.4.2 Specific Objectives

1. To assess the functional outcomes and activities of daily living resumption in orthopedic patients following total knee replacement at Metropolitan Hospital.
2. To assess the rehabilitation progress and activities of daily living resumption between different age groups, gender, and preoperative comorbidity profiles in orthopedic patients undergoing total knee replacement at Metropolitan Hospital.
3. To determine the incidence of prosthetic joint infection, among orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

1.5 Research Questions

1. How do functional outcomes and the resumption of activities of daily living change in orthopedic patients following total knee replacement at Metropolitan Hospital?
2. What are the differences in rehabilitation progress after Total Knee Replacement (TKR) across various age groups, gender categories, and preoperative comorbidity profiles among orthopedic patients undergoing the procedure at Metropolitan Hospital?
3. What is the incidence rate of prosthetic joint infection among orthopaedic patients who have undergone total knee replacement at Metropolitan Hospital?

1.6 Study Hypothesis

1. To assess the functional outcomes and activities of daily living resumption in orthopedic patients following total knee replacement at Metropolitan Hospital.

Null Hypothesis (H0): There is no significant difference in functional outcomes and the resumption of activities of daily living among orthopedic patients following total knee replacement at Metropolitan Hospital.

Alternative Hypothesis (H1): There is a significant difference in functional outcomes and the resumption of activities of daily living among orthopedic patients following total knee replacement at Metropolitan Hospital.

2. To assess the rehabilitation progress and activities of daily living resumption between different age groups, gender, and preoperative comorbidity profiles in orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

Null Hypothesis (H0): There is no significant difference in rehabilitation progress and the resumption of activities of daily living among different age groups, genders, and preoperative comorbidity profiles in orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

Alternative Hypothesis (H1): There is a significant difference in rehabilitation progress and the resumption of activities of daily living among different age groups, genders, and preoperative comorbidity profiles in orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

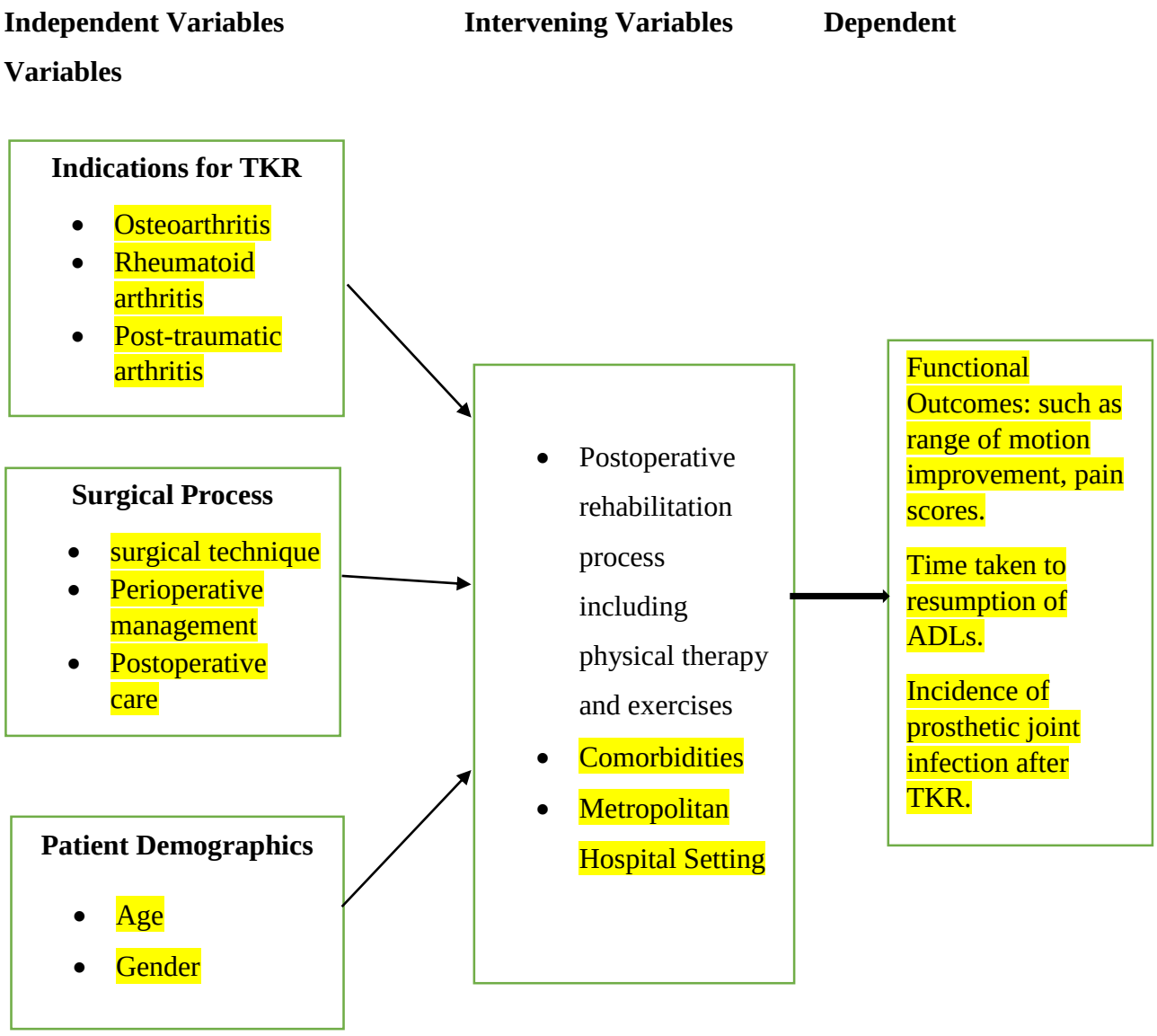
3. To determine the incidence of prosthetic joint infection among orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

Null Hypothesis (H0): The incidence of prosthetic joint infection among orthopedic patients undergoing total knee replacement at Metropolitan Hospital is equal to or less than the expected rate based on existing literature.

Alternative Hypothesis (H1): The incidence of prosthetic joint infection among orthopedic patients undergoing total knee replacement at Metropolitan Hospital is greater than the expected rate based on existing literature.

1.7 Conceptual Framework

In this study, the independent variables included demographic factors such as age, gender, and preoperative comorbidity profiles, which were assessed to understand their impact on rehabilitation progress and activities of daily living (ADLs) resumption. The intervening variables were the rehabilitation strategies and interventions employed post-surgery, which may have influenced the patients' recovery trajectories. The dependent variables consisted of functional outcomes, the level of ADL resumption, and the incidence of prosthetic joint infection among orthopedic patients following TKR. These variables interacted as the independent variables could have affected the effectiveness of the rehabilitation interventions, thereby influencing the dependent variables. For instance, older patients with more comorbidities might have experienced different functional outcomes and infection rates due to variations in their rehabilitation progress.


Independent Variables
Intervening Variables
Dependent Variables
Indications for TKR
Osteoarthritis
Rheumatoid arthritis
Post-traumatic arthritis
Surgical Process
surgical technique
Perioperative management
Postoperative care
Patient Demographics
Age
Gender
Postoperative rehabilitation process including physical therapy and exercises
Comorbidities
Metropolitan Hospital Setting
Functional Outcomes: such as range of motion improvement, pain scores.
Time taken to resumption of ADLs.
Incidence of prosthetic joint infection after TKR.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This literature review is structured to provide a comprehensive overview of the key thematic areas related to functional outcomes, rehabilitation progress, and the incidence of prosthetic joint infection following Total Knee Replacement (TKR). The review begins with an exploration of functional outcomes and the resumption of activities of daily living (ADLs), which are critical indicators of the success of TKR. This section highlights the impact of osteoarthritis on knee function and the benefits of TKR in alleviating pain and enhancing mobility. Following this, the review delves into rehabilitation progress across different demographics and comorbidity profiles, examining how age, gender, and pre-existing health conditions influence recovery trajectories.

The rationale for this sequence lies in the foundational understanding that effective rehabilitation is essential for optimizing functional outcomes post-TKR. By first addressing the functional outcomes, the review sets the stage for discussing the factors that facilitate or hinder rehabilitation, thereby providing a logical flow of information. The final sections focus on the incidence and associated factors of prosthetic joint infection, emphasizing the importance of understanding infection risks in the context of postoperative recovery. This structure allows for a holistic examination of the interplay between functional recovery, rehabilitation practices, and the risk of complications such as prosthetic joint infection.

Throughout the review, the literature consistently underscores the interconnectedness of these thematic areas, illustrating how effective rehabilitation strategies can mitigate the risk of prosthetic joint infection and enhance overall recovery. By synthesizing findings from various studies, the review aims to inform clinical practices and highlight the need for tailored interventions that address individual patient profiles, ultimately improving outcomes for those undergoing TKR.

2.2 Functional Outcomes and Resumption of ADLs

Osteoarthritis (OA) significantly impacts the knee joint, resulting in pain, stiffness, and decreased mobility, which can severely affect the performance of Activities of Daily Living (ADLs) (Hunter *et al.*, 2021). Total knee replacement (TKR) is a common and effective surgical treatment for end-stage knee OA, aimed at improving pain relief and functional outcomes (Baker *et al.,* 2019). The post-surgical functional improvements typically include a reduction in pain and enhanced mobility, allowing patients to resume ADLs such as walking, climbing stairs, and performing basic self-care tasks (Jones *et al.,* 2020). Following TKR, patients generally experience a significant improvement in quality of life, with many regaining a higher level of physical function and independence (Baker *et al.,* 2019).

Figure 2.1: Right and Left Knee with Severe Osteoarthristis

Osteoarthritis (OA) leads to progressive degeneration of joint cartilage and structural changes within the knee joint, resulting in pain, stiffness, and reduced mobility. Figure 1 illustrates radiographic evidence of severe osteoarthritis, characterized by joint space narrowing, osteophyte formation, and subchondral sclerosis. This visual representation reinforces the clinical basis for Total Knee Replacement (TKR) as an intervention aimed at restoring joint function and alleviating symptoms.

Figure 2.2: Left Knee having Undergone TKR

Following surgical intervention, structural restoration of the knee joint is achieved through prosthetic implantation. Figure 2 illustrates a postoperative radiographic image of a knee following Total Knee Replacement, demonstrating the alignment and positioning of prosthetic components. This figure provides visual evidence of the anatomical correction achieved through TKR, which underpins improvements in mobility, pain reduction, and functional outcomes discussed in this section.

Both X-ray images above add academic value to the literature review by visually illustrating the anatomical changes achieved through total knee replacement and supporting the discussion of surgical outcomes. They also enhance readers' understanding by linking theoretical concepts with clinical evidence.

2.2.1 Introduction to Functional Outcomes in TKR

Total knee replacement (TKR) is widely regarded as one of the most successful orthopedic procedures for patients with severe knee pain and disability due to osteoarthritis, rheumatoid arthritis, or post-traumatic arthritis (Evans *et al.*, 2019). The primary aim of the procedure is to alleviate pain, restore knee functionality, and enable patients to regain independence in performing activities of daily living (ADLs). Studies have consistently shown that patients experience marked improvements in knee function within the first 6–12 weeks following surgery (Harmelink *et al.*, 2021). While most patients achieve satisfactory outcomes, a minority may encounter delayed functional recovery due to various patient- and surgery-related factors.

The evaluation of functional outcomes post-TKR relies on a range of clinical and patient-reported outcome measures. Tools such as the Knee Society Score (KSS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), and Short Form Health Survey (SF-12) are commonly employed to assess pain, physical function, and quality of life (Christensen *et al.*, 2020). These metrics are pivotal in determining the success of the procedure and identifying areas for postoperative care improvement. Pain reduction, improved range of motion, and the ability to perform basic and complex ADLs are key indicators of recovery.

Functional outcomes following TKR are influenced by preoperative factors, including baseline knee function, patient age, body mass index (BMI), and comorbidities. According to Taylor *et al.* (2022), patients with higher baseline mobility and fewer comorbid conditions tend to experience more favorable outcomes. Conversely, older patients and those with chronic illnesses such as diabetes or hypertension often report slower recovery and may require extended rehabilitation support.

2.2.2 Pain Reduction and Mobility Restoration

Pain relief is a central goal of TKR and a primary driver for patients undergoing the procedure. Preoperative pain, often debilitating, significantly limits mobility and quality of life. Postoperatively, pain reduction is typically rapid, with studies reporting substantial improvements within the first six weeks (Christensen *et al.,* 2020). The Visual Analog Scale (VAS) is frequently used to quantify pain levels, with most patients experiencing a decrease from severe to mild or negligible pain within the early recovery phase (Harmelink *et al.,* 2021).

Restoration of mobility is another pivotal functional outcome following TKR. Range of motion (ROM) improvements is often observed early in the recovery process, with maximum gains typically achieved within 12 weeks (Mehta *et al.*, 2020). Studies have shown that knee flexion increases from an average of 90 degrees preoperatively to approximately 120 degrees postoperatively in most patients (Pua *et al.*, 2019).

Despite these positive outcomes, a subset of patients may experience persistent pain or limited mobility post-TKR. Factors contributing to suboptimal outcomes include surgical complications, pre-existing comorbidities, and inadequate adherence to rehabilitation protocols. Shah *et al.* (2019) highlighted that older age, higher BMI, and a history of smoking are associated with prolonged recovery and less favorable functional outcomes. These findings emphasize the need for targeted interventions to address modifiable risk factors and support patients at higher risk of delayed recovery.

Pain after TKR has a significant impact on a patient’s ability to perform essential daily activities. Despite improvements in knee function following the surgery, pain during the early postoperative period can severely limit functions such as climbing stairs, walking, and performing personal hygiene tasks. According to Lee *et al.* (2020), many patients report difficulty with stair climbing in the initial months after TKR, primarily due to pain, stiffness, and weakness in the knee joint. This limitation can negatively affect patients' independence, particularly in homes with multiple levels or when using public transport. Additionally, daily activities such as taking a shower or grooming can be hindered by pain, as patients may avoid bending their knee fully, leading to

challenges with balance and mobility (Haughom *et al.,* 2020). These difficulties often persist until patients reach a significant reduction in pain, typically around the 3- to 6-month mark.

Walking, a core functional outcome after TKR, is similarly impacted by postoperative pain. Early after surgery, walking short distances or performing simple activities like walking to the bathroom can be challenging due to discomfort and muscle weakness. A study by *Elson et al.* (2017) found that patients who reported higher pain levels post-surgery were more likely to have slower walking speeds and needed longer recovery periods to regain normal walking abilities. The duration of pain after TKR varies, but the intensity tends to decrease over time, with most patients experiencing substantial pain relief by the 3-month follow-up (Singh *et al.,* 2019). However, for some patients, moderate pain may persist for 6 to 12 months, delaying the resumption of normal walking and contributing to decreased mobility.

The ability to use the toilet independently is another core activity often impacted by pain after TKR. Difficulty with squatting or sitting on and standing up from the toilet can be a major barrier to functional independence, particularly in the early recovery stages. According to Samaan *et al.* (2021), patients may require assistance with toilet use for up to 6 weeks post-surgery, with pain significantly affecting their ability to bend the knee comfortably. The duration of this limitation varies, but most patients report regaining full independence in bathroom activities within 3 to 6 months following TKR, assuming pain levels are well-managed through rehabilitation and physiotherapy (Coffey *et al.,* 2020). Overall, the functional impacts of pain after TKR are multifaceted, with recovery times differing based on individual factors such as pain management, rehabilitation efforts, and preoperative health status.

2.2.3 Resumption of Activities of Daily Living (ADLs)

The resumption of ADLs is a key indicator of TKR success and a primary concern for patients undergoing the procedure. ADLs encompass basic self-care activities, such as dressing and bathing, as well as more complex tasks, such as household chores and recreational activities. Studies indicate that most patients are able to resume basic

ADLs within 2–4 weeks post-surgery; while more demanding activities may take up to 12 weeks (Harmelink *et al.*, 2021). Early mobilization and structured rehabilitation programs play a critical role in facilitating this recovery.

Several factors influence the timeline for ADL resumption, including patient age, gender, and preoperative physical condition. Younger patients and those with higher levels of preoperative activity generally recover faster and regain independence in ADLs more quickly than older or less active individuals (Sveinsdóttir *et al.*, 2021). Gender differences have also been noted, with women often reporting slightly better outcomes in ADL resumption, possibly due to higher adherence to postoperative rehabilitation protocols (Hawker *et al.*, 2017).

Cultural and socioeconomic factors can also impact ADL recovery. In low- and middle-income countries (LMICs) such as Kenya, limited access to postoperative care and rehabilitation services may delay recovery and exacerbate disparities in functional outcomes. Addressing these barriers through improved healthcare access, community-based rehabilitation programs, and patient education is essential to optimize recovery and enhance quality of life for all patients (Omondi, 2024).

2.2.4 Predictors of Functional Outcomes

Several predictors of functional outcomes following TKR have been identified in the literature. Preoperative physical fitness, psychological readiness, and the presence of comorbidities are among the most significant factors influencing recovery trajectories. According to Taylor *et al.* (2022), patients with higher preoperative activity levels and better mental health scores tend to achieve more favorable outcomes. Psychological readiness, including positive expectations and motivation for recovery, has been shown to correlate strongly with postoperative success.

Age and BMI are additional predictors of functional outcomes. Older patients often face challenges related to reduce muscle strength, delayed wound healing, and the presence of chronic conditions such as arthritis or cardiovascular disease (Shah *et al.*, 2019). Similarly, patients with higher BMI may experience greater stress on the knee

joint, leading to slower recovery and increased risk of complications. These findings highlight the importance of preoperative interventions, such as weight management and strength training, to enhance postoperative outcomes.

Comorbidities, particularly diabetes and hypertension, are associated with delayed recovery and poorer functional outcomes. Diabetic patients are at increased risk of wound complications and infections, while hypertensive patients may experience compromised tissue perfusion and delayed healing (Zhang *et al.,* 2021).

2.2.5 Clinical and Patient-Reported Outcome Measures

The assessment of functional outcomes following TKR relies on a combination of clinical evaluations and patient-reported outcome measures (PROMs). Clinical assessments focus on parameters such as range of motion, joint stability, and pain levels. PROMs, including the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Short Form Health Survey (SF-12), provide valuable insights into patients' perceptions of their recovery and quality of life (Christensen *et al.,* 2020).

These measures are critical for tracking recovery progress, identifying areas for intervention, and evaluating the effectiveness of rehabilitation programs. For example, improvements in WOMAC scores are indicative of enhanced physical function and reduced pain, while higher SF-12 scores reflect better overall health and well-being. Regular assessments using these tools can guide individualized care plans and ensure that patients achieve their desired functional outcomes.

2.2.6 Challenges and Recommendations

While TKR is highly effective in improving functional outcomes, several challenges remain. Suboptimal recovery in certain patient populations highlights the need for personalized care strategies. Preoperative interventions, such as patient education, weight management, and strength training, can enhance postoperative outcomes and reduce the risk of complications (Ferket *et al.,* 2017).

Healthcare providers should also focus on enhancing patient engagement in rehabilitation programs. Early mobilization, structured physiotherapy, and on-going support are essential for maximizing recovery and promoting long-term functional gains (Nizam *et al.,* 2019). Future research should explore innovative approaches to rehabilitation, such as telehealth and virtual physiotherapy, to improve access and outcomes for patients in resource-limited settings.

2.3 Rehabilitation Progress across Different Demographics and Comorbidity Profiles in TKR Patients

Rehabilitation following Total Knee Replacement (TKR) plays a crucial role in the overall recovery process, significantly influencing functional outcomes such as range of motion (ROM), pain reduction, and mobility. According to a study by Aftab *et al.* (2025), patients who undergo regular physiotherapy and rehabilitation tend to experience faster recovery in terms of both pain reduction and functional improvement, compared to those who do not. Physiotherapy, particularly early mobilization and exercises focused on strengthening the knee and improving flexibility, has been shown to accelerate ROM gains and improve pain management. Conversely, patients who do not engage in structured rehabilitation may experience slower recovery, with prolonged pain and stiffness limiting functional outcomes (Wang *et al.*, 2017). Early intervention through physiotherapy has been linked to faster recovery times, with most patients achieving significant ROM improvement within the first 6–8 weeks after surgery.

Regarding range of motion, the time it takes for patients to achieve full ROM varies widely, depending on several factors such as the patient's age, baseline knee function, and the quality of postoperative rehabilitation. Research by Petersen *et al.* (2018) indicates that most patients can regain near-normal ROM within 6 months post-surgery, though some may take up to a year to fully recover, especially in cases where there were pre-existing joint deformities or limited mobility before surgery. Early postoperative physiotherapy focusing on range of motion exercises is crucial, as it helps to minimize the risk of complications such as stiffness and the development of scar tissue, which can hinder full ROM restoration (Zhang et al., 2020).

However, several factors can hinder rehabilitation progress and delay functional recovery. These include poor adherence to physiotherapy regimens, which may stem from pain, fear of re-injury, or lack of motivation (Brown *et al.*, 2020). Additionally, comorbidities such as obesity, diabetes, or cardiovascular diseases can impede progress by affecting overall healing and physical function. Age also plays a significant role; older patients may experience slower rehabilitation progress due to reduced muscle strength and lower tolerance to exercise (Zhang *et al.*, 2020). Furthermore, psychological factors, such as depression or anxiety, can negatively affect motivation and compliance with rehabilitation protocols, thereby hindering progress (Naylor *et al.*, 2019). The success of rehabilitation ultimately depends on a combination of timely physiotherapy, patient engagement, and management of any underlying health conditions.

2.3.1 The Role of Rehabilitation in Post-TKR Recovery

Rehabilitation is a cornerstone of postoperative care following total knee replacement (TKR), enabling patients to regain mobility, functional independence, and quality of life. Rehabilitation focuses on physical therapy, pain management, and the strengthening of muscles around the knee joint to ensure stability and flexibility. A well-structured rehabilitation program not only accelerates recovery but also reduces the risk of complications, such as joint stiffness and deep vein thrombosis (Harikesavan *et al.*, 2019).

Rehabilitation is most effective when initiated early, with evidence suggesting that postoperative physiotherapy within 24 hours significantly improves recovery outcomes (Vertullo & Nagarajan, 2017). Early mobilization helps to mitigate the risk of complications associated with immobility, including pressure ulcers and pulmonary embolism. Furthermore, the intensity and duration of rehabilitation programs vary based on patient characteristics, such as age, gender, and comorbidities. Studies highlight that individualized rehabilitation plans tailored to patient needs yield better outcomes than standardized protocols (Witjes *et al.*, 2017).

2.3.2 Age-Related Differences in Rehabilitation Progress

Age is a significant determinant of rehabilitation outcomes following TKR. Younger patients typically experience faster recovery and greater improvements in functional mobility compared to older patients. This disparity can be attributed to differences in muscle strength, bone density, and overall physical resilience (Taylor *et al.*, 2022). Younger individuals are also more likely to adhere to rehabilitation programs, as they are motivated to return to active lifestyles and work-related responsibilities (Sveinsdóttir *et al.*, 2021).

Conversely, older patients often face challenges related to delayed wound healing, reduced muscle strength, and the presence of age-related comorbidities, such as osteoarthritis and cardiovascular disease (Shah *et al.*, 2019). These factors can prolong rehabilitation and limit the extent of functional recovery. Studies report that older adults may take up to 12–16 weeks to achieve comparable outcomes to younger patients who recover within 6–8 weeks (Mehta *et al.*, 2020).

Age-specific rehabilitation programs are essential for addressing these disparities. For example, older patients may benefit from low-impact exercises, balance training, and additional support to address mobility limitations. Tailored interventions that account for age-related physical changes can enhance recovery outcomes and improve the quality of life for older adults undergoing TKR (Christensen *et al.*, 2020).

2.3.3 Gender Disparities in Rehabilitation Outcomes

Gender plays a notable role in influencing rehabilitation progress following TKR. Research shows that women are more likely to report better functional outcomes and adherence to physiotherapy programs compared to men (Hawker *et al.*, 2017). This advantage is partly attributed to women's higher levels of health-seeking behavior and greater willingness to engage in structured rehabilitation.

Women also face unique challenges in the postoperative period. Hormonal changes, such as those associated with menopause, can affect bone density and joint health, potentially impacting recovery (Sveinsdóttir *et al.*, 2021). Additionally, studies have

found that women are more likely than men to experience chronic knee pain, which may necessitate more intensive pain management strategies (Zhang *et al.,* 2021).

On the other hand, men often exhibit faster improvements in muscle strength and joint stability, potentially due to higher baseline levels of physical fitness and muscle mass (Harmelink *et al.,* 2021).

2.3.4 Impact of Comorbidities on Rehabilitation Progress

Comorbid conditions, such as diabetes and hypertension, significantly affect rehabilitation outcomes following TKR. Diabetic patients are at increased risk of wound complications, infections, and delayed healing, which can prolong recovery and limit functional gains (Zhang *et al.,* 2021). Similarly, hypertension can impede tissue perfusion and exacerbate postoperative swelling, further complicating the rehabilitation process (Ferket *et al.,* 2017).

A study by Li *et al.* (2023) highlighted the compounded impact of multiple comorbidities on rehabilitation progress. Patients with both diabetes and hypertension were found to experience significantly slower recovery compared to those with a single condition or no comorbidities.

Managing comorbidities requires a proactive approach, including preoperative optimization and close monitoring during the postoperative period. For example, tight glycemic control in diabetic patients and effective blood pressure management in hypertensive patients can reduce the risk of complications and improve rehabilitation outcomes. Incorporating nutritional support, patient education, and regular follow-ups into rehabilitation programs can further enhance recovery in patients with comorbidities (Piuzzi *et al.,* 2025).

2.3.5 Socioeconomic Factors and Access to Rehabilitation

Socioeconomic status is a critical determinant of access to and outcomes of rehabilitation following TKR. Patients from higher-income groups are more likely to afford advanced rehabilitation services, including private physiotherapy and home-

based care (Omondi, 2024). In contrast, low-income patients often face barriers such as limited access to healthcare facilities, transportation challenges, and high out-of-pocket costs, which can delay recovery and exacerbate disparities in rehabilitation outcomes.

Cultural factors also play a role in shaping rehabilitation experiences. In some settings, traditional beliefs and practices may discourage early mobilization, leading to suboptimal recovery. Addressing these barriers requires culturally sensitive interventions that align with patients' beliefs while promoting evidence-based rehabilitation practices (Sveinsdóttir *et al.,* 2021).

Community-based rehabilitation programs offer a promising solution for addressing socioeconomic disparities. These programs provide accessible and affordable care to underserved populations, enabling them to benefit from structured rehabilitation services. Expanding such initiatives in resource-limited settings, such as Kenya, can significantly improve equity in rehabilitation outcomes and enhance the overall success of TKR procedures (Harikesavan *et al.,* 2019).

2.3.6 Rehabilitation Strategies and Protocols

Various rehabilitation protocols have been developed to optimize recovery following TKR. Continuous passive motion (CPM), sling therapy, and cryotherapy are among the techniques commonly used to enhance mobility and reduce pain and swelling (Maloney *et al.,* 2017). CPM, in particular, has been shown to prevent joint stiffness and improve early range of motion, although its long-term benefits remain debated.

Cryotherapy, or cold therapy, is another widely used intervention, particularly in the early postoperative period. By reducing inflammation and swelling, cryotherapy accelerates the recovery process and improves patient comfort (Aspinall *et al.*, 2021). Stretching exercises and resistance training are also integral components of rehabilitation, helping to strengthen the quadriceps and improve joint stability (Hashizaki *et al.,* 2023).

Individualized rehabilitation programs that combine these strategies with traditional physical therapy yield the best outcomes. Regular assessments using tools such as the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Visual Analog Scale (VAS) can guide adjustments to rehabilitation protocols, ensuring they meet the unique needs of each patient (Christensen *et al.*, 2020).

2.4 Incidence and Associated Factors of Infections Post-TKR

Prosthetic joint infection (PJI) is one of the most serious complications following Total Knee Replacement, with the potential to impair recovery and lead to significant morbidity. Several determinants and risk factors for PJI have been identified in the literature, many of which are related to patient characteristics, surgical factors, and postoperative care.

Patient-related determinants of PJI include comorbidities such as diabetes mellitus, obesity, and immunosuppressive conditions. According to Lethongkam *et al.* (2018), patients with diabetes are at an increased risk for PJI due to poor wound healing, impaired immune function, and increased skin colonization by bacteria, particularly *Staphylococcus aureus*. Similarly, obesity has been associated with higher rates of PJI, as it complicates surgical procedures, increases the risk of wound dehiscence, and contributes to chronic inflammation that may affect immune response (Hernandez *et al.*, 2020). Furthermore, patients who are older or those with a history of previous joint infections are at heightened risk for developing PJI following TKR (Patel *et al.*, 2020). These patient-related factors make it critical to manage pre-existing conditions carefully to reduce the risk of infection post-surgery.

Surgical-related factors also contribute significantly to the development of PJI. Surgical techniques, the duration of the operation, and the sterility of the surgical environment play essential roles in infection rates. For instance, prolonged surgery times have been linked to higher rates of infection due to increased exposure to potential contaminants (Kurtz *et al.*, 2017). Additionally, the experience and skill of the surgeon can impact infection outcomes, with studies showing that high-volume centers and surgeons with more experience tend to have lower rates of PJI (Zimmerli

et al., 2019). Another important factor is the quality of postoperative care, including wound care and early mobilization, which can influence the risk of infection. Poor adherence to aseptic protocols, inadequate antibiotic prophylaxis, or improper wound management increases the likelihood of bacterial colonization and infection.

Other factors that contribute to PJI post-TKR include intraoperative bacterial contamination, poor postoperative care, and incorrect antibiotic prophylaxis. Intraoperative contamination can occur through breaches in sterile techniques, such as improper handling of surgical instruments or contamination from the surrounding environment. Postoperatively, inadequate antibiotic prophylaxis or premature weight-bearing before the joint has properly healed can also predispose patients to infection (Gallo *et al.,* 2018). Additionally, early mobilization and physiotherapy are important to prevent complications such as deep vein thrombosis, but excessive or improper movement of the joint in the early stages can increase the risk of infection, especially if the wound has not healed adequately. As such, a multifaceted approach involving patient selection, surgical precision, and careful postoperative management is critical in preventing PJI following TKR.

2.4.1 Overview of Prosthetic Joint Infections in TKR

Periprosthetic infection remains one of the most challenging complications of joint arthroplasty. A detailed clinical history and physical examination remain the most reliable tool to recognize a potential periprosthetic infection. In some cases, the classic signs of fever, chills, painful joint, and a draining sinus may be present, and diagnostic studies are simply done to confirm the diagnosis. In reality though, most patients do not present with those clinical signs, and in fact the clinical presentation may overlap with other complications such as aseptic loosening and pain. In those cases, diagnostic tests can be useful in confirming or excluding infection.

Modern diagnosis of infection around a total knee replacement is based on the Musculoskeletal Infection Society (MSIS) criteria et al., 2018) They are:

1. There is a sinus tract communicating with the prosthesis; or

2. A pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint; or

Four of the following six criteria exist:

i. Elevated serum erythrocyte sedimentation rate (ESR>30mm/hr) and serum C-reactive protein (CRP>10 mg/L) concentration,
ii. Pain of the knee post TKR,
iii. Swelling of the knee
iv. Pus draining from the knee at the incision site
v. Isolation of a microorganism in one culture of periprosthetic tissue or fluid
vi. Reddening and swelling of the knee.

None of the above laboratory tests has 100% sensitivity or specificity for diagnosing infection. Specificity improves when the tests are performed in patients in whom clinical suspicion exists. ESR and CRP remain good 1st line tests for screening (high sensitivity, low specificity). Aspiration of the joint remains the test with the highest specificity for confirming infection.

The choice of treatment depends on the type of prosthetic infection (Pellegrini et al., 2022)

a. Positive intraoperative cultures: Antibiotic therapy alone
b. Early post-operative infections: debridement, antibiotics, and retention of prosthesis.
c. Acute hematogenous infections: debridement, antibiotic therapy, retention of prosthesis.
d. Late chronic: delayed exchange arthroplasty. Surgical debridement and parenteral antibiotics alone in this group has limited success, and standard of care involves exchange arthroplasty (Piuzzi *et al.*, 2025).

Prosthetic joint infection (PJI) is one of the most serious and challenging complications of total knee replacement (TKR). While the incidence of PJI is relatively low, ranging between 0.3% and 2% globally, the consequences are severe, often requiring

prolonged treatment, revision surgeries, and extensive rehabilitation (Sinclair *et al.*, 2021). PJI can significantly impact the success of TKR by compromising functional outcomes, extending recovery periods, and reducing patient satisfaction.

The etiology of PJI is multifactorial, involving a combination of patient-specific and surgical factors. Patient-related factors include age, comorbidities such as diabetes and obesity, and immune status, while surgical factors involve the duration of the procedure, sterilization protocols, and the use of prophylactic antibiotics (Piuzzi *et al.*, 2025).

In low- and middle-income countries (LMICs), including Kenya, the incidence of PJI may be underreported due to limited access to diagnostic resources and follow-up care. Studies have shown that inadequate infection control measures, suboptimal surgical techniques, and delayed treatment are key contributors to higher infection rates in resource-limited settings (Omondi, 2024).

2.4.2 Risk Factors Associated with Prosthetic Joint Infections

Several patient-specific risk factors have been identified as significant contributors to the incidence of PJI. Advanced age is a well-documented risk factor, with older patients exhibiting a 33% increased risk of infection for each additional year of age (Inoue *et al.,* 2019). Age-related immune system decline, known as immunosenescence, reduces the body's ability to combat infections, making elderly patients more vulnerable to PJI (Spichler-Moffarah *et al.,* 2023).

Comorbidities such as diabetes, obesity, and rheumatoid arthritis are also strongly associated with PJI. Diabetic patients, in particular, are at higher risk due to impaired wound healing, increased susceptibility to infections, and poor glycemic control (Zhang *et al.*, 2021). A study by Li *et al.* (2023) found that patients with uncontrolled diabetes were 2.5 times more likely to develop PJI than their non-diabetic counterparts. Similarly, obesity increases the risk of infection by placing additional stress on the surgical site and contributing to wound complications (He *et al.*, 2023).

Lifestyle factors, including smoking and alcohol consumption, further exacerbate the risk of PJI. Smokers are more likely to experience wound dehiscence and delayed healing, while excessive alcohol intake impairs immune function and tissue repair (Anderson *et al.,* 2022).

2.4.3 Surgical Factors and Infection Control Measures

Surgical factors play a pivotal role in determining the risk of PJI. Prolonged surgical duration, intraoperative contamination, and inadequate sterilization practices are among the most common contributors to infection. Studies have shown that procedures lasting longer than 90 minutes are associated with a 20–30% increased risk of PJI due to prolonged exposure to potential contaminants (Blanco et al., 2020). Ensuring strict adherence to infection control protocols, such as aseptic techniques and the use of laminar airflow systems, is critical for minimizing these risks.

The use of prophylactic antibiotics has been widely recognized as an effective strategy for preventing PJI. Antibiotics administered within one hour before the incision significantly reduce the risk of surgical site infections by targeting potential pathogens (Piuzzi *et al.,* 2025). In some cases, antibiotic-loaded bone cement is used during the procedure to provide localized antimicrobial effects and further reduce the risk of infection.

Advancements in implant technology have also contributed to reducing the incidence of PJI. Antimicrobial coatings on prosthetic components inhibit bacterial colonization and biofilm formation, which are major challenges in managing PJI (Parvizi et al., 2018). However, these technologies are often cost-prohibitive and may not be readily available in resource-limited settings, emphasizing the need for cost-effective alternatives.

2.4.4 Diagnosis and Classification of PJI

Accurate and timely diagnosis of PJI is essential for effective management. The Musculoskeletal Infection Society (MSIS) criteria are widely used for diagnosing PJI, combining clinical, microbiological, and histopathological findings (Parvizi et al.,

2018). Key diagnostic indicators include elevated serum erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) levels, the presence of a sinus tract communicating with the prosthesis, and positive cultures from synovial fluid or tissue samples.

PJIs are classified into four types based on the timing and clinical presentation:

1. **Positive Intraoperative Cultures:** Detected during surgery without clinical signs of infection.
2. **Early Postoperative Infections:** Occurring within one month after surgery.
3. **Acute Hematogenous Infections:** Resulting from hematogenous seeding of a previously well-functioning prosthesis.
4. **Late Chronic Infections**: Characterized by indolent symptoms persisting for more than one month (Blanco et al., 2020).

These classifications guide treatment decisions and help clinicians tailor management strategies based on the severity and type of infection.

2.4.5 Management of Prosthetic Joint Infections

The management of PJI involves a combination of surgical and medical approaches. For early infections, debridement, antibiotic therapy, and retention of the prosthesis are often effective (Pellegrini *et al.,* 2022). Acute hematogenous infections may also be managed with debridement and antibiotics if detected early. However, late chronic infections typically require more aggressive interventions, such as two-stage revision surgeries, which involve removing the infected prosthesis, placing an antibiotic spacer, and implanting a new prosthesis once the infection is cleared (Piuzzi *et al.,* 2025).

Medical management of PJI includes prolonged courses of intravenous and oral antibiotics, often guided by microbial culture and sensitivity results. The choice of antibiotics depends on the causative organism, with methicillin-resistant *Staphylococcus aureus* (MRSA) and gram-negative bacteria being common pathogens (Anderson *et al.,* 2022). Multidisciplinary care involving orthopedic surgeons,

infectious disease specialists, and rehabilitation teams is essential for achieving optimal outcomes.

2.4.6. Linking PJI Incidence to Functional Outcomes and Rehabilitation Delay

Prosthetic joint infection (PJI) represents a significant complication following TKR that can adversely affect both functional outcomes and rehabilitation progress. The incidence of PJI is critical to understanding the overall success of TKR, as infections can lead to extended recovery times and diminished patient satisfaction. When a patient develops a PJI, the resulting complications often necessitate additional surgical interventions, prolonged hospitalization, and increased pain management, which can severely delay the rehabilitation process.

Patients experiencing PJI typically face challenges in resuming activities of daily living (ADLs), as the infection can exacerbate pain and limit mobility. This situation creates a vicious cycle: delayed rehabilitation due to infection can further hinder functional recovery, leading to prolonged periods of inactivity and dependency. Studies have shown that patients with PJI report lower functional outcomes compared to those without infections, as the presence of infection often correlates with poorer range of motion, increased pain levels, and diminished ability to perform basic self-care tasks.

Furthermore, rehabilitation outcomes are significantly affected by the presence of infection. For instance, patients with PJI may require modifications to their rehabilitation protocols, reducing the intensity and frequency of physical therapy sessions to accommodate their condition. This can lead to slower gains in strength and mobility, ultimately impacting their overall recovery trajectory. Therefore, understanding the link between PJI incidence and functional outcomes is essential for developing effective postoperative care strategies that prioritize infection prevention and promote timely rehabilitation.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Design

This study employed a prospective longitudinal cohort study, which involved biweekly patient follow-up over a period of six weeks following total knee replacement surgery. Study participants recruited on rolling basis whereby eligible patients were enrolled consecutively as they presented for total knee replacement surgery during the study period until the required sample size was achieved for a period of five months. This design was selected because it allowed the incidence of PJI, and the trajectory of functional outcomes and rehabilitation progress, to be tracked repeatedly within the same patients over time, rather than relying on a single postoperative assessment that could not capture how these three variables changed across the recovery period.

3.2 Study Area

The study was conducted at Metropolitan Hospital, a renowned healthcare institution in Kenya known for its orthopedic services. This hospital has a bed capacity of 160 and whose setting offers access to a diverse patient population and well-equipped facilities for TKR procedures and postoperative care. The hospital was selected was selected based on its high surgical volume, averaging 25 TKR procedures monthly compared to fewer than 10 per month at other public facilities. Additionally, its participation in NHIF's comprehensive coverage has increased accessibility for patients undergoing TKR". These high numbers of TKR surgeries enabled this study to be undertaken within the stipulated study frame. Metropolitan Hospital is a private hospital located along Rabai road, Harambee ward, Makadara sub county, Nairobi County, Kenya.

3.3 Study Participants

Study participants included patients who required primary total knee replacement, encompassing both unilateral and bilateral procedures, performed at Metropolitan Hospital during the study period and who met the inclusion criteria described in the sampling criteria section below.

3.4 Inclusion and Exclusion Criteria

3.4.1 Inclusion Criteria

a. The study included orthopedic patients who consented to take part in the study and had undergone TKR at Metropolitan Hospital
b. The study included TKR patients whose surgeons consented.
c. Patients >18 years who require TKR.

3.4.2 Exclusion Criteria

a. Patients that had cognitive impairments affecting participation in follow-up assessments.
b. Patients who refused to provide informed consent will be excluded.
c. Patients whose surgeon did not give consent to take part in study.
d. Patients with active PJI post TKR at metropolitan hospital.
e. Patients who already had TKR before the study commenced.

3.5 Sample Size Determination

The sample size for this study was calculated using the Cochran (1977) formula for estimating a population proportion at a specified confidence level and margin of error:

$$n = \frac{(Z^2 \cdot p \cdot (1-p))}{(E^2)}$$

Where:

n = required sample size

Z = Z-value corresponding to the desired confidence level (Z = 1.96 for a 95% confidence level)

p = estimated proportion of prosthetic joint infection. This related to a broader category of adverse clinical outcomes of which prosthetic joint infection is the most common (0.05)

E = desired margin of error (0.05)

Since incidence of PJI is considered very low, this study used p=0.05 as proportion for calculating the sample size.

Substituting the values, the calculation was as follows:

$$n = \frac{1.96^2 \cdot 0.05 \cdot (1-0.05)}{(0.05)^2}$$

This resulted in the required size of approximately 73 participants. A minimum target sample size of 75 participants was established to account for potential attrition or incomplete data.

3.6 Sampling Criteria

Every patient admitted to Metropolitan Hospital for total knee replacement during the study period and meeting the inclusion criteria was approached for participation by the principal investigator or a trained research assistant. Eligible patients were identified from the daily theatre admission list, briefed on the purpose and procedures of the study, and invited to provide written informed consent before enrolment. Patients who consented, and whose treating surgeon also consented to their participation, were enrolled using consecutive sampling criteria as they presented for surgery, continuing until the close of the study period. Consecutive sampling is a non-probability sampling technique in which every eligible participant who meets the inclusion criteria is recruited as they become available until the desired sample size is achieved

This census-based approach to sampling was used because the hospital's average monthly TKR caseload was modest in absolute terms, making it both feasible and methodologically preferable to attempt enrolment of the entire eligible population rather than draw a probability sample from it. Approaching every eligible patient also minimised the risk of selection bias that could arise from random or systematic sampling within a comparatively small and clinically heterogeneous patient population, ensuring that the final sample of 75 patients was representative of the full range of ages, comorbidity profiles, and clinical presentations seen at the facility during the study period.

3.7 Data Collection

Data collection involved a combination of methods, including: Medical record reviews covering information regarding patients' demographic characteristics, preoperative comorbidities, surgical details, postoperative tests and postoperative complications. This information was sourced directly from the hospital records. Patient interviews covered patient interviews facilitated using standardized questionnaires, focusing on activities of daily living (ADL) resumption, functional outcomes, and rehabilitation progress. Trained interviewers, specifically healthcare professionals led by the principal investigator, administered these interviews in a designated and private space within the hospital premises. The interviews took approximately 30 minutes to ensure a thorough exploration of the patients' experiences. Clinical assessments covered trained healthcare professionals, encompassing physical assessments to measure parameters such as range of motion, pain scores, and other relevant clinical indicators. These assessments were performed by qualified nurses with Higher National Diplomas in Peri operative theatre nursing and Kenya registred nursing diploma. The assessments were conducted in a clinical setting at scheduled intervals throughout the postoperative period, thereby, ensuring a comprehensive evaluation of patients' progress.

3.8 Data Management

3.8.1 Data Collection Tools

Standardized questionnaires and assessment tools were used, including the Short Form Health Survey (SF-12) for quality-of-life assessment, Visual Analog Scale (VAS) for pain measurement, and relevant scales for ADL assessment. These tools were administered by the same trained healthcare professionals throughout the study, ensuring uniformity in data collection procedures.

The validity of the standardized questionnaire, including the Short Form Health Survey (SF-12) for quality-of-life assessment, Visual Analog Scale (VAS) for pain measurement, and other relevant scales for activities of daily living (ADL) assessment,

was paramount to the study's reliability. These tools were selected based on their established validity in previous research and relevance to orthopedic outcomes assessment. To enhance content validity, a panel of orthopedic and rehabilitation experts reviewed and adapted the questionnaires, aligning them closely with the study objectives. Construct validity was rigorously assessed through a pilot study, incorporating feedback from a subset of the target population to refine and tailor the questionnaires. Concurrent and convergent validity was addressed by comparing results with established measures, ensuring the collected data accurately reflects the experiences and outcomes of orthopedic patients undergoing total knee replacement at Metropolitan Hospital.

Data collected during the study were entered, cleaned, and organised using Microsoft Excel prior to analysis. Excel was used to compile patient-level records from each biweekly follow-up, check for missing or inconsistent entries, and structure the dataset into the variables required for subsequent statistical analysis. Collected data was entered into a secure electronic database (Ms Excel) with restricted access. Data cleaning and validation was conducted to ensure accuracy and consistency. Data confidentiality and protection was maintained throughout the study.

Interviews conducted with study participants generated quantitative data, captured through structured questionnaires administered at each biweekly follow-up visit. This allowed responses on functional outcomes and rehabilitation progress to be recorded in a standardised, numerically codeable format suitable for statistical analysis alongside the clinical and laboratory data collected for determining PJI incidence.

The validity and reliability of the study tools were assessed to ensure that they accurately measured the incidence of prosthetic joint infections (PJI) and their impact on functional recovery and rehabilitation progress. The tools utilized in the study underwent rigorous testing to confirm their content validity, construct validity, and reliability. This involved pre-testing the tools with a small sample of participants to identify any ambiguities or biases. Statistical analyses were conducted to determine the internal consistency of the tools, yielding a Cronbach's alpha coefficient above the acceptable threshold, indicating high reliability.

The research assistant underwent comprehensive training prior to data collection. This training included detailed instructions on the study protocols, ethical considerations, and the proper use of the study tools. The assistant was trained to administer questionnaires consistently and to ensure accurate data recording. Mock interviews were conducted to enhance the assistant's proficiency in engaging with participants and to address any potential challenges that might arise during the actual data collection process. No missing data was identified.

3.8.2 Data Analysis

R Statistical software was used throughout the statistical analysis process. Descriptive statistics, such as frequencies and percentages, was employed to summarize the prevalence of each post-operative complication, calculated by dividing the total number of affected patients by the overall TKR surgeries performed. Functional outcomes, including range of motion measurements and pain scores, were presented using mean. Demographic factors (age, gender) and their potential associations with complications were explored through chi-square and Fisher's exact tests. Logistic regression analysis assessed the influence of preoperative comorbidity profiles on complication likelihood. Statistical significance was set at an alpha level of 0.05. (p-value).

The study aimed to establish the incidence of new cases of prosthetic joint infections (PJI) among orthopedic patients at Metropolitan Hospital, Nairobi County, Kenya. Poisson regression was employed to analyze the data and obtain incidence rate ratios (IRRs). This statistical method allowed for the examination of the relationship between various risk factors and the occurrence of PJI.

3.9 Ethical Considerations

This study addressed all ethical considerations. First, informed consent was sought after the study patients were fully informed about the study's purpose, procedures, potential risks, and benefits before agreeing to participate. The research ensured the

confidentiality and anonymity of patient data to protect their privacy. Additionally, the study was designed to avoid any undue influence or coercion, ensuring that participation was voluntary and free from external pressures. Also, consent was sought from all the surgeons whose patients were involved in this study. Consent was obtained from surgeons even though their practice was not the primary focus of the research. This was necessary to access patient records and facilitate recruitment, and it was clearly stated in the study protocol that the surgeons' consent was primarily for these purposes, ensuring transparency regarding ethical considerations. Additionally, the study articulated participants' rights, including the right to withdraw from the research at any time without penalty, which is a fundamental principle of research ethics that helps ensure participants feel safe and respected throughout their involvement. The potential risks, such as emotional distress and discomfort during physical assessments, particularly for patients who may have experienced complications related to PJI, were acknowledged, and appropriate mitigation strategies were outlined, including providing psychological support, ensuring a comfortable assessment environment, and allowing breaks if needed. By addressing these ethical concerns, the study enhanced its credibility and ensured alignment with established ethical guidelines in research involving human subjects.

Research license was also sought from NACOSTI which provided the research license, number: NACOSTI/P/24/32725. Finally, the University of Eastern Africa, Baraton Ethics and Research Committee oversaw the study's adherence to ethical standards, safeguarding the rights and welfare of all participants through institutional ethics approval reference UEAB/ISERC/26/11/2023.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the findings from the study, focusing on the characteristics of the participants and their functional outcomes following total knee replacement (TKR). Section 4.2 details the demographic and clinical profiles of the 75 participants, highlighting age, sex, marital status, education, income, religion, occupation, and comorbidities. Section 4.3 discusses functional outcomes and the resumption of activities of daily living, analyzing the relationships between various participant characteristics and recovery rates. Section 4.4 examines rehabilitation progress at the sixth week of follow-up, while Section 4.5 addresses the signs and symptoms of prosthetic joint infection encountered during the study. Of the 75 participants recruited, all 75 completed the full six-week follow-up period, yielding a response rate of 100%. No participants were lost to follow-up or withdrew from the study.

4.2 Characteristics of Study Participants

The study included a diverse group of participants, with a total of 75 individuals. The age distribution revealed that the majority of participants were aged 60 years and older, comprising 77.4% of the sample (Table 4.1). Specifically, 40% were aged 70 years and above, while 37.4% were in the 60-69 age bracket. Younger age groups were less represented, with only 1.3% aged 30-39 and 5.3% aged 40-49. In terms of sex, the sample was predominantly female, with 56% (42 participants) identifying as such, compared to 44% (33 participants) who were male. Marital status indicated that a significant proportion of participants were married (66.7%), followed by widowed individuals (17.3%). Single participants comprised 4% of the sample, while divorced individuals accounted for 12%. Education levels varied among participants. Nearly half (49.3%) had attained a primary education, while 25.4% completed secondary education, and 20% had post-secondary education. A small percentage (5.3%) reported having no formal education. Income levels also showed diversity, with the majority (52%) earning over 100,000 KES. Only 1.3% of participants reported an income of

less than 10,000 KES, while 9.3% earned between 10,001 and 50,000 KES, and 37.4% earned between 50,001 and 100,000 KES. The religious affiliation of the participants was predominantly Christian, comprising 88% of the sample, while 12% identified as Muslim. Occupationally, most participants were engaged in informal work (61.3%), with 38.7% involved in formal employment. Regarding comorbidities, a significant majority (80%) reported having no chronic conditions. Among those with comorbidities, 10.7% had diabetes mellitus (DM), 4% had hypertension (HTN), and 5.3% had both DM and HTN (Table 4.1).

Table 4.1: Characteristics of Study Participants

Variable	Category	Frequency, n	Proportion %
Age in years	30-39	1	1.3
	40-49	4	5.3
	50-59	12	16
	60-69	28	37.4
	≥70	30	40
Sex	Male	33	44
	Female	42	56
Marital status	Single	3	4
	Married	50	66.7
	Divorced	9	12
	Widowed	13	17.3
Education attained	None	4	5.3
	Primary	37	49.3
	Secondary	19	25.4
	Post-secondary	15	20
Income level	<10,000	1	1.3
	10,001-50,000	7	9.3
	50,001-100,000	28	37.4
	>100,000	39	52
Religion	Christianity	66	88

	Islam	9	12
Occupation	Formal	29	38.7
	Informal	46	61.3
Comorbidity	DM	8	10.7
	HTN	3	4
	DM and HTN	5	5.3
	None	59	80

DM: diabetes mellitus, HTN hypertension

4.3 Functional Outcomes and Activities of Daily Living Resumption Following TKR

Table 4.2 presents the functional outcome status of study participants, categorized into "Prompt" and "Delayed" outcomes, alongside various demographic and clinical characteristics. The analysis reveals significant trends and associations between these variables and the functional recovery of the participants. The age group of 30-39 years demonstrated a perfect prompt outcome, with 100% (1 participant) achieving this status. Similarly, all participants aged 40-49 (100%, 4 participants) also reported prompt outcomes. In contrast, the outcomes varied among older age groups, with 75% of participants aged 50-59 achieving prompt outcomes, while only 37% of those aged 70 years and above experienced prompt recovery. The p-value of 0.002 indicated a statistically significant association between age and functional outcome status. Regarding sex, 73% of male participants (24 out of 33) achieved a prompt outcome, compared to 60% of female participants (25 out of 42). The p-value of 0.34 suggested no significant association between sex and functional recovery. Among marital statuses, single participants had a prompt outcome rate of 66.7%, while married individuals achieved a 74% prompt outcome. However, divorced (44.4%) and widowed participants (46.2%) had lower prompt outcomes. The p-value of 0.13 indicated no significant association between marital status and functional outcome. In terms of education, participants with post-secondary education had the highest prompt outcome rate (86.7%), while those with no formal education had the lowest (33.3%). The p-value of 0.08 suggested a trend towards significance, although it does not reach

conventional levels. Income levels showed varied outcomes, with participants earning less than 10,000 KES achieving a 100% prompt outcome. However, those in the 10,001-50,000 KES bracket had a 50% prompt outcome rate. The p-value of 0.76 indicated no significant association between income level and functional recovery. Among religious affiliations, 63.6% of Christians achieved a prompt outcome, while 77.8% of Muslims did. The p-value of 0.64 indicated no significant association between religion and functional outcome status. Occupational status revealed a notable difference, with 82.8% of participants in formal employment achieving a prompt outcome compared to only 54.3% in informal occupations. The p-value of 0.02 indicated a statistically significant association between occupation and functional recovery. Comorbidity had a profound impact on functional outcomes. Only 12.5% of participants with diabetes mellitus (DM) achieved a prompt outcome, while none of those with both DM and hypertension (HTN) did. In contrast, 77% of participants with no comorbidities achieved prompt recovery. The p-value of 0.00 indicated a highly significant association between comorbidity and functional outcome status (Table 4.2).

Table 4.2: Functional outcome Status Cross-tabulated with Characteristics of Study Participants

		Outcome		
Variable	**Category**	**Prompt Frequency n (%)**	**Delayed Frequency (n, %)**	**P- Value**
Age in years	30-39	1 (100)	0 (0)	0.002568
	40-49	4 (100)	0 (0)	
	50-59	9 (75)	3 (25)	
	60-69	24 (86)	4 (14)	
	≥70	11 (37)	19 (63)	
Sex	Male	24 (73)	9 (27)	0.343
	Female	25 (60)	17 (40)	
Marital status	Single	2 (66.7)	1 (33.3)	0.1383

	Married	37 (74)	13 (26)	
	Divorced	4 (44.4)	5 (55.6)	
	Widowed	6 (46.2)	7 (53.8)	
Education attained	None	1 (33.3)	3 (66.7)	0.08846
	Primary	22 (59.5)	15 (40.5)	
	Secondary	13 (68.4)	6 (31.6)	
	Post-secondary	13 (86.7)	2 (13.3)	
Income level	<10,000	1 (100)	0 (0)	0.7679
	10,001-50,000	4 (50)	4 (50)	
	50,001-100,000	19 (67.9)	9 (32.1)	
	>100,000	25 (65.8)	13 (34.2)	
Religion	Christianity	42 (63.6)	24 (36.4)	0.6434
	Islam	7 (77.8)	2 (22.2)	
Occupation	Formal	24 (82.8)	5 (17.2)	0.02329
	Informal	25 (54.3)	21 (45.7)	
Comorbidity	DM	1 (12.5)	7 (87.5)	0.00009
	HTN	1 (50)	1 (50)	
	DM and HTN	0 (0)	4 (100)	
	None	47 (77)	14 (23)	

The resumption of activities of daily living following TKR exhibited a consistent pattern. At two weeks post-surgery, most patients showed limited progress in recovery. By the four-week assessment, recovery levels became more evenly distributed among patients. However, at the six-week follow-up, a significant proportion of patients still demonstrated inadequate recovery (Figure 4.1).

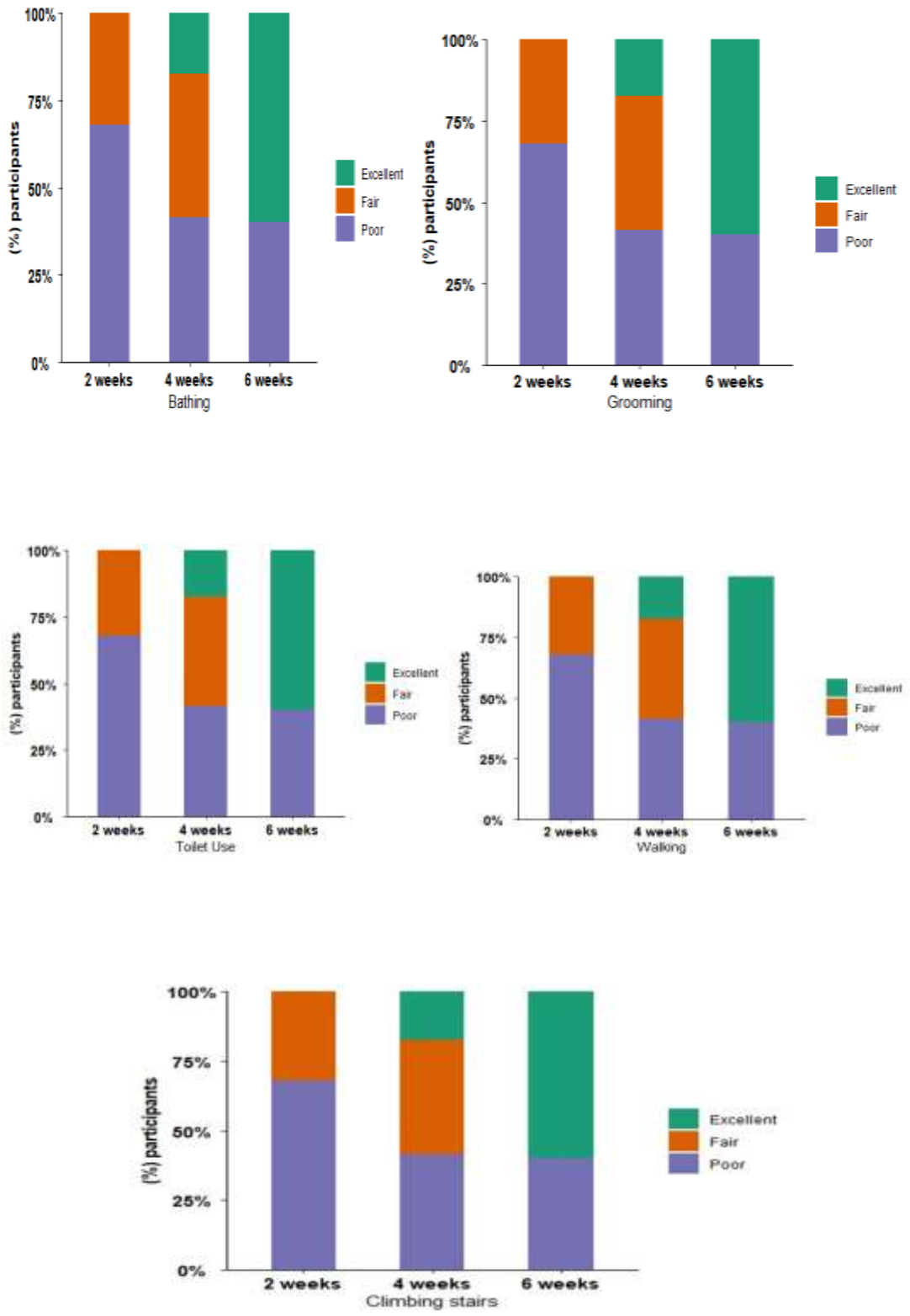


Figure 4.1: Functional Outcomes and Activities of Daily Living Resumption at 2 Weeks, 4 Weeks and 6 Weeks among the Patients who went TKR

4.4 Rehabilitation Progress and Activities of Daily Living Resumption

Table 4.3 provides an overview of the rehabilitation progress and the resumption of activities of daily living among study participants at the 6th week of follow-up. The outcomes are categorized into "Poor" and "Excellent" based on the participants' progress, with statistical significance indicated by p-values.

The age group of 30-39 years showed a remarkable outcome, with 100% (1 participant) achieving excellent rehabilitation progress. Similarly, all participants aged 40-49 (100%, 4 participants) also reported excellent outcomes. However, as age increased, the proportion of excellent outcomes decreased significantly. Among participants aged 60-69, 75% achieved excellent outcomes, while only 33.3% of those aged 70 years and above did. The p-value of 0.001 indicated a highly significant association between age and rehabilitation progress. In terms of sex, 30.3% of male participants (10 out of 33) experienced poor outcomes, while 69.7% achieved excellent outcomes. For females, 47.6% (20 out of 42) had poor outcomes, and 52.4% achieved excellent outcomes. The p-value of 0.19 suggested no significant association between sex and rehabilitation progress. Among marital statuses, single participants had 33.3% achieving excellent outcomes, while married individuals had 48.5% reporting excellent progress. Divorced (44.4%) and widowed participants (46.2%) had similar outcomes. The p-value of 0.43 indicated no significant association between marital status and rehabilitation progress. Education levels revealed that participants with no formal education had a poor outcome rate of 75%. In contrast, those with post-secondary education had 80% achieving excellent outcomes. The p-value of 0.16 suggested no significant association between education attained and rehabilitation progress. Income levels displayed varied outcomes, with participants earning less than 10,000 KES achieving a 100% excellent outcome. However, those in the income bracket of 10,001-50,000 KES had equal proportions of poor and excellent outcomes (50% each). The p-value of 0.85 indicated no significant association between income level and rehabilitation progress. Regarding religious affiliation, 42.4% of Christian participants achieved excellent outcomes, while 22.2% of Muslim participants did. The p-value of 0.42 suggested no significant association between religion and

rehabilitation progress. Occupational status revealed a significant difference, with only 16.7% of participants in formal employment experiencing poor outcomes, compared to 54.3% of those in informal occupations. The p-value of 0.003 indicated a statistically significant association between occupation and rehabilitation progress. Participants who received post-discharge physiotherapy care reported better outcomes, with 67.9% achieving excellent progress compared to 36.8% of those who did not receive such care. The p-value of 0.03 indicated a significant association between post-discharge physiotherapy care and rehabilitation progress. Comorbidity had a substantial impact on rehabilitation outcomes. A significant 87.5% of participants with diabetes mellitus (DM) experienced poor outcomes, while 100% of those with both DM and hypertension (HTN) did not achieve excellent outcomes. In contrast, 70.5% of participants with no comorbidities achieved excellent outcomes. The p-value of 0.0001 indicated a highly significant association between comorbidity and rehabilitation progress (Table 4.3).

Table 4.3: Rehabilitation Progress and Activities of Daily Living Resumption at the 6th Week of Follow-Up

Variable	Category	Poor	Excellent	P- Value
Age in years	30-39	0 (0)	1 (100)	0.001
	40-49	0 (4)	4 (100)	
	50-59	3 (25)	9 (75)	
	60-69	7 (25)	21 (75)	
	≥70	20 (66.7)	10 (33.7)	
Sex	Male	10 (30.3)	23 (69.7)	0.19
	Female	20 (47.6)	22 (52.4)	
Marital status	Single	1(33.3)	2 (66.7)	0.43
	Married	17 (51.5)	33 (48.5)	
	Divorced	5 (55.6)	4 (44.4)	
	Widowed	7 (53.8)	6 (46.2)	
Education attained	None	3 (75)	1 (25)	0.16
	Primary	17 (45.9)	20 (54.1)	
	Secondary	7 (36.8)	12 (63.2)	

	Post-secondary	3 (20)	12 (80)	
Income level	<10,000	0 (0)	1 (100)	0.85
	10,001-50,000	4 (50)	4 (50)	
	50,001-100,000	10 (35.7)	18 (64.3)	
	>100,000	16 (42.1)	22 (57.9)	
Religion	Christianity	28 (42.4)	38 (57.6)	0.42
	Islam	2 (22.2)	7 (77.8)	
Occupation	Formal	5 (16.7)	25 (83.3)	0.003
	Informal	25 (54.3)	21 (45.7)	
Post-discharge physiotherapy care	Yes	18 (32.1)	38 (67.9)	0.03
	No	12 (63.2)	7 (36.8)	
Comorbidity	DM	7 (87.5)	1 (12.5)	0.0001
	HTN	1 (50)	1 (50)	
	DM and HTN	4 (100)	0 (0)	
	None	18 (29.5)	43 70.5)	

Figure 4.2 shows rehabilitation progress parameters at 2 weeks, 4 weeks and 6 weeks where at two weeks post-surgery, most patients exhibited limited range of motion, poor mobility, and mild pain during physiotherapy. By four weeks, there was noticeable improvement in all parameters, with a small proportion of patients reporting no pain and some demonstrating better mobility and range of motion. However, by the six-week follow-up, while the majority of patients experienced significant pain relief and improved mobility, a notable proportion still faced restricted range of motion and continued to report poor mobility, indicating persistent functional limitations despite rehabilitation progress.

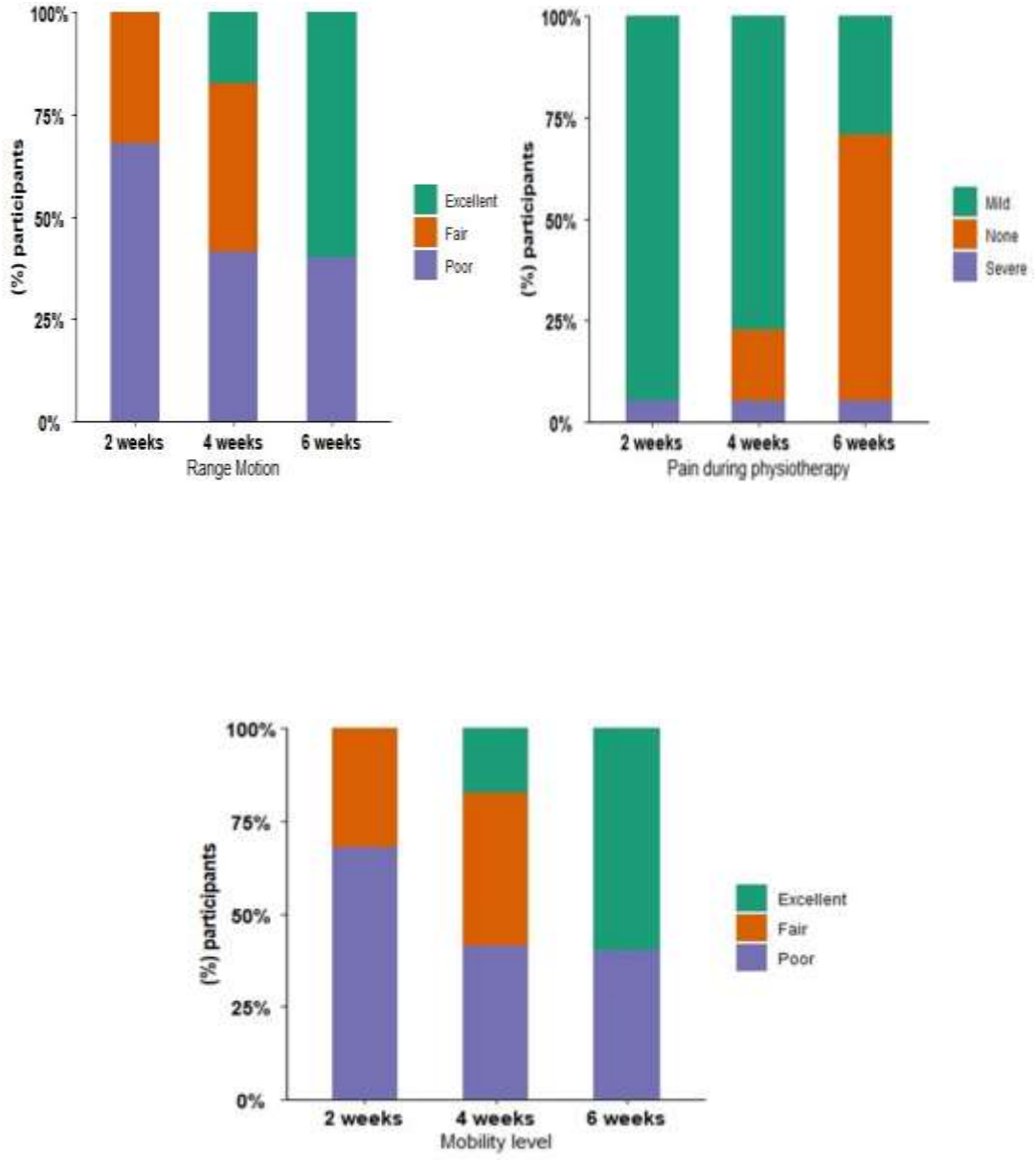


Figure 4.2: Rehabilitation Progress and ADL Resumption at 2 Weeks, 4 Weeks and 6 Weeks among the Patients Who Underwent TKR

4.5 Signs And Symptoms of Prosthetic Joint Infection Following TKR

At two weeks time following TKR, pain (67%) and warmth (69%) at the incision site were the most frequently signs and symptoms reported (Figure 4.3). At four weeks and six weeks following TKR, pus draining from the incision (50% in each time line) was the frequently sign and symptom reported. However, all signs were reported at each follow-up at lower frequencies (Figure 3). The number of prosthetic joint infections

patients in the five months of follow-up was 4 in 449 patient weeks at risk of the infection, yielding an incidence density of 0.009 per patient week or 9 cases per 1000 patient weeks. Only age was associated with this incidence (Table 4). An IRR of 1.33 meant that the incidence rate of infection among the study patients increased by 33% for each year of the patients (Table 4.4).

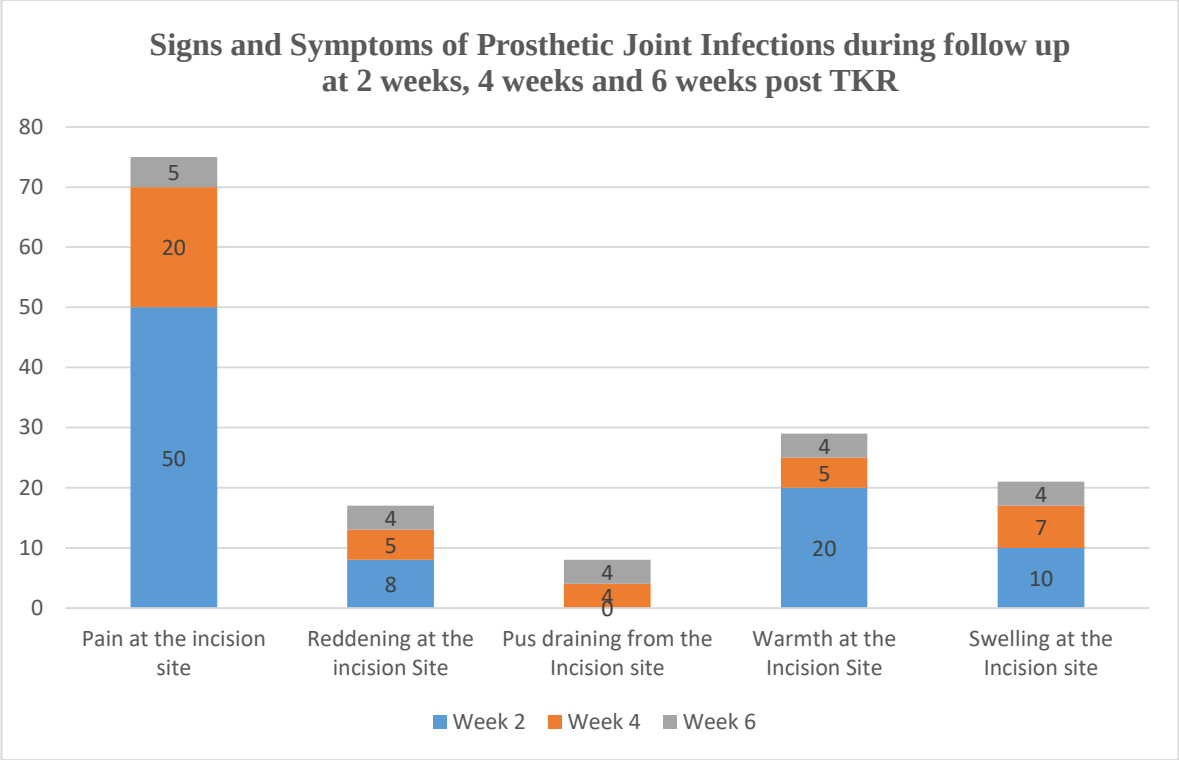


Figure 4.3: Signs and Symptoms of Prosthetic Joint Infections during follow up at 2 Weeks, 4 Weeks and 6 Weeks Post TKR

Table 4.4: Incidence Rate Ratio of Age Association with Infection Incidence

Term	Coefficient	Standard error	P value	Incidence rate ratio (IRR)	Incidence rate ratio (IRR) lower 95% confidence limit	Incidence rate ratio (IRR) higher 95% confidence limit
Intercept	-23.8	10.5	0.0237	$4.69e^{-11}$	$5.26e^{-20}$	0.0419
Age	0.287	0.138	0.0374	1.33	1.02	1.74

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

The findings from this study provide valuable insights into the outcomes of total knee replacement procedures conducted at Metropolitan Hospital, Nairobi. A notable proportion of patients achieved excellent rehabilitation progress within six weeks post-surgery, reflecting the effectiveness of the hospital's structured rehabilitation protocols. Functional recovery was largely favorable, with most patients reporting significant improvements in mobility and pain reduction as they resumed their activities of daily living (ADLs). Furthermore, the incidence of prosthetic joint infection (PJI) was exceptionally low, underscoring the success of the hospital's infection control measures and surgical protocols. However, age emerged as a critical factor influencing outcomes, with older patients facing an increased risk of infection, which highlights the need for age-specific care strategies. Additionally, the presence of comorbid conditions, particularly diabetes and hypertension, was strongly associated with delayed recovery and adverse outcomes, emphasizing the importance of tailored interventions to address these complexities in patient management. Overall, these findings not only affirm the efficacy of TKR at this institution but also point to essential considerations for optimizing patient care in the future.

5.1.1 Key Demographics: Age and Comorbidities

The findings of this study indicate that age and comorbidities significantly influence recovery outcomes following TKR). Advanced age correlates with an increased risk of prosthetic joint infection (PJI), as noted by Inoue *et al.* (2019), who linked age-related immune decline to heightened infection susceptibility. Specifically, the study found that for each additional year of age, the infection rate increased by 33%. This emphasizes the necessity for age-specific care protocols to mitigate risks in older patients.

The impact of comorbidities on recovery outcomes in this study aligns with findings by Li *et al.* (2023), who demonstrated that diabetic patients are at significantly higher risk of complications post-TKR. Similarly, Zhang *et al.* (2021) linked hypertension to delayed wound healing and adverse outcomes. These parallels underscore the global relevance of addressing comorbid conditions in TKR patients through comprehensive preoperative assessments and multimorbidity care.

5.1.2 Infection Rates and Recovery Outcomes

Regional studies have reported higher infection rates and poorer functional outcomes in low- and middle-income countries (LMICs) compared to developed nations. For example, Yahaya *et al.* (2021) identified resource constraints and delayed treatment as key contributors to higher PJI rates in Sub-Saharan Africa. The relatively low infection rate observed at Metropolitan Hospital demonstrates the potential for improved outcomes through the implementation of standardized protocols and targeted interventions.

This study also highlights the unique challenges faced by patients in LMICs, such as limited access to advanced surgical technologies and rehabilitation services. Kigera and Kimpiatu (2015) emphasized the need for investments in healthcare infrastructure and training to address these gaps. In comparison with studies conducted in developed countries, such as those by Taylor *et al.* (2022) and Christensen *et al.* (2020), the findings reveal similar trends in functional recovery and infection prevention. However, disparities in access to postoperative care and rehabilitation services remain a significant barrier in LMICs. Addressing these disparities through innovative approaches, such as telemedicine and community-based rehabilitation programs, could bridge the gap and ensure equitable outcomes for all patients undergoing TKR.

This study observed that functional outcomes post-TKR are generally favourable, with patients who were followed up resuming their daily activities in a relatively short timeframe of less than six weeks. By the sixth week, 60% of the patients had undergone excellent rehabilitation progress. The incidence of prosthetic knee infection was

notably low, perhaps highlighting the effectiveness of the applied surgical techniques and postoperative care.

The positive outcome of patients resuming daily activities within six weeks post-TKR is consistent with global trends (Nizam *et al.,* 2019; Sveinsdóttir *et al.,* 2021; Taylor *et al.,* 2022). This quick recovery may be attributed to several factors, including the patients' preoperative physical condition, the surgical techniques employed, and strict adherence to postoperative rehabilitation protocols (Nizam *et al.,* 2019; Sveinsdóttir *et al.,* 2021; Taylor *et al.,* 2022). It is well established that active patient involvement in rehabilitation contributes to better outcomes. Motivated patients in structured programs often recover faster, especially with early mobilization and physiotherapy support (Witjes *et al.,* 2017). Advanced surgical techniques, such as minimally invasive methods, have been reported to reduce tissue trauma and facilitate quicker recovery (Picard *et al.,* 2018). The presence of an effective health system comprised of skilled orthopedic surgeons and a coordinated healthcare team, especially nursing support, could have enhanced the success of TKR surgeries in this study, as reported elsewhere (Caprari *et al.,* 2018).

5.1.3 Implications for Clinical Practice and Future Research

While the incidence of infection was low, it was significantly associated with age. Specifically, as age increases, the risk of developing an infection rises, which is consistent with previous research (Inoue *et al.,* 2019; Lum *et al.,* 2018; Spichler-Moffarah *et al.,* 2023), perhaps due to diminished immune response, which emphasizes the importance of age-related factors in preoperative planning and postoperative care. An important implication of this finding is that healthcare providers should implement age-specific strategies to alleviate infection risks. Targeting the unique needs of older patients could enhance TKR outcomes in this vulnerable demographic.

Our findings underscore the significant impact of comorbid conditions, particularly diabetes and hypertension, on the recovery process following TKR. Patients with diabetes often experience impaired wound healing and increased susceptibility to

infections, which can delay postoperative recovery and prolong the resumption of daily activities (Li *et al.,* 2023). Similarly, hypertension has been associated with poorer surgical outcomes, as it can affect blood flow and tissue perfusion, further complicating the healing process (Zhang *et al.,* 2021). Considering the foregoing, this study highlights the necessity for comprehensive preoperative evaluations that consider the management of these comorbidities to optimize surgical outcomes. By controlling diabetes and hypertension prior to surgery, healthcare providers can potentially improve recovery timelines and enhance the overall quality of life for patients undergoing TKR. This approach not only benefits individual patients but also has broader implications for healthcare systems by reducing the burden of prolonged rehabilitation and associated healthcare costs (Ferket *et al.,* 2017).

These findings carry important implications for clinical practice, patient management, and future research in TKR. Favorable outcomes and low infection rates indicate that TKR is a safe, effective option for patients with severe knee pain or stiffness, encouraging them to consider the surgery actively. Embracing this procedure can significantly improve the quality of life, mobility, and overall function for those suffering from debilitating knee conditions (Evans *et al.,* 2019). However, the association of age with infection risk highlights the need for thorough preoperative assessments and age-specific surgical and postoperative care protocols, particularly for older patients. The presence of diabetes and hypertension contributing to delayed healing underscores the necessity for targeted preoperative interventions. By optimizing the management of these comorbid conditions before surgery, healthcare providers can potentially enhance recovery times and reduce the risk of complications, leading to improved overall outcomes. The findings highlight the need for further research into how diabetes and hypertension affect healing post-TKR, investigating the effectiveness of specific interventions aimed at these comorbidities to provide valuable insights that enhance surgical outcomes.

The study's finding that 60% of patients achieved excellent rehabilitation progress within six weeks is indicative of the effectiveness of early mobilization and structured rehabilitation programs. Patients were able to regain independence in performing

ADLs such as walking, climbing stairs, and engaging in routine household activities. These outcomes reflect the hospital's commitment to individualized patient care, including tailored physiotherapy sessions and close postoperative follow-ups. However, 40% of patients experienced delayed progress, largely attributable to advanced age and the presence of comorbid conditions, underscoring the need for additional support in these populations.

The low incidence of PJI (9 cases per 1,000 patient weeks) observed in this study is a testament to the hospital's robust infection control practices. This rate is notably lower than the global average, which ranges from 0.3% to 2%. Contributing factors include the administration of prophylactic antibiotics, meticulous surgical techniques, and strict postoperative monitoring. Despite the overall success, the study revealed that older patients faced a higher risk of infection. This aligns with previous research emphasizing the role of age-related immune system decline in increasing susceptibility to infections. Such findings highlight the importance of developing age-specific infection prevention strategies.

Comorbidities emerged as a critical factor influencing TKR outcomes in this study. Patients with diabetes were particularly vulnerable to delayed wound healing and an increased risk of infection, while those with hypertension faced challenges related to poor tissue perfusion and prolonged recovery times. These findings align with existing literature that identifies diabetes and hypertension as significant predictors of adverse postoperative outcomes. Multimorbidity management, including tight glycemic control and effective blood pressure management, is essential to mitigate these risks and improve recovery outcomes.

This study acknowledges two significant limitations. First, the duration of follow-up was limited to six weeks, which hindered the ability to fully assess the long-term outcomes and potential complications associated with TKR. A more extended follow-up period could provide deeper insights into the incidence of infections and overall joint function over time. Second, they could not separate the effects of age and comorbidities on the occurrence of infections. While this limited the generalizability

of our findings, addressing these limitations in future research will be essential for enhancing the understanding of the factors influencing infections in TKR patients.

5.2 Conclusion

1. Enhanced functional outcomes: The study demonstrates that total knee replacement (TKR) significantly improves functional outcomes, with 60% of orthopedic patients at Metropolitan Hospital regaining independence in activities of daily living (ADLs) within six weeks after surgery. These findings reinforce the effectiveness of TKR in improving patients' quality of life while highlighting the need for health systems to invest in comprehensive postoperative rehabilitation services. At the policy level, strengthening access to structured physiotherapy and rehabilitation programs should be prioritized to maximize functional recovery, reduce disability, and improve long-term patient outcomes. Future research should evaluate long-term functional recovery, cost-effectiveness, and the impact of different rehabilitation models across diverse healthcare settings.
2. Rehabilitation progress influenced by demographics: The study found that rehabilitation progress and the resumption of ADLs vary significantly according to age, gender, and preoperative comorbidity profiles. These findings underscore the importance of individualized rehabilitation strategies that address the specific needs of different patient groups, particularly those with chronic conditions such as diabetes and hypertension. From a health system perspective, multidisciplinary care pathways integrating orthopedic surgeons, physiotherapists, physicians, nurses, and nutritionists should be strengthened to optimize recovery. Policymakers should support the development of standardized clinical guidelines that promote risk stratification and personalized rehabilitation. Future research should investigate interventions that improve recovery among high-risk patient populations and evaluate the effectiveness of personalized rehabilitation protocols.
3. Low incidence of prosthetic joint infection: The low incidence of prosthetic joint infection (PJI), recorded at 9 cases per 1,000 patient-weeks, demonstrates

the effectiveness of rigorous surgical techniques, infection prevention measures, and postoperative care practices at Metropolitan Hospital. This finding highlights the importance of maintaining high standards of infection prevention and control across orthopedic services to enhance patient safety and reduce healthcare costs associated with revision surgeries and prolonged hospital stays. At the policy level, continuous investment in infection surveillance systems, antimicrobial stewardship, and adherence to evidence-based surgical protocols should be encouraged. Future research should focus on identifying modifiable risk factors for PJI, evaluating long-term infection outcomes, and assessing the effectiveness of infection prevention strategies across different healthcare facilities.

4. The findings have important implications for national orthopedic care policy by supporting the development of standardized, evidence-based guidelines for total knee replacement, rehabilitation, and infection prevention to improve patient outcomes, ensure equitable access to quality care, and strengthen orthopedic service delivery across healthcare facilities.

5.3 Recommendations

1. Develop and expand access to structured, patient-centered rehabilitation programs that prioritize early mobilization and progressive physical therapy to optimize functional recovery within six weeks.
2. Implement targeted interventions, such as multidisciplinary care and preoperative optimization of comorbidities like diabetes and hypertension, to address factors that delay recovery in specific patient groups.
3. Strengthen infection prevention protocols, including the use of prophylactic antibiotics and stringent surgical sterilization practices, while introducing age-specific care plans to mitigate infection risks in older patients.
4. Establish a comprehensive long-term research and data monitoring system. This system could include a centralized longitudinal database that tracks patient demographics, preoperative comorbidities, surgical details, and long-term functional outcomes through regular follow-ups at specified intervals (e.g., 6 months, 1 year, 2 years, and 5 years post-surgery). Incorporating

patient-reported outcomes measures (PROMs) will capture patients' perspectives on their recovery and quality of life.

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APPENDICES

Appendix I: Participant's Informed Consent Form/ Fomu Ya Ridhaa Inayofahamisha

Title of the Research Study/ Kichwa cha Utafiti

English: INCIDENCE OF PROSTHETIC JOINT INFECTION, FUNCTIONAL RECOVERY AND REHABILITATION PROGRESS AMONG ORTHOPAEDIC PATIENTS AT METROPOLITAN HOSPITAL, NAIROBI COUNTY, KENYA

Swahili: KUTAMBUA MATUKIO YA MATOKEO MABAYA YA Kliniki NA MAENDELEO YA UKARABATI KWA WAGONJWA WA MIFUPA WANAOFANYIWA UBADILISHWAJI WA MAGOTI KWA UJUMLA KATIKA HOSPITALI YA METROPOLITAN

Principal Investigator (PI)/ Mpelelezi Mkuu: Wycliffe Vutiya

Contact Information/ Maelezo ya Mawasiliano: 0714485134

Contact Information for Metropolitan Hospital quality control unit Maelezo ya Mawasiliano ya kitengo cha kudhibiti ubora cha hospitali ya metropolitan

0722468019

English: If you have any questions about your rights as a research subject or need to report research-related problems, please contact quality control Office.

Swahili: Ikiwa una maswali yoyote kuhusu haki zako kama somo la utafiti au unahitaji kuripoti matatizo yanayohusiana na utafiti, tafadhali wasiliana na Ofisi kitengo cha kudhibiti ubora cha hospitali ya metropolitan

Purpose of Data Collection/Research/ Madhumuni ya Ukusanyaji/Utafiti wa Data:

English: You are being invited to participate in a research study. The purpose of this study is to determine the incidence of infection, functional outcomes, and rehabilitation progress in orthopedic patients who have undergone total knee replacement (TKR) at Metropolitan Hospital. Your participation in this research is essential to understanding the outcomes of this surgical procedure.

Swahili: Unaalikwa kushiriki katika utafiti. Madhumuni ya utafiti huu ni kuchunguza matukio ya maambukizi, matokeo ya kazi, na maendeleo ya ukarabati kwa wagonjwa wa mifupa ambao wamebadilishwa jumla ya goti (TKR) katika Hospitali ya Metropolitan. Ushiriki wako katika utafiti huu ni muhimu ili kuelewa matokeo ya utaratibu huu wa upasuaji.

Procedures /Taratibu:

English: You will be asked to provide information about your medical history, including any preoperative comorbidities. Additionally, you will be interviewed using standardized questionnaires to assess your activities of daily living (ADL) resumption, functional outcomes, and rehabilitation progress. Trained healthcare professionals will conduct physical assessments to measure your range of motion, pain scores, and other relevant clinical indicators. Medical records will also be reviewed for information regarding your demographic characteristics and postoperative complications.

Swahili: Utaombwa kutoa maelezo kuhusu historia yako ya matibabu, ikiwa ni pamoja na magonjwa yoyote yanayoweza kutokea kabla ya upasuaji. Zaidi ya hayo, utahojiwa kwa kutumia dodoso sanifu kutathmini shughuli zako za uanzishaji wa maisha ya kila siku (ADL), matokeo ya utendaji kazi, na maendeleo ya ukarabati. Wataalamu wa afya waliofunzwa watafanya tathmini za kimwili ili kupima aina mbalimbali za mwendo wako, alama za maumivu, na viashirio vingine muhimu vya kliniki. Rekodi za matibabu pia zitakaguliwa kwa habari kuhusu sifa zako za idadi ya watu na matatizo ya baada ya upasuaji.

Participant's Role/ Wajibu wa Mshiriki:

English: Your participation will involve answering questions, undergoing physical assessments, and allowing the research team to review your medical records. Your participation is voluntary, and you may choose not to participate or withdraw from the study at any time without any penalty.

Swahili: Ushiriki wako utahusisha kujibu maswali, kufanyiwa tathmini ya kimwili, na kuruhusu timu ya utafiti kukagua rekodi zako za matibabu. Kushiriki kwako ni kwa hiari, na unaweza kuchagua kutoshiriki au kujiondoa kwenye utafiti wakati wowote bila adhabu yoyote.

Risks and Benefits/ Hatari na Faida:

English: There may be risks associated with participation in this study, including potential discomfort during physical assessments and the sharing of personal medical information. However, these risks will be minimized to the greatest extent possible. The benefits of participating include contributing to medical knowledge and potentially improving the quality of care for future patients undergoing total knee replacement.

Swahili: Kunaweza kuwa na hatari zinazohusiana na kushiriki katika utafiti huu, ikijumuisha usumbufu unaoweza kutokea wakati wa kutathminiwa kimwili na kushiriki maelezo ya kibinafsi ya matibabu. Hata hivyo, hatari hizi zitapunguzwa kwa kiwango kikubwa iwezekanavyo. Faida za kushiriki ni pamoja na kuchangia ujuzi wa matibabu na uwezekano wa kuboresha ubora wa huduma kwa wagonjwa wa baadaye wanaofanyiwa ubadilishwaji wa jumla wa goti.

Privacy, Confidentiality, and Anonymity/ Faragha, Usiri, na Kutokujulikana:

English: Your privacy and confidentiality will be strictly protected. All data collected will be kept confidential and will only be accessible to authorized members of the research team. Your personal information will be anonymized, and any reports or publications resulting from this study will not contain identifying information.

Swahili: Faragha na usiri wako utalindwa kikamilifu. Data zote zitakazokusanywa zitawekwa siri na zitapatikana tu kwa washiriki walioidhinishwa wa timu ya utafiti.

Maelezo yako ya kibinafsi yatafichuliwa, na ripoti au machapisho yoyote yanayotokana na utafiti huu hayatakuwa na taarifa ya kutambua.

Use of Results/ Matumizi ya Matokeo:

English: The results of this research study may be published in scientific journals or presented at conferences. Your individual data will be kept confidential, and no personally identifiable information will be disclosed in any publications or presentations.

Swahili: Matokeo ya utafiti huu yanaweza kuchapishwa katika majarida ya kisayansi au kuwasilishwa kwenye mikutano. Data yako ya kibinafsi itawekwa siri, na hakuna maelezo ya kibinafsi yatakayofichuliwa katika machapisho au mawasilisho yoyote.

Duration of Participation/ Muda wa Kushiriki:

English: Your participation in this study may take some time, including the time required for interviews and assessments. The exact duration will vary depending on individual circumstances but we expect to conduct the study in 6 weeks

Swahili: Kushiriki kwako katika utafiti huu kunaweza kuchukua muda, ikijumuisha muda unaohitajika kwa mahojiano na tathmini. Muda kamili utatofautiana kulingana na hali ya mtu binafsi lakini tunatarajia kufanya utafiti ndani ya kipindi cha wiki sita.

Voluntary Participation and Right to Withdraw/ Ushiriki wa Hiari na Haki ya Kujitoa:

English: Participation in this study is entirely voluntary. You have the right to refuse to participate or withdraw from the study at any time without any penalty. Your decision will not affect your medical care in any way.

Swahili: Kushiriki katika utafiti huu ni kwa hiari kabisa. Una haki ya kukataa kushiriki au kujiondoa kwenye utafiti wakati wowote bila adhabu yoyote. Uamuzi wako hautaathiri huduma yako ya matibabu kwa njia yoyote.

Questions and Additional Information/ Maswali na Taarifa za Ziada:

English: If you have any questions or need additional information about this study, please contact the Principal Investigator, Wycliffe Vutiya, through 0714485134.

Swahili: Ikiwa una maswali yoyote au unahitaji maelezo ya ziada kuhusu utafiti huu, tafadhali wasiliana na Mpelelezi Mkuu, Wycliffe Vutiya, kupitia 0714485134.

Decision/Maamuzi:

English: I have read and understood the information provided above, and I voluntarily agree to participate in this research study.

Swahili: Nimesoma na kuelewa maelezo yaliyotolewa hapo juu, na ninakubali kwa hiari kushiriki katika utafiti huu.

Participant's Name/ Jina la Mshiriki: _____

Participant's Signature/Sahihi ya Mshiriki: _____

Date/Tarehe: _____

Researcher's Name/Jina la Mtafiti: **WYCLIFFE VUTIYA**

Researcher's Signature/ Sahihi ya Mtafiti: _____

Date/Tarehe: _____

Appendix II: Surgeons Consent Form

I Dr/Prof/Mr_____, hereby grant permission to ***Mr Wycliffe Vutiya*** of JKUAT and any other authorized representatives involved in the medical care and research, to conduct an interview with me regarding my post-surgery experiences after the total knee replacement performed on_____ at ***The Metropolitan Hospital***.

I understand and agree to the following terms:

1. **Aim of the Interview** is to gather patient information about post-surgery experiences, including but not limited to any symptoms, improvements, challenges faced, or overall health status for educational research purposes.
2. **Voluntary Participation:** I acknowledge that my consenting for patient participation in this interview is voluntary. I have the right to withdraw patient from the interview at any time.
3. **Confidentiality:** I understand that all information disclosed during the interview will be kept confidential and will only be used for educational research only. My identity will be protected, and my personal information will not be disclosed without my explicit consent, except as required by law.
4. **Benefits and Risks:** I understand that participating in this interview may provide valuable information for educational research and may contribute to improving patient care. There are no foreseeable risks associated with this interview other than potential discomfort in discussing medical details.
5. **Contact Information:** I acknowledge that the medical team may contact me using the provided contact information to give my consent in person or over the phone.
6. **Right to Information:** I have the right to ask questions about the interview process, its purpose, and the use of the gathered information

I have read and understood the contents of this consent form, and I voluntarily consent my patient to participate in the interview.

Surgeon's Name: _____

Surgeon's Signature: _____

Date: _____

Researcher's name: _____

Researcher's Signature: _____

Date: _____

Appendix III: Standardized Questionnaire/ Kiambatisho Ii: Dodoso Sanifu

Title of the Research Study/ Kichwa cha Utafiti:

English: INCIDENCE OF PROSTHETIC JOINT INFECTION, FUNCTIONAL RECOVERY AND REHABILITATION PROGRESS AMONG ORTHOPAEDIC PATIENTS AT METROPOLITAN HOSPITAL, NAIROBI COUNTY, KENYA.

Swahili: KUTAMBUA MATUKIO YA MATOKEO MABAYA YA Kliniki NA MAENDELEO YA UKARABATI KWA WAGONJWA WA MIFUPA WANAOFANYIWA UBADILISHWAJI WA MAGOTI KWA UJUMLA KATIKA HOSPITALI YA METROPOLITAN.

Participant Information/ Taarifa za Mshiriki:

Participant's Name (initials/optional)/ Jina la mshiriki: _____

Date of Birth/ Tarehe ya kuzaliwa: _____

Gender/ Jinsia: [ ] Male/Mwanaume [ ] Female/Mwanamke [ ] Other/Nyingine

Contact Information/ Maelezo ya Mawasiliano: _____

Medical Record Number (if available)/ Nambari ya Rekodi ya Matibabu (ikiwa inapatikana):

_____

_____

Next of kin contacts/Mawasiliano ya jamaa wa karibu: _____

Patient Demographics/ Idadi ya Wagonjwa:

Marital Status/Hali ya Ndoa: [ ] Single/Sijaoa [ ] Married/Nimeoa [ ] Divorced/Nimetalakiana [ ] Widowed/Mjane

Educational Level/Kiwango cha Elimu: _____

Occupation/Kazi: _____

Religion/Dini: _____

Monthly Income Bracket/ Mabano ya Mapato ya Kila Mwezi: [ ] < 10,000 [ ] 10,001 - 50,000 [ ] 50,001 – 100,000 [ ] > 100,000

Interviewer Information/ Maelezo ya Mhojaji:

Interviewer's Name/ Jina la Mhojaji: _____

Date of Interview/ Tarehe ya Mahojiano: _____

Section 1: Medical History/Sehemu ya 1: Historia ya Matibabu

English: Please provide a brief overview of your medical history, including any preoperative comorbidities or chronic conditions you may have.

Swahili: Tafadhali toa muhtasari mfupi wa historia yako ya matibabu, ikijumuisha magonjwa yoyote ya kabla ya upasuaji au hali sugu ambazo unaweza kuwa nazo.

……
……
……
……
……
……
……

English: Have you undergone any knee surgeries other than total knee replacement (TKR)? If yes, please provide details.

Swahili: Je, umefanyiwa upasuaji wowote wa goti zaidi ya kubadilisha goti (TKR)? Kama ndiyo, tafadhali toa maelezo.

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, please provide details/ Kama ndiyo, tafadhali toa maelezo:

_____

_____

_____

_____

_____

Section 2: Activities of Daily Living (ADL) Resumption/ Sehemu ya 2: Shughuli za Kuanza tena kwa Maisha ya Kila Siku (ADL).

English: Before undergoing TKR, were there any specific activities of daily living (e.g., walking, climbing stairs, dressing) that you had difficulty performing due to your knee condition? Please describe.

Swahili: Kabla kufanyiwa upasuaji wa jumla wa goti, je! Kulikua na shughuli zozote za kila siku za maisha ikiwemo kutembea, kupanda ngazi, kujivalisha mavazi ambazo ulikua na ugumu wa kufanya kwa sababu ya hali yako ya goti? Tafadhali eleza.

……
……
……
……
……
……
……

English: Since your TKR surgery, have you noticed improvements in your ability to perform these activities of daily living? If yes, please describe the improvements.

Swahili: Tangu upasuaji wako wa TKR, umeona maboresho katika uwezo wako wa kufanya shughuli hizi za maisha ya kila siku? Kama ndiyo, tafadhali eleza maboresho.

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, please describe the improvements/ Kama ndiyo, tafadhali eleza maboresho:

_____

_____

_____

_____

_____

_____

_____

_____

Can you be able to do domestic chores such as cooking, gardening and cleaning house more easily after surgery as compared to before surgery?

Je, unaweza kufanya kazi za nyumbani kama vile kupika, kutunza bustani na kusafisha nyumba kwa urahisi zaidi baada ya upasuaji ikilinganishwa na kabla ya upasuaji?

[ ] yes/ Ndio

[ ] no/ Hapana

Can you able to perform personal care activities like bathing, dressing, and grooming without significant difficulty after surgery?

Je, unaweza kufanya shughuli za utunzaji wa kibinafsi kama kuoga, kuvaa, na kujipamba bila shida kubwa baada ya upasuaji?

[ ] yes/ Ndio

[ ] no/ Hapana

Kama ndiyo, vikadirie kutoka 0 hadi 10 (0 kutokuwa na uwezo wa kufanya, 5 vimefanywa kwa haki na 10 vimefanywa vyema zaidi.

Feeding/ Kulisha [ ] 0 [ ] 5 [ ] 10

Bathing / Kuoga[ ] 0 [ ] 5 [ ] 10

Grooming/ Utunzaji [ ] 0 [ ] 5 [ ] 10

Dressing/ Mavazi [ ] 0 [ ] 5 [ ] 10

Bowel Control/ kudhibiti utumbo [ ] 0 [ ] 5 [ ] 10

Bladder Control/ udhibiti wa kibofu [ ] 0 [ ] 5 [ ] 10

Toilet Use/ Matumizi ya choo [ ] 0 [ ] 5 [ ] 10

Transfers/ Uhamisho (e.g., from bed to chair/ Kutoka kitanda hadi kiti) [ ] 0 [ ] 5 [ ] 10

Mobility on Level Surfaces / Usogeaji kwenye nyuso za kiwango [ ] 0 [ ] 5 [ ] 10

Are you able to do recreational activities or hobbies that were difficult to perform before surgery? For example dancing, swimming and playing games

Je, unafanya shughuli za burudani au mambo ya kujifurahisha ambayo yalikuwa magumu kufanya kabla ya upasuaji?

[ ] yes/ Ndiyo

[ ] no/ Hapana

Describe how the surgery has affected your ability to go up and down stairs?

Eleza jinsi upasuaji umeathiri uwezo wako wa kupanda na kushuka ngazi?

_____

_____

_____

_____

Have you returned to work or resumed work-related activities post-surgery?

Je, umerejea kazini au umeanza tena shughuli zinazohusiana na kazi baada ya upasuaji?

[ ] yes/ Ndiyo

[ ] no/ Hapana

If yes, tell us the difference in your work performance comparatively before and after surgery?

Ikiwa ndio, tuambie tofauti katika utendaji wako wa kazi kwa kulinganisha kabla na baada ya upasuaji?

_____

_____

_____

Section 3: Functional Outcomes/ Sehemu ya 3: Matokeo ya Kiutendaji

English: Please rate your pain level related to your knee on a scale from 0 to 10, with 0 being no pain and 10 being the worst pain imaginable.

Swahili: Tafadhali kadiria kiwango chako cha maumivu yanayohusiana na goti lako kwa mizani kutoka 0 hadi 10, 0 ikiwa hakuna maumivu na 10 kuwa maumivu mabaya zaidi kuwaza.

[ ] 0 (No Pain/Hakuna Maumivu)

[ ] 1 (Mild Pain/Maumivu Kidogo)

[ ] 2 (Discomforting/Inayosumbua)

[ ] 3 (Tolerable/Inavumilika)

[ ] 4 (Distressing/Inasikitisha)

[ ] 5 (Very Distressing/Inasikitisha sana)

[ ] 6 (Intense/Makali)

[ ] 7 (Very Intense/Makalisana)

[ ] 8 (Utterly Intense/Makali kabisa)

[ ] 9 (Excruciating/Inasikitisha)

[ ] 10 (Worst Pain Imaginable /Maumivu Mabaya Zaidi Yanayoweza Kufikiriwa)

English: Please rate your pain level related to your knee before total knee replacement surgery on a scale from 0 to 10, with 0 being no pain and 10 being the worst pain imaginable.

Swahili: Tafadhali kadiria kiwango chako cha maumivu yanayohusiana na goti lako kabla ya upasuaji kwa mizani kutoka 0 hadi 10, 0 ikiwa hakuna maumivu na 10 kuwa maumivu mabaya zaidi kuwaza.

[ ] 0 (No Pain/Hakuna Maumivu)

[ ] 1 (Mild Pain/Maumivu Kidogo)

[ ] 2 (Discomforting/Inayosumbua)

[ ] 3 (Tolerable/Inavumilika)

[ ] 4 (Distressing/Inasikitisha)

[ ] 5 (Very Distressing/Inasikitisha sana)

[ ] 6 (Intense/Makali)

[ ] 7 (Very Intense/Makalisana)

[ ] 8 (Utterly Intense/Makali kabisa)

[ ] 9 (Excruciating/Inasikitisha)

[ ] 10 (Worst Pain Imaginable /Maumivu Mabaya Zaidi Yanayoweza Kufikiriwa)

English: Are you currently receiving any pain management or rehabilitation services for your knee? If yes, please specify.

Swahili: Je, kwa sasa unapokea huduma zozote za udhibiti wa maumivu au urekebishaji wa goti lako? Kama ndiyo, tafadhali taja.

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, please specify /Kama ndiyo, tafadhali taja:

_____

_____

_____

_____

English: How satisfied are you with the overall results of the knee replacement surgery on a scale of 1 to 5? (Scale: 1 Very Dissatisfied and 5 Very Satisfied).

Swahili Je, umeridhishwa kwa kiasi gani na matokeo ya jumla ya upasuaji wa kubadilisha goti kwa kipimo cha 1 hadi 5? (Kipimo: 1 Sijaridhika Sana na 5 Nimeridhika Sana)

[ ]1 – Very Dissatisfied/ Sijaridhika sana
[ ]2 – Dissatisfied/ Sijaridhika
[ ]3 – Neither Dissatisfied or satisfied/ Sijaridhika au kutosheka
[ ]4 – satisfied/ nimeridhika
[ ] 5 - Very Satisfied/ nimeridhika sana

English: On a scale of 1 to 5, kindly rate your current ability to walk without assistance compared to before the surgery? (1 being Much Worse and 5 being Much Better).

Swahili Kwa kipimo cha 1 hadi 5, tafadhali ukadirie uwezo wako wa sasa wa kutembea bila usaidizi ikilinganishwa na kabla ya upasuaji? (1 kuwa mbaya zaidi na 5 kuwa bora zaidi)

[ ]1 – Much Worse/ Mbaya zaidi
[ ]2 - Slightly Worse/ Mbaya
[ ]3 – Same/ sawa
[ ]4 - Slightly Better/ Bora Kidogo
[ ] 5 - Much Better/ Bora Zaidi

English Are there any improvements you've noticed in your knee's range of motion since the surgery?

Swahili Je, kuna maboresho yoyote ambayo umeona katika mwendo wa goti lako tangu upasuaji?

[ ] yes/ Ndiyo

[ ] no/ Hapana

If yes, describe these improvements/ Kama ndiyo, eleza maboresho haya

_____

_____

_____

_____

English Are there any specific activities or movements that are still challenging for you post-surgery?

SwahilJe, kuna shughuli zozote maalum au harakati ambazo bado ni changamoto kwako baada ya upasuaji?

[ ] yes/ Ndiyo

[ ] no/ Hapana

If yes, describe these activities/ Kama ndiyo, eleza shughuli hizi

_____

_____

_____

_____

Section 4: Rehabilitation Progress/ Sehemu ya 4: Maendeleo ya Ukarabati

English: Have you been participating in a rehabilitation program following your TKR surgery? If yes, please describe the type and frequency of exercises or therapies daily and weekly.

Swahili: Je, umekuwa ukishiriki katika mpango wa ukarabati baada ya upasuaji wako wa TKR? Kama ndiyo, tafadhali eleza aina na marudio ya mazoezi au matibabu ambayo umekuwa ukijishughulisha nayo.

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, please describe/ Kama ndiyo, tafadhali eleza:

_____

_____

_____

_____

_____

_____

English: How would you rate your overall progress in rehabilitation on a scale from 1 to 5, with 1 being poor progress and 5 being excellent progress?

Swahili: Je, unaweza kukadiriaje maendeleo yako ya jumla katika urekebishaji katika mizani kutoka 1 hadi 5, huku 1 ikiwa ni maendeleo duni na 5 kuwa maendeleo bora?

[ ] 1 (Poor Progress/ Maendeleo Mabaya)

[ ] 2 (Fair Progress /Maendeleo ya Haki)

[ ] 3 (Moderate Progress/ Maendeleo ya Wastani)

[ ] 4 (Good Progress /Maendeleo Mzuri)

[ ] 5 (Excellent Progress/ Maendeleo Bora)

English: Are you experiencing any difficulties or challenges in your rehabilitation process? If yes, please describe.

Swahili: Je, unakumbana na matatizo au changamoto zozote katika mchakato wako wa ukarabati? Kama ndiyo, tafadhali eleza.

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, please describe /Kama ndiyo, tafadhali eleza:

_____

_____

_____

_____

_____

_____

Section 4: Determining infection

Section 5: Overall Impact and Recommendations/ Sehemu ya 5: Athari na Mapendekezo kwa Jumla.

How can you describe your quality of life post total knee replacement surgery?

Unawezaje kuelezea ubora wa maisha yako baada ya upasuaji wa uingizwaji wa goti?

_____

_____

_____

_____

_____

Can you advise someone suffering from similar problem to undergo total knee replacement surgery?

Je, unaweza kumshauri mtu anayesumbuliwa na tatizo kama hilo kufanyiwa upasuaji wa kubadilisha goti?

_____
_____
_____
_____
_____

Any information you feel could have been helpful before undergoing total knee replacement surgery which you didn't know?

Taarifa yoyote unayohisi inaweza kuwa na manufaa kabla ya kufanyiwa upasuaji wa kubadilisha goti ambao hukujua?

_____
_____
_____
_____
_____

Section 6: Any other aadditional Comments/ Sehemu ya 6: Maoni Mengine Yoyote ya Ziada:

Kindly provide any additional comments or insights regarding your experience with knee replacement surgery and recovery.

Tafadhali toa maoni au maarifa yoyote ya ziada kuhusu uzoefu wako na upasuaji wa kubadilisha goti na kupona.

_____
_____
_____
_____
_____

English: THANK YOU FOR YOUR PARTICIPATION IN THIS RESEARCH STUDY. YOUR INPUT IS VALUABLE IN ADVANCING OUR UNDERSTANDING OF TOTAL KNEE REPLACEMENT OUTCOMES AND PATIENT EXPERIENCES. IF YOU HAVE ANY QUESTIONS OR REQUIRE FURTHER INFORMATION, PLEASE DO NOT HESITATE TO CONTACT US.

Swahili: ASANTE KWA USHIRIKI WAKO KATIKA UTAFITI HUU. PEMBEJEO LAKO NI LA THAMANI KATIKA KUENDELEZA UFAHAMU WETU WA MATOKEO KAMILI YA KUBADILISHA MAGOTI NA TABIA YA MGONJWA. IKIWA UNA MASWALI YOYOTE AU UNAHITAJI MAELEZO ZAIDI, TAFADHALI USISITE KUWASILIANA NASI.

Interviewer's Signature/Sahihi ya Mhojaji: _____

Date/Tarehe: _____

QUESTIONNAIRRE TO DETERMINE INFECTION

1. **Symptoms related/ Dalili zinazohusiana**

   I. Rate the pain level in your replaced knee on a scale of 1 to 5/ Kadiria kiwango cha maumivu katika goti lako lililobadilishwa kwa mizani ya 1 hadi 5

[ ]1 - No pain/Hakuna maumivu
[ ]2 - Mild pain/Maumivu kidogo
[ ]3 - Moderate pain/Maumivu ya wastani
[ ]4 - Severe pain/Maumivu makali
[ ] 5 - Very severe pain/Maumivu makali sana

   II. Do you experience any swelling around your knee area/ Je, unapata uvimbe wowote karibu na eneo la goti lako

[ ] Yes/Ndiyo
[ ] No/Hapana
If yes,rate it/ Kama ndiyo, ikadirie

[ ]1 - No swelling/Hakuna uvimbe

[ ]2 - Slight swelling/Kuvimba kidogo

[ ]3 - Moderate swelling/Uvimbe wa wastani

[ ]4 - Severe swelling/Kuvimba sana

[ ]5 - Very severe swelling/Uvimbe mkali sana

III. Is there any redness around the knee area?/ Je, kuna uwekundu kuzunguka eneo la goti?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, rate it/ Kama ndiyo, ikadirie

[ ] 1 - No redness/Hakuna wekundu

[ ] 2 - Slight redness/Wekundu kidogo

[ ] 3 - Moderate redness/Wekundu wa wastani

[ ] 4 - Severe redness/Wekundu mkali

[ ] 5 - Very severe redness/Uwekundu mkali sana

IV. How would you rate your overall ability to walk post-surgery? (Scale of 1 to 5, 1 being poor , 5 being excellent)/ Je, unaweza kukadiriaje uwezo wako wa jumla wa kutembea baada ya upasuaji? (Kipimo cha 1 hadi 5, 1 kuwa duni, 5 kuwa bora)

[ ] Excellent/Bora

[ ] Very Good/Vizuri sana

[ ] Good/Nzuri

[ ] Fair/Haki

[ ] Poor/ Duni

V. Have you noticed any abnormal warmth around the knee?/ Je, umeona joto lolote lisilo la kawaida karibu na goti?

[ ] Yes/Ndiyo

[ ] No/Hapana

VI. Is there any discharge or drainage from the surgical site? / Je, kuna uchafu au mifereji ya maji kutoka kwa tovuti ya upasuaji?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, for how long/ Ikiwa ndio, kwa muda gani ----------

Rate it/Ikadirie

[ ] 1 - No discharge or drainage/ Hakuna kutokwa na maji au mifereji ya maji

[ ] 2 - Slight discharge or drainage/ Utoaji mdogo au mifereji ya maji

[ ] 3 - Moderate discharge or drainage/ Utoaji wa wastani au mifereji ya maji

[ ] 4 - Severe discharge or drainage/ Kutokwa na uchafu au mifereji ya maji

[ ] 5 - Very severe discharge or drainage/ Utoaji mkali sana au mifereji ya maji

VII. Is there any foul smell coming from the surgical site?/ Je, kuna harufu mbaya kutoka kwa tovuti ya upasuaji?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, for how long/ Ikiwa ndio, kwa muda gani ----------

VIII. Have you experienced any fever or chills since the surgery?/ Je, umepata homa au baridi yoyote tangu upasuaji?

[ ] Yes/Ndiyo
[ ] No/Hapana

2. **Post-surgery follow ups/ Ufuatiliaji wa baada ya upasuaji**

I. Have you visited your surgeon or any other healthcare provider since the surgery?/ Je, umemtembelea daktari wako wa upasuaji au mtoa huduma yeyote wa afya tangu upasuaji?

[ ] Yes/Ndiyo
[ ] No/Hapana

II. Did the healthcare provider mention to you any concerns regarding infection during your visits?/ Je, mhudumu wa afya alikutajia wasiwasi wowote kuhusu maambukizi wakati wa ziara zako?

[ ] Yes/Ndiyo
[ ] No/Hapana

III. Have you had any tests or evaluations done to assess the knee post-surgery?/ Je, umekuwa na vipimo au tathmini yoyote iliyofanywa ili kutathmini goti baada ya upasuaji?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, what tests were done/ Kama ndiyo, ni majaribio gani yalifanyika -------

---

--

IV. Have you experienced any complications or concerns related to the surgery?/ Je, umekumbana na matatizo au wasiwasi wowote kuhusiana na upasuaji huo?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, what are the concerns/ Ikiwa ndio, ni wasiwasi gani ----------

---

V. Are you currently under any medication or treatment post-surgery?/ Je, kwa sasa uko chini ya dawa au matibabu yoyote baada ya upasuaji?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, what medications/ Ikiwa ndio, ni dawa gani ----------

---

---

3. **Lifestyle modifications and Activity level/ Marekebisho ya mtindo wa maisha na kiwango cha Shughuli**

   I. How much physical activity have you been capable of performing since the surgery/ Ni kiasi gani cha shughuli za kimwili ambacho umeweza kufanya tangu upasuaji

[ ] 1 (No physical activity at all)/ (Hakuna shughuli za kimwili hata kidogo)
[ ] 2 (Minimal physical activity including walking around the house)/ (Shughuli ndogo za kimwili ikiwa ni pamoja na kutembea kuzunguka nyumba)
[ ] 3 (Moderate physical activity including light exercises)/ (Mazoezi ya wastani ya mwili pamoja na mazoezi mepesi)
[ ] 4 (Fairly active including engaging in regular walks)/ (Inafanya kazi kwa usawa ikiwa ni pamoja na kushiriki katika matembezi ya kawaida)
[ ] 5 (Highly active including participating in strenuous exercise) (Inafanya kazi sana ikiwa ni pamoja na kushiriki katika mazoezi magumu)

   II. Have you experienced any alterations in your lifestyle due to knee replacement surgery?/ Je, umepata mabadiliko yoyote katika mtindo wako wa maisha kutokana na upasuaji wa kubadilisha goti?

[ ] Yes/Ndiyo
[ ] No/Hapana
If yes, what are the alterations/ Ikiwa ndio, ni mabadiliko gani ----------
---

---

4. **Information regarding general Health/ Taarifa kuhusu Afya kwa ujumla**

   I. Do you suffer from any health conditions that may affect your immune system?/ Je, unasumbuliwa na hali yoyote ya afya ambayo inaweza kuathiri mfumo wako wa kinga?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, what's the name of the condition/ Kama ndio, hali hiyo inaitwaje ------

---

II. Do you take any medications that may also affect your immune system?/ Je, unatumia dawa yoyote ambayo inaweza pia kuathiri mfumo wako wa kinga?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, name of the drugs/ Kama ndiyo, jina la dawa ----------

---

III. Have you recently been in contact with a person experiencing infections?/ Je, hivi majuzi umewasiliana na mtu anayepata maambukizi?

[ ] Yes/Ndiyo

[ ] No/Hapana

If yes, name of infection/ Kama ndiyo, jina la maambukizi ----------

---

PATIENTS WITH PRE-EXISTING CORMOBIDITIES/ WAGONJWA WENYE MAGONJWA YALIYOKUWAPO

Section 1: Demographic Information/ / Sehemu ya 1: Taarifa za Kidemografia

1. Age/ Umri
2. Gender/ Jinsia
3. Occupation/ Kazi
4. Date of total knee replacement surgery/ Tarehe ya upasuaji wa jumla wa uingizwaji wa goti:
5. Preoperative comorbidity profile (select all that apply):

   Profaili ya magonjwa ya magonjwa kabla ya upasuaji (chagua yote yanayotumika):

   [ ] Diabetes/ Ugonjwa wa kisukari

   [ ]Hypertension/ Shinikizo la damu

   [ ]Cardiovascular disease/ Ugonjwa wa moyo

   [ ]Obesity/ Unene

   [ ]Rheumatoid arthritis/ Rheumatoid arthritis

   [ ]HIV/ virusi vya ukimwi

   [ ]Osteoarthritis in other joints/ Osteoarthritis katika viungo vingine

[ ]Other (please specify)/ Nyingine (tafadhali taja)

_____

_____

_____

Section 2: Preoperative Health Status/ Sehemu ya 2: Hali ya Afya Kabla ya Upasuaji

1. How many of the listed comorbidities were present before the surgery?

   Je, ni magonjwa mangapi kati ya yaliyoorodheshwa yaliyokuwepo kabla ya upasuaji?

   _____

   _____

   _____

2. Did any of these comorbidities significantly affect your knee condition or mobility before the surgery?

   Je, mojawapo ya magonjwa haya yaliathiri sana hali ya goti lako au uhamaji kabla ya upasuaji?

   [ ] Yes/ ndiyo

   [ ]No)/ hapana

3. Rate the impact of your comorbidities on your overall health and activity level before the knee replacement surgery. (Scale of 1-5)

   Kadiria athari za magonjwa yako kwa afya yako yote na kiwango cha shughuli kabla ya upasuaji wa uingizwaji wa goti. (Kiwango cha 1-5)

   [ ]1 - No impact: My comorbidities had no noticeable impact on my overall health and activity level before surgery.

   [ ]1 - Hakuna athari: Magonjwa yangu ya maradhi hayakuwa na athari inayoonekana kwa afya yangu kwa ujumla na kiwango cha shughuli kabla ya upasuaji.

   [ ]2 - Minor impact: My comorbidities had a slight impact on my overall health and activity level, but it was manageable.

[ ]2 - Athari ndogo: Magonjwa yangu yaliathiri kidogo kiwango cha afya yangu na shughuli, lakini iliweza kudhibitiwa.

[ ]3 - Moderate impact: My comorbidities moderately affected my overall health and activity level before the surgery.

[ ]3 - Athari ya wastani: Magonjwa yangu ya maradhi yaliathiri kiasi afya yangu na kiwango cha shughuli kabla ya upasuaji.

[ ]4 - Significant impact: My comorbidities had a considerable impact on my overall health and activity level before the surgery.

[ ]4 - Athari kubwa: Magonjwa yangu yalikuwa na athari kubwa kwa afya yangu kwa ujumla na kiwango cha shughuli kabla ya upasuaji.

[ ]5 - Severe impact: My comorbidities significantly impaired my overall health and severely limited my activity level before the surgery

[ ]5 - Athari kali: Magonjwa yangu yaliathiri vibaya afya yangu kwa ujumla na kupunguza kiwango cha shughuli yangu kabla ya upasuaji.

Section 3: Rehabilitation Progress/ Sehemu ya 3: Maendeleo ya Ukarabati

1. Are you following a prescribed physical therapy regimen post-surgery?

   Je, unafuata utaratibu uliowekwa wa tiba ya kimwili baada ya upasuaji?

   [ ] Yes/ ndiyo

   [ ]No/ hapana

2. How often do you engage in physical therapy or exercise sessions day and per week?

   Je, ni mara ngapi unajihusisha na mazoezi ya mwili au vipindi vya mazoezi kwa siku na kwa wiki?

Per day/ kwa siku_____

Per week/ kwa wiki_____

3. Have any of your preexisting health conditions affected your ability to adhere to the recommended rehabilitation program?

   Je, hali zozote za kiafya zilizokuwepo zimeathiri uwezo wako wa kuambatana na mpango uliopendekezwa wa ukarabati?

   [ ] Yes/ ndiyo

   [ ]No/ hapana

4. Describe any challenges you've faced during rehabilitation due to your preexisting health conditions.

   Eleza changamoto zozote ambazo umekumbana nazo wakati wa ukarabati kutokana na hali yako ya kiafya iliyokuwepo hapo awali.

   -

   _____

   _____

   _____

   _____

   _____

   _____

Section 4: Activities of Daily Living (ADL)/ Sehemu ya 4: Shughuli za Maisha ya Kila Siku (ADL)

1. To what extent have your preexisting health conditions impacted your ability to resume daily activities post-surgery? On a scale of 1 to 5.

   Ni kwa kiwango gani hali zako za kiafya zilizokuwepo zimeathiri uwezo wako wa kuendelea na shughuli za kila siku baada ya upasuaji? Kwa kipimo cha 1 hadi 5.

   [ ]1 - No impact: My preexisting health conditions did not affect my ability to resume daily activities after surgery.

   [ ]1 - Hakuna athari: Hali zangu za afya zilizokuwepo hazikuathiri uwezo wangu wa kuendelea na shughuli za kila siku baada ya upasuaji.

   [ ]2 - Minor impact: My preexisting health conditions had a slight impact on my ability to resume daily activities, but it was manageable.

   [ ]2 - Athari ndogo: Hali yangu ya afya iliyokuwapo awali ilikuwa na athari kidogo katika uwezo wangu wa kuendelea na shughuli za kila siku, lakini iliweza kudhibitiwa.

   [ ]3 - Moderate impact: My preexisting health conditions moderately affected my ability to resume daily activities post surgery.

   [ ]3 - Athari ya wastani: Hali zangu za afya zilizokuwepo awali ziliathiri kwa kiasi uwezo wangu wa kuendelea na shughuli za kila siku baada ya upasuaji

   [ ]4 - Significant impact: My preexisting health conditions had a considerable impact on my ability to resume daily activities after the surgery.

   [ ]4 - Athari kubwa: Hali yangu ya afya iliyokuwapo awali ilikuwa na athari kubwa katika uwezo wangu wa kuendelea na shughuli za kila siku baada ya upasuaji.

   [ ]5 - Severe impact: My preexisting health conditions significantly impaired my ability to resume daily activities post surgery

[ ]5 - Athari kali: Hali yangu ya kiafya iliyokuwepo ilidhoofisha kwa kiasi kikubwa uwezo wangu wa kuendelea na shughuli za kila siku baada ya upasuaji

(Significantly/Minimally/Not at all)/ (Kwa kiasi kikubwa/Kidogo/Sio kabisa)

2. Rate your level of difficulty in performing ADL tasks post-surgery compared to before the surgery. (Scale of 0-10)

   Kadiria kiwango chako cha ugumu katika kufanya kazi za ADL baada ya upasuaji ikilinganishwa na kabla ya upasuaji. (Kiwango cha 0-10)

   If yes, rate them from 0 to 10 (0 being unable to perform, 5 fairly performed and 10 excellently performed

   Kama ndiyo, vikadirie kutoka 0 hadi 10 (0 kutokuwa na uwezo wa kufanya, 5 vimefanywa kwa haki na 10 vimefanywa vyema zaidi.

   Feeding/ Kulisha [ ] 0 [ ] 5 [ ] 10

   Bathing/ kuoga [ ] 0 [ ] 5 [ ] 10

   Grooming/ Utunzaji [ ] 0 [ ] 5 [ ] 10

   Dressing/ mavazi[ ] 0 [ ] 5 [ ] 10

   Bowel Control/ Kudhibiti utumbo [ ] 0 [ ] 5 [ ] 10

   Bladder Control/ udhibiti wa kibofu [ ] 0 [ ] 5 [ ] 10

   Toilet Use/ matumizi ya choo [ ] 0 [ ] 5 [ ] 10

   Transfers (e.g., from bed to chair)/ Uhamisho (k.m., kutoka kitanda hadi kiti) [ ] 0 [ ] 5 [ ] 10

   Mobility on Level Surfaces/ Usogeaji kwenye Nyuso za Kiwango [ ] 0 [ ] 5 [ ] 10

3. Are there specific ADL tasks that remain particularly challenging due to your preexisting health conditions?

Je, kuna kazi mahususi za ADL ambazo husalia kuwa changamoto kutokana na hali yako ya kiafya iliyokuwepo?

[ ] yes/ ndiyo

[ ] no/ hapana

If yes, name them/ Ikiwa ndio, wape majina

_____

_____

_____

_____

_____

4. Have you required any additional assistance or modifications in your daily routine due to these health conditions post-surgery?

   Je, umehitaji usaidizi wowote wa ziada au marekebisho katika utaratibu wako wa kila siku kutokana na hali hizi za kiafya baada ya upasuaji?

   [ ] Yes /ndiyo

   [ ] No/ hapana

If yes, which assistance/ Ikiwa ndio, msaada gani

_____

_____

_____

_____

5. How do you perceive the influence of your comorbidities on your ability to regain pre-surgery levels of activity and functionality?

   Je, unaonaje ushawishi wa magonjwa yako kwenye uwezo wako wa kurejesha viwango vya shughuli na utendaji wa kabla ya upasuaji?

   [ ] Positive/ chanya

[ ] Neutral/ si upande wowote

[ ] Negative/ Hasi

Section 5: Postoperative Health and Well-being/ Sehemu ya 5: Afya na Ustawi wa Baada ya Upasuaji

1. Have your preexisting health conditions shown any changes or fluctuations since the surgery?

   Je, hali zako za kiafya zilizokuwepo zimeonyesha mabadiliko au mabadiliko yoyote tangu upasuaji?

   [ ] Improved/ Imeboreshwa

   [ ] Remained the same/ Ilisalia sawa

   [ ] Declined/ Imekataa

2. Describe any emotional or psychological impact your comorbidities have had on your recovery process.

   Eleza athari yoyote ya kihisia au kisaikolojia ambayo magonjwa yako ya maradhi yamekuwa nayo kwenye mchakato wako wa kurejesha uwezo wa kufikia matokeo.

   _____

   _____

   _____

   _____

   _____

3. Rate your overall satisfaction with the surgery outcome considering your preoperative health status. (Scale of 1-5)

   Kadiria kuridhika kwako kwa jumla na matokeo ya upasuaji ukizingatia hali yako ya afya kabla ya upasuaji. (Kiwango cha 1-5)

   [ ]1 – Very Dissatisfied/ Sijaridhika sana

   [ ]2 – Dissatisfied/ Sijaridhika

[ ]3 – Neither Dissatisfied or satisfied/ Sijaridhika au kutosheka

[ ]4 – satisfied/ nimeridhika

[ ] 5 - Very Satisfied/ nimeridhika sana

4. Are there any support systems or strategies that have been particularly helpful in managing both your comorbidities and the recovery process?

   Je, kuna mifumo yoyote ya usaidizi au mikakati ambayo imekuwa muhimu sana katika kudhibiti magonjwa yako na mchakato wa kurejesha?

   [ ] yes/ ndiyo

   [ ] no/ hapana

   If yes, name them_____

   _____

   _____

   _____

   _____

Section 6: Additional Feedback/ Sehemu ya 6: Maoni ya Ziada

Is there anything else you would like to share about how your preoperative comorbidities have affected your rehabilitation and ADL resumption post total knee replacement surgery?

Je, kuna kitu kingine chochote ungependa kushiriki kuhusu jinsi matatizo yako ya kabla ya upasuaji yameathiri urekebishaji wako na kuanza tena kwa ADL baada ya upasuaji wa jumla wa uingizwaji wa goti?

Appendix IV: Short Form Health Survey (Sf-12)/ Kiambatisho Iii: Utafiti Wa Afya Wa Fomu Fupi (SF-12)

Participant Information/ Taarifa za Mshiriki:

Participant's Name/ Jina la mshiriki: _____

Date of Birth/ Tarehe ya kuzaliwa: _____

Gender/Jinsia: [ ] Male/Mwanaume [ ] Female/Mwanamke [ ] Other/Nyingine

Contact Information/ Maelezo ya Mawasiliano: _____

Medical Record Number (if available)/ Nambari ya Rekodi ya Matibabu (ikiwa inapatikana):

_____

_____

Interviewer Information/ Maelezo ya Mhojaji:

Interviewer's Name /Jina la Mhojaji: _____

Date of Interview /Tarehe ya Mahojiano: _____

English: Instructions: Please answer the following questions about your health and how you feel. For each question, please choose the response that best describes your situation in the past four weeks. There are no right or wrong answers; we are interested in your honest opinion.

Swahili: Maagizo: Tafadhali jibu maswali yafuatayo kuhusu afya yako na jinsi unavyohisi. Kwa kila swali, tafadhali chagua jibu linalofafanua vyema hali yako katika wiki nne zilizopita. Hakuna majibu sahihi au yasiyo sahihi; tunavutiwa na maoni yako ya uaminifu.

Physical Health /Afya ya Kimwili:

English: In general, would you say your health is?

Swahili: Kwa ujumla, unaweza kusema afya yako?

[ ] Excellent/ Bora

[ ] Very Good/ Vizuri sana

[ ] Good/ Nzuri

[ ] Fair/ Haki

[ ] Poor/ Maskini

English: Compared to one year ago, how would you rate your physical health now?

Swahili: Ikilinganishwa na mwaka mmoja uliopita, unaweza kukadiria vipi afya yako ya kimwili sasa?

[ ] Much Better/Nzuri zaidi

[ ] Somewhat Better/Bora Zaidi

[ ] About the Same/Sawa

[ ] Somewhat Worse/Mbaya Zaidi

[ ] Much Worse/Mbaya zaidi

English: During the past four weeks, how much did physical health problems limit your usual activities, such as walking, climbing stairs, carrying groceries, or moving a table or chair?

Swahili: Katika wiki nne zilizopita, ni kwa kiasi gani matatizo ya kiafya yalipunguza shughuli zako za kawaida, kama vile kutembea, kupanda ngazi, kubeba mboga, au kusogeza meza au kiti?

[ ] Not at All/Hapana kabisa

[ ] A Little Bit/Kidogo

[ ] Moderately/Kiasi

[ ] Quite a Bit/Kimya kidogo

[ ] Extremely/Sana

English: How much bodily pain have you had during the past four weeks?

Swahili: Je, umekuwa na maumivu ya mwili kiasi gani katika wiki nne zilizopita?

[ ] None/Hakuna

[ ] Very Mild/Mpole Sana

[ ] Mild/Mpole

[ ] Moderate/Wastani

[ ] Severe/ Mkali

Mental Health/Afya ya kiakili:

English: Have you felt calm and peaceful?

Swahili: Je, umejisikia utulivu na amani?

[ ] All of the Time/Wakati Wote

[ ] Most of the Time/Mara nyingi

[ ] A Good Bit of the Time/Muda Mzuri wa Wakati

[ ] Some of the Time/Baadhi ya Wakati

[ ] A Little of the Time/Wakati Kidogo

[ ] None of the Time/Hakuna Wakati

English: Have you felt downhearted and blue?

Swahili: Je, umejisikia huzuni na bluu?

[ ] None of the Time/Hakuna Wakati

[ ] A Little of the Time/Wakati Kidogo

[ ] Some of the Time/Baadhi ya Wakati

[ ] A Good Bit of the Time/Muda Mzuri wa Wakati

[ ] Most of the Time/Mara nyingi

[ ] All of the Time/Wakati Wote

English: Have you felt so down in the dumps that nothing could cheer you up?

Swahili: Je, umejisikia chini sana kwenye madampo hivi kwamba hakuna kitu kinachoweza kukutia moyo?

[ ] None of the Time/Hakuna Wakati

[ ] A Little of the Time/Wakati Kidogo

[ ] Some of the Time/Baadhi ya Wakati

[ ] A Good Bit of the Time/Muda Mzuri wa Wakati

[ ] Most of the Time/Mara nyingi

[ ] All of the Time/Wakati Wote

English: Have you been a very nervous person?

Swahili: Umekuwa mtu wa wasiwasi sana?

[ ] All of the Time/Wakati Wote

[ ] Most of the Time/Mara nyingi

[ ] A Good Bit of the Time/Muda Mzuri wa Wakati

[ ] Some of the Time/Baadhi ya Wakati

[ ] A Little of the Time/Wakati Kidogo

[ ] None of the Time/Hakuna Wakati

Overall Quality of Life/Ubora wa Maisha kwa Jumla:

English: How would you rate your overall quality of life?

Swahili: Je, unaweza kukadiria vipi ubora wako wa maisha kwa ujumla?

[ ] Excellent/Bora

[ ] Very Good/Vizuri sana

[ ] Good/Nzuri

[ ] Fair/Haki

[ ] Poor/ Mbaya

English: How would you rate your overall health now?

Swahili: Je, unaweza kutathmini vipi afya yako kwa ujumla sasa?

[ ] Excellent/Bora

[ ] Very Good/Vizuri sana

[ ] Good/Nzuri

[ ] Fair/Haki

[ ] Poor/Mbaya

Interference with Daily Life/Kuingilia maisha ya kila siku:

English: To what extent has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.) during the past four weeks?

Swahili: Je, afya yako ya kimwili au matatizo yako ya kihisia yameingilia kwa kiasi gani shughuli zako za kijamii (kama vile kutembelea marafiki, jamaa, n.k.) katika muda wa wiki nne zilizopita?

[ ] Not at All/Hapana kabisa

[ ] A Little Bit/Kidogo

[ ] Moderately/Kiasi

[ ] Quite a Bit/Kimya kidogo

[ ] Extremely/Sana

English: How much time during the past four weeks has your physical health or emotional problems interfered with your work or regular daily activities, including both work outside the home and housework?

Swahili: Ni muda gani katika wiki nne zilizopita ambapo afya yako ya kimwili au matatizo ya kihisia-moyo yameingilia kazi yako au shughuli za kawaida za kila siku, ikiwa ni pamoja na kazi za nje ya nyumbani na za nyumbani?

[ ] Not at All/Hapana kabisa

[ ] A Little Bit/Kidogo

[ ] Moderately/ Kiasi

[ ] Quite a Bit/Kimya kidogo

[ ] Extremely/Sana

English: Thank you for completing the SF-12 questionnaire. Your responses will help us understand your overall health and well-being. If you have any questions or need further assistance, please let us know.

Swahili: Asante kwa kujaza dodoso la SF-12. Majibu yako yatatusaidia kuelewa afya yako kwa ujumla na hali njema. Ikiwa una maswali yoyote au unahitaji usaidizi zaidi, tafadhali tujulishe.

Interviewer's Signature/Sahihi ya Mhojaji: _____

Date/Tarehe: _____

Appendix V: Visual Analog Scale (Vas) For Pain Measurement/ Kiambatisho IV: Kipimo Cha Analogu Inayoonekana (Vas) Kwa Kipimo Cha Maumivu

English: The Visual Analog Scale (VAS) is a tool used to assess the intensity of pain. It consists of a straight line with endpoints that represent the extreme limits of pain intensity ("No Pain" on the left and "Worst Pain Imaginable" on the right). The participant is asked to mark a point on the line to indicate their pain level.

Swahili: Visual Analog Scale (VAS) ni chombo kinachotumiwa kutathmini ukubwa wa maumivu. Inajumuisha mstari wa moja kwa moja na ncha ambazo zinawakilisha mipaka iliyokithiri ya kiwango cha maumivu ("Hakuna Maumivu" upande wa kushoto na "Maumivu Mbaya Zaidi Yanayoweza Kufikiriwa" upande wa kulia). Mshiriki anaombwa kuweka alama kwenye mstari ili kuonyesha kiwango chao cha maumivu.

Instructions/Maagizo:

English: Please mark a point on the line to indicate your level of pain. The left endpoint represents "No Pain," and the right endpoint represents the "Worst Pain Imaginable."

[No Pain] _____ [Worst Pain Imaginable]

Please mark a point on the line that best represents your pain level:

[ ] No Pain [ ] Mild Pain [ ] Moderate Pain [ ] Severe Pain [ ] Worst Pain Imaginable

Swahili: Tafadhali weka alama kwenye mstari ili kuonyesha kiwango chako cha maumivu. Mwisho wa kushoto unawakilisha "Hakuna Maumivu," na mwisho wa kulia unawakilisha "Maumivu Mbaya Zaidi Yanayoweza Kufikiriwa."

[Hakuna Maumivu]_____ [Maumivu Mabaya Zaidi Yanayoweza Kufikiriwa]

Tafadhali weka alama kwenye mstari unaowakilisha vyema kiwango chako cha maumivu:

[ ] Hakuna Maumivu [ ] Maumivu Kiasi [ ] Maumivu ya Wastani [ ] Maumivu Makali [ ] Maumivu Mabaya Zaidi Yanayoweza Kufikirika

Appendix VI: Relevant Scales For Activities Of Daily Living (Adl) Assessment /Kiambatisho V: Mizani Husika Kwa Shughuli Za Tathmini Ya Maisha Ya Kila Siku (ADL)

Barthel Index:

English: The Barthel Index assesses an individual's ability to perform basic activities of daily living. It assigns scores to various ADLs, with a higher score indicating a higher level of independence.

Swahili: Fahirisi ya Barthel inatathmini uwezo wa mtu kufanya shughuli za kimsingi za maisha ya kila siku. Hutoa alama kwa ADL mbalimbali, na alama za juu zinaonyesha kiwango cha juu cha uhuru.

Instructions:/Maagizo

English: Please indicate your level of independence in performing the following activities. Circle the appropriate score for each item.

Swahili: Tafadhali onyesha kiwango chako cha uhuru katika kufanya shughuli zifuatazo. Zungushia alama zinazofaa kwa kila kipengee.

Feeding [ ] 0 [ ] 5 [ ] 10

Bathing [ ] 0 [ ] 5 [ ] 10

Grooming [ ] 0 [ ] 5 [ ] 10

Dressing [ ] 0 [ ] 5 [ ] 10

Bowel Control [ ] 0 [ ] 5 [ ] 10

Bladder Control [ ] 0 [ ] 5 [ ] 10

Toilet Use [ ] 0 [ ] 5 [ ] 10

Transfers (e.g., from bed to chair) [ ] 0 [ ] 5 [ ] 10

Mobility on Level Surfaces [ ] 0 [ ] 5 [ ] 10

Stairs Climbing [ ] 0 [ ] 5 [ ] 10

Kulisha [ ] 0 [ ] 5 [ ] 10

Kuoga [ ] 0 [ ] 5 [ ] 10

Utunzaji [ ] 0 [ ] 5 [ ] 10

Mavazi [ ] 0 [ ] 5 [ ] 10

Kudhibiti utumbo [ ] 0 [ ] 5 [ ] 10

Udhibiti wa Kibofu [ ] 0 [ ] 5 [ ] 10

Matumizi ya Choo [ ] 0 [ ] 5 [ ] 10

Uhamisho (k.m., kutoka kitanda hadi kiti) [ ] 0 [ ] 5 [ ] 10

Usogeaji kwenye Nyuso za Kiwango [ ] 0 [ ] 5 [ ] 10

Kupanda Ngazi [ ] 0 [ ] 5 [ ] 10

Scoring/Bao:

Total Score/Jumla ya Alama: _____ (Maximum score: 100/ Alama ya juu zaidi: 100)

Higher scores indicate greater independence in ADLs/ Alama za juu zinaonyesha uhuru zaidi katika ADLs.

Modified Rankin Scale (mRS)/ Kiwango cha Rankin kilichobadilishwa (mRS):

English: The Modified Rankin Scale assesses a person's functional ability and the degree of disability after a medical condition, such as a stroke. It ranges from 0 (no symptoms) to 6 (death).

Swahili: Kiwango cha Rankin kilichobadilishwa hutathmini uwezo wa mtu kufanya kazi na kiwango cha ulemavu baada ya hali ya kiafya, kama vile kiharusi. Ni kati ya 0 (hakuna dalili) hadi 6 (kifo).

Instructions/Maagizo:

English: Please select the number that best describes your level of disability.

0: No symptoms.

1: No significant disability. Able to carry out all usual duties and activities.

2: Slight disability. Able to look after own affairs without assistance but unable to carry out all previous activities.

3: Moderate disability. Requires some help, but able to walk without assistance.

4: Moderately severe disability. Unable to walk without assistance and unable to attend to own bodily needs without assistance.

5: Severe disability. Requires constant nursing care and attention, bedridden, incontinent.

6: Death.

Please select the number that best describes your current level of disability:

[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6

Thank you for completing these scales. Your responses will help us assess your level of independence in performing daily activities and understand your pain level. If you have any questions or need further assistance, please let us know.

Swahili: Tafadhali chagua nambari inayofafanua vyema kiwango chako cha ulemavu.

0: Hakuna dalili.

1: Hakuna ulemavu mkubwa. Uwezo wa kutekeleza majukumu na shughuli zote za kawaida.

2: Ulemavu kidogo. Awe na uwezo wa kuangalia mambo yako mwenyewe bila msaada lakini hawezi kufanya shughuli zote za awali.

3: Ulemavu wa wastani. Inahitaji msaada fulani, lakini kuweza kutembea bila usaidizi.

4: Ulemavu mkali kiasi. Huwezi kutembea bila usaidizi na kutoweza kushughulikia mahitaji yako ya mwili bila usaidizi.

5: Ulemavu mkubwa. Inahitaji huduma ya uuguzi mara kwa mara na tahadhari, kitandani, bila kujizuia.

6: Kifo.

Tafadhali chagua nambari inayofafanua vyema kiwango chako cha sasa cha ulemavu:

[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6

Asante kwa kukamilisha mizani hii. Majibu yako yatatusaidia kutathmini kiwango chako cha uhuru katika kufanya shughuli za kila siku na kuelewa kiwango chako cha maumivu. Ikiwa una maswali yoyote au unahitaji usaidizi zaidi, tafadhali tujulishe.

Interviewer's Signature/ Sahihi ya Mhojaji: _____

Date/Tarehe: _____

Appendix VII: Research_Permit_NACOSTI-P-24-32725

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **111227**

Date of Issue: **07/February/2024**

RESEARCH LICENSE

This is to Certify that Mr.. Wycliffe Vutiya of Jomo Kenyatta University of Agriculture and Technology, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: DETERMINING THE INCIDENCE OF ADVERSE CLINICAL OUTCOMES AND REHABILITATION PROGRESS IN ORTHOPEDIC PATIENTS UNDERGOING TOTAL KNEE REPLACEMENT AT METROPOLITAN HOSPITAL, NAIROBI COUNTY, KENYA. for the period ending : 07/February/2025.

License No: **NACOSTI/P/24/32725**

111227

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix VIII: Ethical Approval - UEAB

OFFICE OF THE CHAIRPERSON
INSTITUTIONAL SCIENTIFIC ETHICS REVIEW COMMITTEE
UNIVERSITY OF EASTERN AFRICA, BARATON
P.O. BOX 2500-30100, Eldoret, Kenya, East Africa

B2629112023 November 29,2023

TO: Wycliffe Vutiya
Jomo Kenyatta University of Agriculture and Technology
Kenya

Dear Wycliffe,

RE: Determining the Incidence of Adverse Clinical Outcomes and Rehabilitation Progress in Orthopedic Patients Undergoing Total Knee Replacement at Metropolitan Hospital, Nairobi County, Kenya.

This is to inform you that the Institutional Scientific Ethics Review Committee (ISERC) of the University of Eastern Africa Baraton has reviewed and approved your above research proposal. Your application approval number is UEAB/ISERC/26/11/2023. The approval period from is November29th, 2023 – November29th, 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 the Institutional Scientific Ethics Review Committee (ISERC) of the University of Eastern Africa Baraton.
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 the Institutional Scientific Ethics Review Committee (ISERC) of the University of Eastern Africa Baraton within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected the safety or welfare of study participants and others, or affect the integrity of the research must be reported to the Institutional Scientific Ethics Review Committee (ISERC) of the University of Eastern Africa Baraton 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 the 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 the Institutional Scientific Ethics Review Committee (ISERC) of the University of Eastern Africa Baraton.

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

Sincerely yours,

Prof. Jackie K. Obey, PhD
Chairperson, Institutional Scientific Ethics Review Committee

University of Eastern Africa, Baraton
29 NOV 2023
P. O. Box 2500-30100, ELDORET
Research Ethics Committee

Appendix IX: Research Approval Letter – Metropolitan Hospital

Your Partners in health

5th January 2024

Graduate School

Jomo Kenyatta University of Agriculture and Technology

P. O. Box 62000-00200

Nairobi

Dear Sir or Madam,

RE: RESEARCH AUTHORIZATION FOR WYCLIFFE VUTIYA (HSH314G-1822/2022)

This letter confirms that the Metropolitan Hospital Clinical Governance Committee has reviewed the research proposal titled, ***"Determining the incidence of adverse clinical outcomes and rehabilitation progress in orthopaedic patients undergoing total knee replacement at Metropolitan Hospital, Nairobi County, Kenya."*** We are pleased to inform you that Mr. Wycliffe Vutiya (HSH314G-1822/2022) has been granted authorization to conduct this study at Metropolitan Hospital.

Mr. Vutiya is expected to strictly adhere to the following:

- **Ethical conduct:** The research must comply with the Kenyan Science, Technology and Innovation Act and the Metropolitan Hospital's research approval procedures and protocols.
- **Patient confidentiality:** All patient information must be treated with the utmost confidentiality throughout the study and beyond.
- **Business confidentiality:** Any non-public hospital information obtained during the research must be kept confidential.

Upon completion of the study, Mr. Vutiya is required to submit one hard copy and one electronic copy (PDF format) of the research findings to both the Metropolitan Hospital research team and the quality control team.

We wish Mr. Vutiya success in his research and anticipate valuable insights from his findings.

Sincerely,

Elijah Ongeri

Head of Nursing and Quality

Rabai Rd. Buruburu | P.O. Box 808-00515, Buruburu, Nairobi,
Tel: (020) 2002145, 20206300| Mobile: 0722 207665, 0733 602114, 0709 148000, 0730 765000
Email: healthcare@metro-hospital.com | Website: www.metro-hospital.com

Appendix X: Logistic Analyses

Table X.1: Univariable analyses between rehabilitation progress and study participants' characteristics

Variable	Category	Odds Ratio (OR)	Standard error	p-value
Age*		1.15	0.04	0.0002
Sex	Male	0.48	0.48	0.13
	Female	1.00		
Marital status	Married	0.41	0.73	0.22
	Single	0.40	1.39	0.51
	Widowed	0.94	0.87	0.94
	Divorced	1.00		
Level of education*	Primary	0.28	1.2	0.29
	Secondary	0.19	1.25	0.19
	Tertiary	0.08	1.32	0.06
	None	1.00		
Occupation*	Informal	5.70	0.57	0.002
	Formal	1.00		
Income (Ksh) per month	>100,000	4197501.39	1455.4	0.99
	50,001-100,000	3204286.49	1455.4	0.99
	10,001-50,000	5780495.71	1455.4	0.99
	<10,000	1.00		

Religion	Islam	0.39	0.84	0.26
	Christianity	1.00		
NCD comorbidity*	DM +HTN	6076868.06	1978.1	0.99
	HTN	0.23	1.77	0.27
	none	0.06	1.1	0.01
Post-discharge physiotherapy care*	Yes	0.28	0.55	0.02
	No	1.00		

Significant factors* p<0.1

For age, as a continuous variable, a one-year increase was associated with a 1.15 increase in the odds ratio of poor progress. Study participants without formal education had the highest likelihood of reporting poor rehabilitation progress compared to those with varying levels of education. Participants in informal occupations were approximately six times more likely to report poor progress compared to those in the formal sector. Additionally, co-morbidity with both diabetes and hypertension significantly increased the odds of poor rehabilitation progress. Conversely, participants undergoing post-discharge physiotherapy care were 72% less likely to report poor rehabilitation progress.

Table X.2: Multivariable analyses (p<0.1) between rehabilitation progress and study participants' characteristics

Variable	Category	Odds Ratio (OR)	Standard error	p-value
Age		**1.53**	**0.115**	**0.0002**
Sex	**Male**	**0.23**	**0.86**	**0.08**
	Female	**1.00**		
NCD comorbidity	**DM +HTN**	**1530492.29**	**2559**	**0.99**
	HTN	**0.00**	**4.12**	**0.16**
	None	**0.00**	**3.06**	**0.0008**

Adjusting for sex and co-morbidity, age as a continuous variable was associated with a 1.53 increase in the odds ratio of poor rehabilitation progress for every one-year increase in age. Male participants were 77% less likely to report poor rehabilitation progress compared to female participants, after adjusting for age and co-morbidity. Furthermore, individuals with co-morbidity of both diabetes and hypertension had considerably higher odds of poor rehabilitation progress, even when accounting for age and sex.