EARLY MORTALITY RATE AND ASSOCIATED RISK FACTOR IN PATIENTS UNDERGOING PRIMARY TOTAL HIP REPLACEMENT AT MUHIMBILI ORTHOPAEDIC INSTITUTE

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MMed (Orthopaedics and Traumatology)Dissertation

Muhimbili University of Health and Allied Sciences.

October 2024

Muhimbili University of Health And Allied Sciences

Department of Orthopaedics And Traumatology

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Dissertation Submitted in a (Partial) Fulfilment of the Requirements for the Degree of Masters of Medicine in Orthopaedics and Traumatology at

Muhimbili University of Health and Allied Sciences

October 2024

CERTIFICATION

This undersigned certifies that he has read and hereby recommend for acceptance by the Muhimbili University of Health and allied science this research project titled ***"Early Mortality Rate and Associated Risk Factor in Patients Undergoing Primary Total Hip Replacement at Muhimbili Orthopaedic Institute"***. In partial fulfilment of the requirement for the degree of Masters Orthopaedics and Traumatology of Muhimbili university of health and allied sciences

_____

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Date: _____

DECLARATION

I, Disha Deograthias Wadosa declare that this dissertation is my original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature: …… Date……..…

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ACKNOWLEDGMENT

I want to express my gratitude and acknowledge the following individuals who have significantly completed my study. Firstly, I am immensely grateful to Almighty God for providing guidance and protection throughout my study.

I sincerely appreciate my supervisor, Dr Violet Lupondo, an esteemed Orthopaedic Surgeon and Senior Lecturer at Muhimbili University of Health and Allied Sciences. Dr Lupondo has fulfilled her role as my supervisor and has also been a remarkable teacher in Orthopaedic and Traumatology, serving as a mentor throughout my journey. I am thankful for her willingness to be my supervisor and invaluable guidance in developing this dissertation.

I would also like to thank my co-supervisor, Dr Adam Hussein, an Orthopaedic surgeon and lecturer at Muhimbili University of Health and Allied Sciences. His contributions and support have been instrumental in shaping this research work, and I am thankful for his guidance and expertise. I appreciate all the esteemed Faculty members of the Department of Orthopaedic, Traumatology, and Neurosurgery. Their constructive input and feedback have been invaluable in helping me achieve the objectives of this research.

I want to thank my dear wife, Theleza Stanislaus, for her unwavering patience and support throughout my absence during this study. I am genuinely grateful for her understanding and encouragement. I would also like to express my love and gratitude to our lovely children, Janelle and Joellyn, for their understanding and constant motivation.

Lastly, I thank the MOI administration for permitting me to conduct my research at MOI, enabling me to carry out this study.

Each of these individuals and entities has played a vital role in my academic journey, and I sincerely appreciate their contributions.

DEDICATION

I dedicate this dissertation to my patients (research participants) for placing their most profound trust in me and completing this work efficiently.I dedicate the dissertation to my wife, Theleza, and my children, Janelle and Joellyn.

ABSTRACT

Background: Hip joint replacement surgery, or Total Hip Arthroplasty (THA), is an effective procedure for elderly patients. It can improve their quality of life and functionality while reducing the direct costs associated with arthritis. With increased THA procedures being performed on patients of different ages, it is essential to identify factors that may affect mortality for better patient care.

Objective: This study aimed to identify the early mortality rate and potential risk factors among patients undergoing primary total hip replacement at MOI.

Methodology: This was a retrospective cohort study conducted at MOI from January 2020 to December 2021, which involved 173 patients who had undergone Total Hip Replacement (THR). The sample was obtained by reviewing the hospital registry in consecutive order, and the study's primary objective was to determine the early treatment outcome, with a specific focus on patient mortality. Data was collected on various demographic characteristics, including age, gender, ASA status, duration of the procedure, mode of anaesthesia and history of co-morbidities. This data was analyzed using SPSS version 20 software. Continuous variables were summarized using mean and standard deviation to measure dispersion around the mean, while categorical variables were summarized using counts or proportions. The study's findings were presented using tables, figures, text and various statistical tests were used to analyze the data. Kaplan-Meier survival plots were used to estimate mortality rates, and log-rank chi-square was employed for group comparisons. Additionally, Cox regression analysis was used to control confounding variables. The significance level for the study was set at 0.05, and any p-value less than or equal to this was considered statistically significant.

Result: The study showed that more males (53.6%) participated than females. The participants had an average age of 55.9 years, with a standard deviation of 18.4. The mortality rate for patients undergoing total hip replacement surgery was 7 out of every 100, though it is important to note that over 93% of participants survived beyond the three-month threshold. The Cox regression multivariate analysis found that having hypertension and being seropositive for HIV were independent prognostic factors survival. Hypertension was associated with an increased chance of death by up to 4.8 times higher than not having hypertension, with HR = 4.791 at 95% CI and p = 0.015. The likelihood of death was eleven times higher among participants who were HIV+ compared to those who were HIV-negotiated, with HR = 10.963 at 95% CI and p-value = 0.006.

Conclusion: On average, one dies in every fourteen patients undergoing total hip replacement surgery within ninety days' post-treatment. Hypertensive patients had an increased chance of death of five times non-hypertensive. HIV+ patients had an increased chance of death, up to eleven times higher than HIV tested negative. Therefore, this highlights the different disease profiles of patients in our center hence, necessitating different approaches and strategies to the procedure.

TABLE OF CONTENT

CERTIFICATION ii
DECLARATION ii
ACKNOWLEDGMENT iii
DEDICATION iv
ABSTRACT v
TABLE OF CONTENT vii
LIST OF TABLES ix
LIST OF FIGURES x
ABBREVIATIONS xi
DEFINITION OF KEY TERMS xii
1.0 INTRODUCTION 1
1.1 Background 1
1.2 Problem Statement 2
1.3 Conceptual Framework 2
1.4 Rationale 3
1.5 Research Questions 3
1.5.1 Broad Research Question 3
1.5.2Specific Research Questions. 3
1.6 Research Objectives 3
1.5.1 Broad Objective 3
1.5.2 Specific Objectives 3
1.7 Literature Review 4
1.7.1 Mortality Rate in THA 4
1.7.2 Factors associated with early mortality. 4
1.7.2.1 Age 4
1.7.2.2 Gender 4
1.7.2. Comorbidity 5

2.0 METHODOLOGY 7
2.1 Study Design 7
2.2 Study Population 7
2.3 Study Area 7
2.4 Study duration 7
2.4.1Inclusions Criteria 7
2.4.2 Exclusions Criteria 7
2.5 Sample Size and sampling technique 8
2.5.1 Dependent variables 9
2.5.2 Independent variables. 9
2.6 Data Collection. 9
2.6.1 Preoperative Information 9
2.6.2 Intraoperative Information 9
2.6.3 Postoperative Information up to 90 days 10
2.7 Data Analysis and Presentation 10
2.8 Ethical Consideration and Consent 11
3.0 RESULTS 12
4.0 DISCUSSION 26
5.0 CONCLUSION AND RECOMMENDATIONS 28
5.1 Conclusion 28
5.2 Recommendations 28
REFERENCES 29
APPENDICES 33
Appendix II: Clearance letter 35
Appendix III: Pemission Letter 37

LIST OF TABLES

Table 1: Social demographic characteristics of the patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.....13

Table 2: Treatment and clinical features of the patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.....14

Table 3: Prognostic factors associated with mortality among patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.....25

LIST OF FIGURES

Figure 1: Kaplan–Meier survival plots grouped by hypertensive status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, ...15

Figure 2: Kaplan–Meier survival plots grouped by diabetic status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021,.....16

Figure 3: Kaplan–Meier survival plots grouped by HIV status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021,.....17

Figure 4: Kaplan–Meier survival plots grouped by age and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021,.....18

Figure 5: Kaplan–Meier survival plots categorized by gender and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.....19

Figure 6: Kaplan–Meier survival plots grouped by categorized time taken to complete procedure and compared by the log-rank test among patients who underwent THR at MOI during the period of 2020 to 2021,.....20

Figure 7: Kaplan–Meier survival plots grouped by diagnosis and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021,.....21

Figure 8: Kaplan–Meier survival plots grouped by education level and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021,.....22

Figure 9: Kaplan–Meier survival plots grouped by marital status and compared by the log-rank test among patients who underwent THR at from of 2020 to 2021,. 23

ABBREVIATIONS

ASA	-	American Society of Anaesthesiologists
ECG	-	Electrocardiogram
ECHO	-	Echocardiogram
Hb	-	Haemoglobin
HR	-	Hazard ratio
MOI	-	Muhimbili Orthopaedic Institute
MUHAS	-	Muhimbili University of Health and Allied Sciences
NOF	-	Neck of femur fracture
OA	-	Osteoarthritis
OR	-	Odds Ratio
RBG	-	Random Blood Glucose
SPSS	-	Statistical Package for Social Science
THA	-	Total hip Arthroplasty
THR	-	Total Hip Replacement
USA	-	United State of America

DEFINITION OF KEY TERMS

Primary total hip arthroplasty is the initial surgery to replace a joint affected by different causes.

Mortality refers to the number of fatalities attributed to a particular illness or condition.

Early Mortality refers to deaths between the day of surgery and 90 days after surgery.

Comorbidities are medical conditions that exist simultaneously but independently of other conditions or related derivatives. Some examples of comorbidities that may increase Mortality in patients undergoing THA include diabetes mellitus, smoking, alcohol use, steroid use, and infections.

General anaesthesia is a state of induced unconsciousness wherein the person loses protective reflexes, including maintaining an airway and responding to physical or verbal cues.

Orthopaedic procedures include preventing, diagnosing, and treating bone, joint, ligament, tendon, and muscle disorders.

Pulmonary embolism is a medical condition where one or more blood clots block the arteries in the lungs, which leads to a decrease in blood flow to the lungs.

Conservative therapy is a medical treatment approach that avoids invasive methods like surgery or other procedures involving invasion.

Perioperative Complication-Is a medical problem which arises during or after a surgical procedure.

Hb Level: Haemoglobin in red blood cells transports oxygen and carbon dioxide. A low count can indicate anaemia.,

Anaemia is a medical condition where the number of red blood cells or haemoglobin levels in the blood is lower than usual. For men, *anaemia* is defined as a haemoglobin level of less than 13.5 grams/100 ml; for women, it is less than 12.0 grams/100 ml.

Random blood sugar is monitoring or regularly monitoring blood glucose levels through fingerstick testing. Continuous glucose monitoring can help individuals with diabetes manage their condition and prevent long-term complications.

1.0 INTRODUCTION

1.1 Background

Hip replacement surgery, also known as total hip arthroplasty (THA), is a successful orthopaedic procedure becoming more common in developing African countries(1). However, despite its safety and effectiveness, there are still possible complications, such as pulmonary embolism, dislocation, and infection(2). Unfortunately, limited information is available regarding THA's epidemiology in developing countries like Tanzania(3).

THA has been found to enhance patient function and improve their overall health-related quality of life compared to traditional treatment methods. Additionally, it is associated with reduced direct costs related to arthritis (4,5). However, THA has risks, including the potential for death and various perioperative complications. As medical care has advanced, life expectancy has increased, particularly among patients with long-term systemic illnesses. It has led to a rise in THA procedures among those with comprehensive medical chronic diseases (6,7).

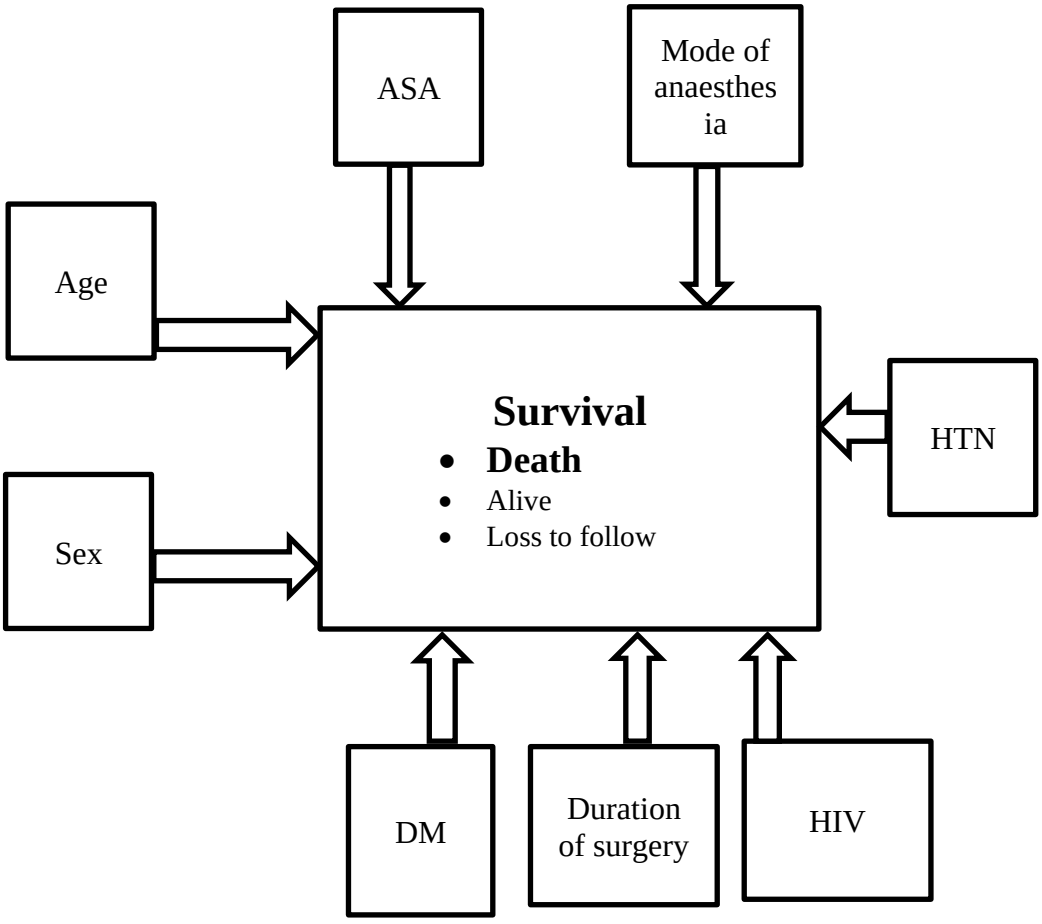
THA is a well-known procedure that can improve quality of life and functional outcomes and reduce pain despite the potential risks (8). After undergoing THA, patients may experience complications, with up to 3.9% of cases being affected, and mortality is a concerning outcome (9,10). As THA is performed on patients of all ages, it is crucial to identify risk factors associated with increased patient mortality. It is important to note that all medical procedures carry some risk, including the possibility of death. In order to enhance surgical decision-making, it is essential to accurately calculate and communicate the risk of mortality following a THA procedure to patients(11).

Furthermore, modifiable surgical risk factors of patients should be identified for preventive steps(11). The data is scarce in developing countries, including Tanzania. Hence the study is set to provide this essential information.

1.2 Problem Statement

For nearly 23 years, MOI has been performing total hip replacement surgeries that have successfully improved quality of life of the patients. However, there is a risk of mortality associated with the procedure that can occur shortly after surgery. The exact mortality rate and risk factors are unknown, so this study aims to shed light on these factors associated with mortality following THR.

1.3 Conceptual Framework



1.4 Rationale

The findings of this study will play a crucial role in establishing a baseline understanding of the mortality rate following total hip replacement (THR) and the various contributing factors. Identifying these risk factors will enable the implementation of targeted interventions to reduce mortality rates in our community. Additionally, this knowledge will catalyse further research on this critical topic.

1.5 Research Questions

1.5.1 Broad Research Question

What are the early mortality rate and associated risk factors in patients undergoing primary total hip arthroplasty?

1.5.2 Specific Research Questions.

1. What is the mortality rate in patients undergoing primary total hip arthroplasty?
2. Does risk factors such as age, sex, hypertensive heart disease, diabetes mellitus, ASA score, duration of surgery and HIV affect mortality in patients undergoing primary THR?

1.6 Research Objectives

1.6.1 Broad Objective

This study aimed to identify the early mortality rate and potential risk factors among patients undergoing primary total hip replacement at MOI.

1.6.2 Specific Objectives

1. To determine the early mortality rate among patients undergoing primary total hip replacement at MOI.

2. To determine the risk factors associated with early mortality among patients undergoing primary total hip replacement surgery at MOI.

1.7 Literature Review

1.7.1 Mortality Rate in THA

The early mortality rate refers to deaths between the day of surgery and 90 days after surgery. It is sometimes referred to as inpatient, one-month, 45-day, or three months' mortality in the medical literature (12–17). In wealthy countries, the inpatient mortality rate decreased from 2% in the 1970s to less than 0.2% (18–20).

In a nationwide survey conducted in the US between 2007 and 2008, Illingworth et al. found that the inpatient mortality rate following THA was 0.13%, which equates to 660 out of 500,815 patients (20). In Burkina Faso, a study by Daschle et al. showed a Perioperative mortality rate of 1.29% (2 out of 155) following THR (21).

1.7.2 Factors associated with early mortality.

1.7.2.1 Age

There is much research suggesting that age and male gender increase the risk of mortality after THA. The risk of mortality increased with age in Blom et al. study. The mortality rate of 30 days for people under 70 was 0.00%,0.048 per cent for those aged 70 to 79, and 1.43 per cent for those aged 80 and above (1). Multiple studies have found a link between advancing age and increased mortality. For instance, in the study by Philip J et al., age groups > 80 years or equal ($p<0.001$) and 70-79 years old ($p=0.003$) (22).

1.7.2.2 Gender

Even though most research has found a link between male gender and increased mortality, of the reviewed studies, two did not show this association. The mortality of 30-day risk given in the National Joint Registry's tenth (2013) Annual Report for Northern Ireland, Wales and England was from 0.06 per cent for women < 55 to 1.18 per cent for men above 80 years. In the study by Bitstock et al., a systemic review of 32 studies found that the risk factor for early mortality rate was male gender (14), Similar observation by E.J. Smith et al. in his study of 30-day mortality after elective THA (23).

1.7.2. Comorbidity

Certain factors have been identified as risks for mortality, including a Charlson co-morbidity index >3, an American Society of Anaesthesiologists risk score >3, use of general anaesthesia, and pre-existing cardiovascular illness (14,22,24,25). Various studies have used multivariate logistic regression models to examine risk factors for mortality after THA (20,22,24,26–32). According to Comba et al., pre-existing cardiovascular diseases increase the risk of death eight times (OR 8.83 at 95% CI (1.77 to 43.60). Studies examining perioperative mortality have also found that pre-existing cardiovascular diseases are a significant risk factor for early mortality post-THR. A study by Aynardi et al. concluded that myocardial infarction was a common cause of mortality following THA (33). Similarly, studies by Gandhi et al. and Parvizi et al. observed that mortality rates were higher in patients with pre-existing cardiovascular disease, with similar results found in a study by Bostock et al. in 2014 (34). However, Gaston et al. found contradictory results.

Bozic et al. conducted a study using a 5% sample of the United States Medicare population. They used a multivariate Cox regression analysis to establish hazard ratios for 90-day mortality. According to their findings, chronic pulmonary disease (HR 1.32), dementia (HR 2.04), metastatic cancer (HR 3.14), renal disease (HR 1.98), hemiplegia/paraplegia (HR 2.62), psychosis (HR 1.85), congestive heart failure (HR 2.11), and cerebrovascular disease (HR 1.40) were all significantly associated with mortality up to 90 days (24).

According to the findings by Hunt et al., individuals with moderate to severe liver illness faced a 10-fold higher risk of mortality(31). Additionally, myocardial infarction (MI) was associated with a three-fold increase in mortality risk, while diabetes and renal disease had a two-fold rise in mortality risk. In Philip J et al.'s study, it was observed that renal insufficiency and cardiac disease were the strongest predictors of mortality(22).

The study by Bhattacharya et al. found that chronic renal failure, atrial fibrillation, chronic obstructive pulmonary disease, metastasis to bone, and osteomyelitis were preoperative medical risk factors for high mortality rates and deaths (10). Diabetes, peripheral vascular disease, coronary artery disease, rheumatoid arthritis, and septic arthritis were not identified as

significant risk factors (10). Operations for arthritis, older adults' malignancies, infection, and trauma were all linked to higher fatality rates among orthopaedic subspecialty groups. Congestive heart failure, chronic renal failure, hip fracture, and chronic obstructive pulmonary diseases with a chronic age above seventy years were identified as the diseases. Patients with no significant risk factors had a death rate of 0.25%. Death increased linearly with rising numbers of significant risk variables (p 0.005).(10).

2.0 METHODOLOGY

2.1 Study Design

This was a single institution based retrospective design study.

2.2 Study Population

Patients who underwent total hip replacement surgery.

2.3 Study Area

A study was conducted at MOI in the Ilala district of Dar es Salaam, a tertiary institute providing specialized Orthopaedic, Trauma and Neurosurgical Care. The hospital receives patients from all over the country and neighbouring countries and also serves as a training centre for orthopaedic and neurosurgery residents from MUHAS. The researcher hopes to gain valuable insights from this study.

2.4 Study duration

This study started February 2022 and ended in May 2023.(13 month)

2.4.1Inclusions Criteria

- Patients aged 18 years and above who underwent primary THR from January 2020 to December 2021 at MOI.

2.4.2 Exclusions Criteria

- **All patients who died more than 90days**
- All patients underwent revision THR
- Patients with missing data.

2.5 Sample Size and sampling technique

All patient underwent primary total hip replacement.

2.6 Sample Size Determination

The sample size was calculated using the formula recommended for estimation of a sample proportion with the required margin of error and confidence level below

$$N = \frac{Z^2 \times P \times (1 - P)}{\varepsilon^2}$$

Where;

N = Desired sample size

Z = Percentage of standard normal distribution corresponding to 95% of confidence interval which is 1.96

ε = Marginal error (absolute precision of P which is 5%)

p = 13% which was obtained from the pilot conducted before commencement of this study, due to absence of published studies about THR in Tanzania.

$$N = \frac{1.96^2 \times 0.13 \times (1 - 0.13) =}{0.05^2} = 173$$

The sample size calculated was 173.

By calculating the 10% of this sample size, to account for the non-responses, then the 10% of 173 sample size is 17. By adding this on the calculated sample, we get 190.

Therefore, this study projected a sample of 190 participants but 183 patients were enrolled

2.7 Variables.

Age, sex, ASA, Cardiac diseases, operation time, mode of anaesthesia, diabetes, mortality rate.

2.7.1 Dependent variables

Mortality rate

2.7.2 Independent variables.

Age, sex, ASA, Cardiac diseases, operation time, mode of anaesthesia, diabetes, HIV.

2.6 Data Collection.

To thoroughly analyze patients who underwent total hip replacement (THR) from January 2020 to December 2021, the list of patients was obtained from the joint registry book at MOI. Then, the patients information was isolated from the institution's medical records. The data about mortality were collected from the mortality statistics store of MOI.

In terms of mortality, any deaths occurring within 90 days' of surgery were considered early mortality. For patients who have yet to return for follow-up within the last 90 days, their next of kin's phone numbers were used to gather information about their well-being. Nevertheless the patient files were used to gather essential details about their social demographics, clinical conditions (such as diabetes, hypertension, and anaemia), and surgical history (such as ASA score, mode of anaesthesia, and operation time). Collecting this information made a better understanding of the outcomes and factors affecting patients who underwent THR during the specified period possible.

2.6.1 Preoperative Information

For eligible patient, hospital registration number, Social demographic data such as age and sex, HB Level, comorbidities (such as hypertensive heart diseases and diabetes) and ASA.

2.6.2 Intraoperative Information

Duration of operation and mode of anaesthesia.

2.6.3 Postoperative Information up to 90 days

Postoperative information within 90 days whether died or survived.

2.7 Data Analysis and Presentation

The collected data were carefully checked and entered into the Statistical Package for Social Science (SPSS) Version 26, released in 2019 by IBM Corp. The checklist was securely kept in a locked cabinet, and a digital copy of the SPSS data file was saved in a computer protected by a password and firewall security.

The checklist data were cross-checked for completeness and consistency to ensure accuracy before entering, cleaning, and analysing using SPSS. Data cleaning involved checking for missing and duplicate entries. Continuous variables like age and parity were categorized based on their relation to other findings in the literature. Categorical variables were categorized multiple times until final categories were obtained based on class distribution and literature articulation. See the figure below for a summary of the variables.

Frequency and percentage were used to summarise categorical variables and presented them in tables and figures. Measures of central tendency and their respective measure of the spread of data were used to summarize numerical variables.

The success of total hip replacement (THR) surgery is classified as either surviving or not surviving. Researchers calculate the mortality rate by dividing the number of participants who passed away by the total number of participants and multiplying it by 100. Researchers employ survival analysis to determine the prognostic factors for mortality in THR surgery. This type of analysis classifies the outcome variable as dead or censored (meaning the participant's status is unknown or they withdrew from the study). To examine survival rates, researchers must specify death as the outcome of interest, and the statistical software will group those still alive as censored.

The analysis was conducted using Kaplan-Meier for univariate analysis and Cox regression analysis (Hazard Ratio) for multivariate analysis. The survival period was measured from admission until ninety days after treatment.

In studying factors that predict mortality after THR surgery, variables with a log-rank p-value of 0.05 or less were analyzed using Cox regression, a multivariate survival analysis. Hazard Ratios were used to determine the influence of these variables on mortality. Variables that were statistically significant at $p<0.05$ were found to be associated with mortality.

2.8 Ethical Consideration and Consent

Prior ethical clearance was obtained from the Ethics and Institutional Research Board to conduct an observational study. MOI then granted permission. Next of kin were informed about the study and requested oral consent before providing information about the patient. The principles of good clinical practice were followed to ensure patient data and privacy were protected. The study aims to determine the mortality rate and associated risk factors for further intervention of the complication. The patient encounters no risk during the observational study, only the potential benefit of increased awareness.

3.0 RESULTS

In this study, a total of 183 individuals were recruited, resulting in a 100% response rate. The participants' average age was 55.9 years, with a standard deviation of 18.4. A detailed breakdown of the social demographic characteristics of the sample can be found in Table 1. It was observed that slightly more males (53.6%) participated in the study than females. Additionally, most participants (60.1%) were below 65. A significant number of participants (64.5%) were married or cohabiting, while 41.0% had completed secondary education, and only 5.5% lacked formal education. Furthermore, it was noticed that most participants (46.4%) were unemployed. In terms of the mortality rate, it was observed that 7 out of every 100 patients undergoing total hip replacement surgery died. Only one death occurred at the hospitals. However, it is worth noting that over 93% of the participants survived beyond the three-month threshold.

Table 1: Social demographic characteristics of the patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.

VARIABLES	Frequencies (Percentage)
Sex	
Male	98(53.6)
Female	85(46.4)
Age	
< 65	110(60.1)
65+	73(39.9)
Marital Status	
Single/widow/divorced	65(35.5)
Married/Cohabiting	118(64.5)
education level	
No formal	10(5.5)
Primary	51(27.9)
Secondary	75(41.0)
College/university	47(25.7)
occupation	
Employed	43(23.5)
Not employed	85(46.4)
Self employed	55(30.1)

Table 2 presents a detailed breakdown of the treatment variables for the sample study participant. Most participants (43.7%) were diagnosed with NOF, while 28.4% had OA. Among the participants who used ASA, 94.0% used type 1. Regional anaesthesia was standard in 72.7% of the participants. Most surgical procedures (71.6%) lasted less than two hours from cutting time. Comorbidities were present in 34 (18.6%) recruited participants, with 11 (32.4%) having multiple comorbidities. Hypertension was the most common comorbidity among 24 (13.1%) study participants.

Table 2:Treatment and clinical features of the patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.

VARIABLES	Frequencies (Percentage)
Diagnosis	
NOF	80(43.7)
NHD	17(9.3)
OA	52(28.4)
AVN	23(12.6)
PTA	11(6.0)
ASA	
Type 1	172(94.0)
Type 2	10(5.5)
Type 3	1(.5)
Type anaesthesia	
Regional	133(72.7)
General	50(27.3)
Duration of surgery	
1	131(71.6)
2	51(27.9)
3	1(.5)
DM	
No	169(92.3)
Yes	14(7.7)
HT	
No	159(86.9)
Yes	24(13.1)
HIV	
No	176(96.2)
Yes	7(3.8)

The graph in Figure 1 displays the number of patients in two groups: those with hypertension (HT) and those without. Within the group of patients with HT, 20.8% passed away. On average, patients with hypertension survived for 84 days.

A log-rank test was conducted to compare the survival rates of participants with and without HT. The results showed that the survival rates were significantly different between the two groups, with a $\chi 2(1)$ value of 1.92 and a p-value of 0. 004.

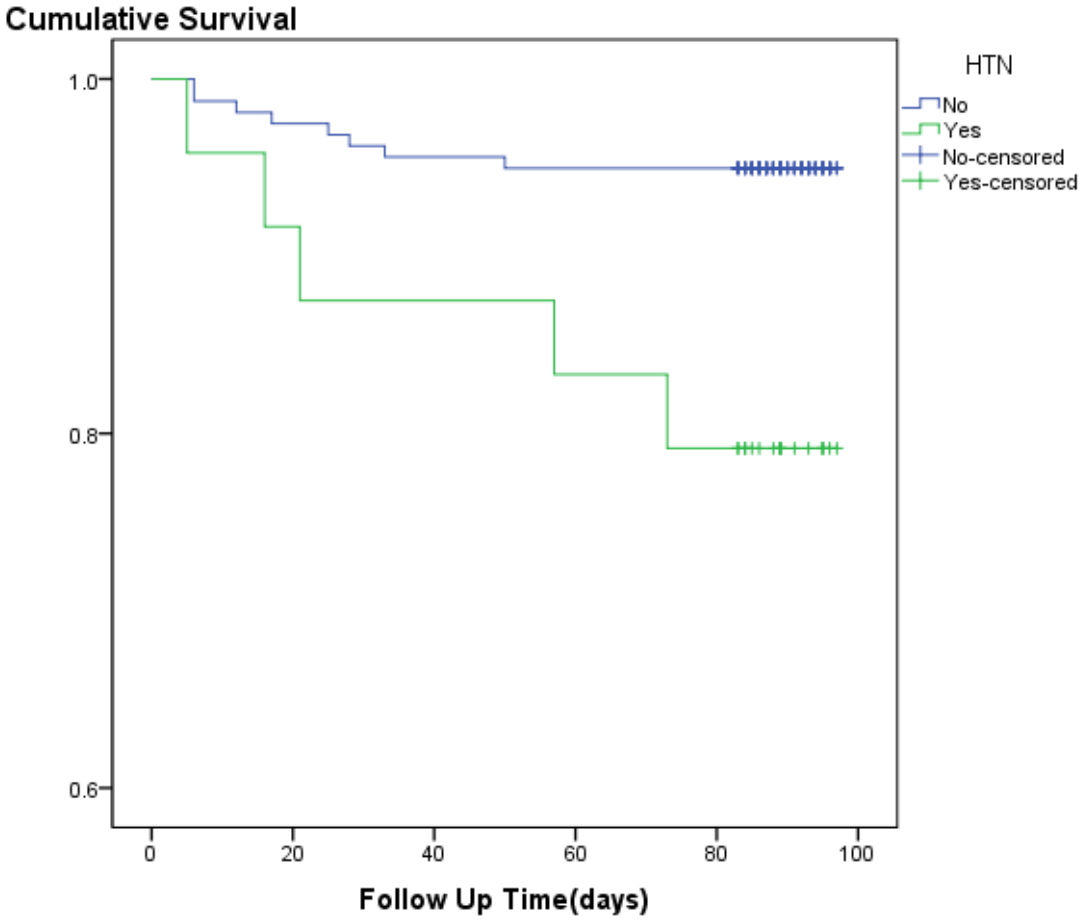


Figure 1: Kaplan–Meier survival plots grouped by hypertensive status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

The chart in Figure 2 displays the survival of patients categorized by their diabetic status: those with diabetes and those without. A log-rank test was conducted to compare the survival rates of participants with and without diabetes. The results showed a statistically significant difference in survival rates between the two groups, with a $\chi 2(1)$ value of 1.92 and a p-value of 0.001. Out of all the cases with diabetes, 28.4% resulted in death.

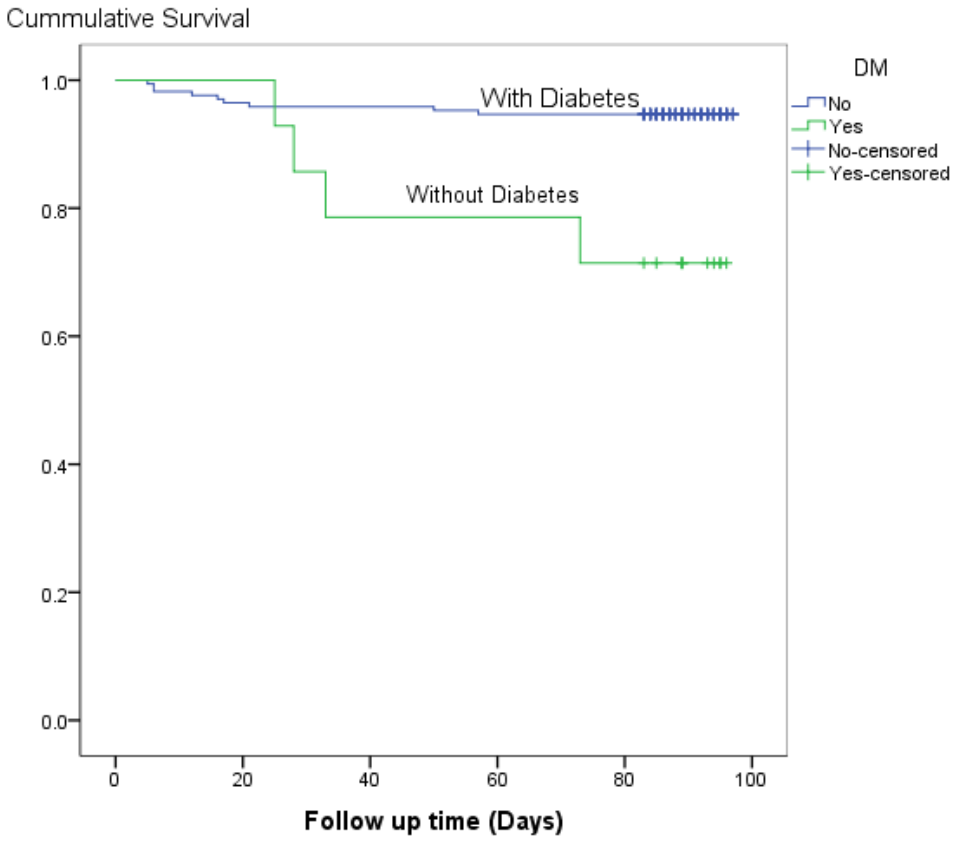


Figure 2: Kaplan–Meier survival plots grouped by diabetic status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

Figure 3 shows the surviving fraction of patients for the two categories of HIV status; those with and without HIV.

A log-rank test was run to determine if there were differences in the survival distribution for the different statuses of HIV among participants. The survival distributions for the two having and not having HIV were statistically significantly different, $\chi 2(1) = 16.6$, $p < 0.001$. Among the total cases of HIV+, 28.4% died.

Figure 3

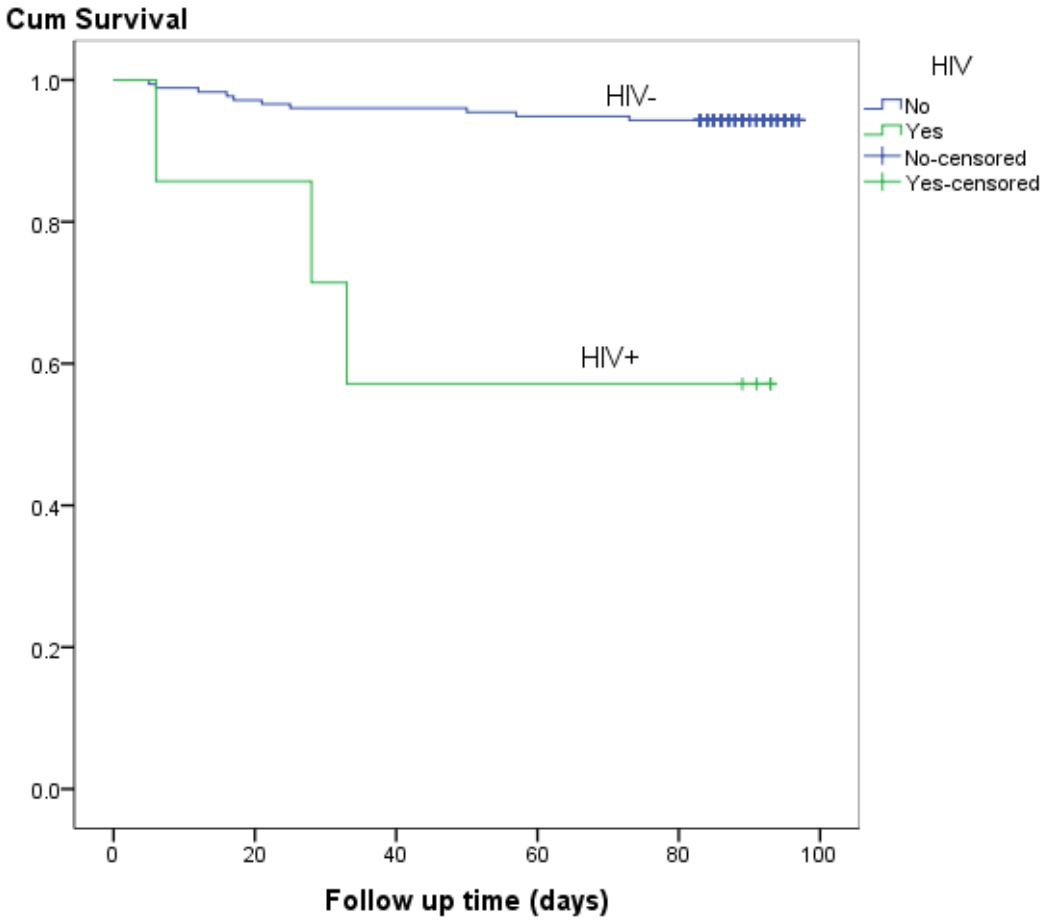


Figure 3: Kaplan–Meier survival plots grouped by HIV status and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

In Figure 4, we can see the number of patients divided into two age groups: those under 65 years old and those 65 years old and above. A log-rank test was conducted to see if there were any differences in survival rates between the two groups. The results showed a statistically significant difference in survival rates between the two groups, with a $\chi 2(1)$ value of 5.0 and a p-value of 0.026. The death rate was 3.6% for those under 65 years old and 2.3% for those 65 and above.

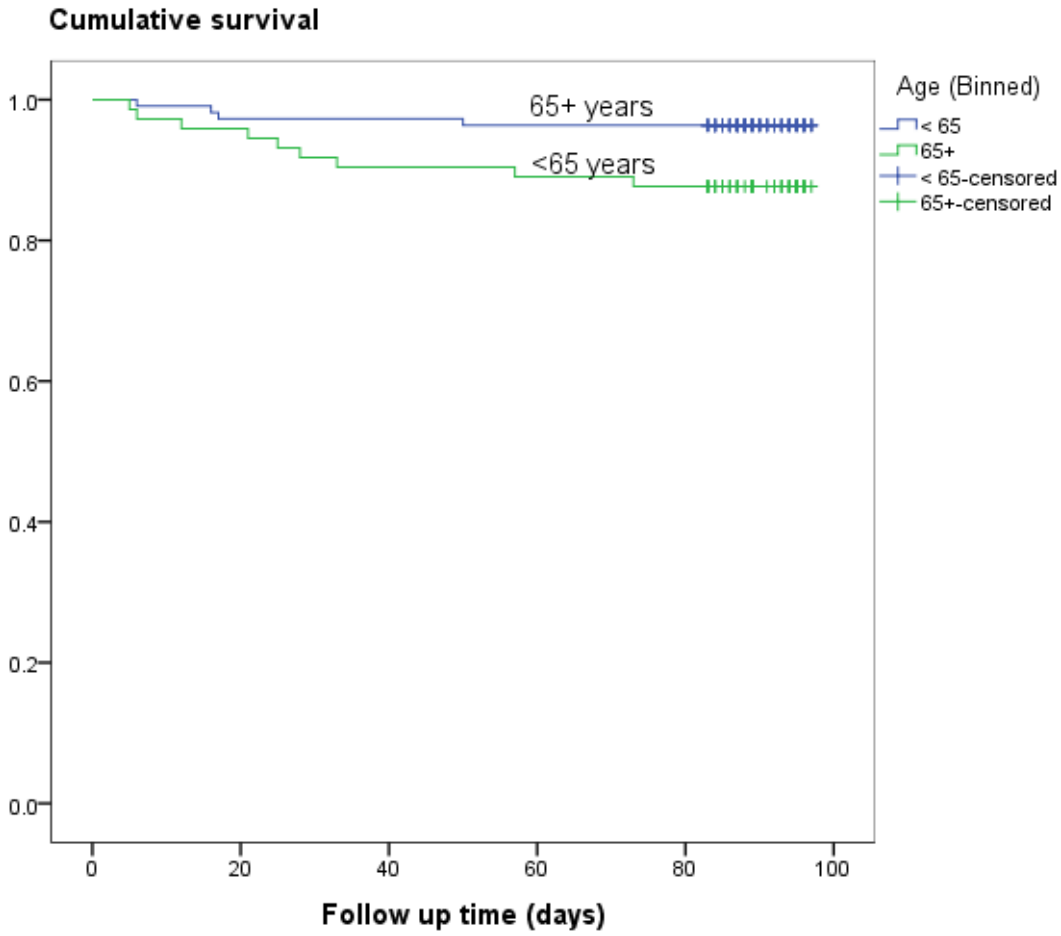


Figure 4: Kaplan–Meier survival plots grouped by age and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

Based on Figure 5, the number of patients was categorized by gender. A log-rank test was conducted to determine whether there were any differences in the survival distribution between the genders of the participants. The results showed no statistically significant difference in the survival distribution between gender categories, with a $\chi 2(1) = 0.39$ and a p-value of 0.53. The rate of deaths was 8.2% for males and 5.9% for females.

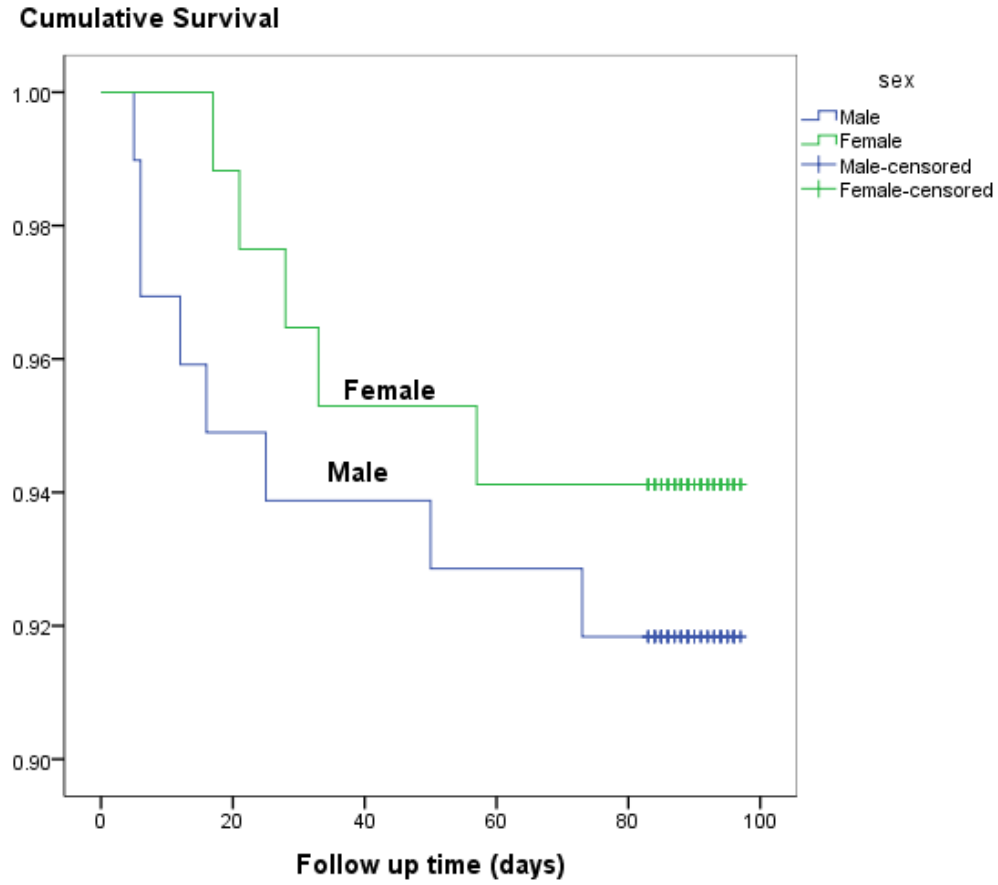


Figure 5: Kaplan–Meier survival plots categorized by gender and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

In Figure 6, we can see participants' survival rates grouped by their surgery duration. Those who had surgery for more than 2 hours had a higher rate of death (11.8%), while those who had surgery for less than 2 hours from cutting time had a death rate of 5.3%. A log-rank test was conducted to determine if there were any significant differences in survival rates among participants based on surgery duration. The results showed no statistically significant differences in survival rates, with a $\chi 2(2)$ value of 2.42 and a p-value of 0.3.

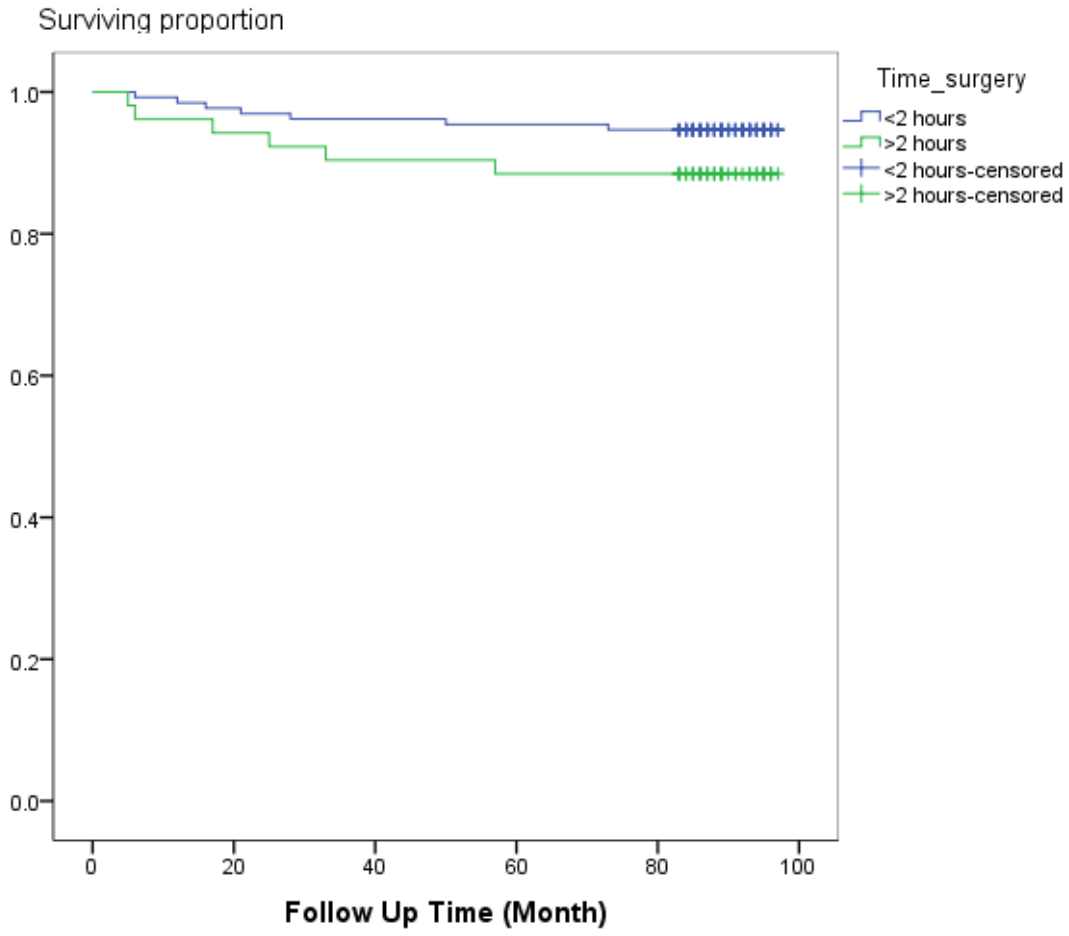


Figure 6: Kaplan–Meier survival plots grouped by categorized time taken to complete procedure and compared by the log-rank test among patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.

Figure 7 shows the surviving fractions per type of diagnosis. Participants who had AVN and PTA were all surviving. Death was more among NOF (12.5%), then followed by NHD (5.9%) and OA (3.8%).

A log-rank test was run to determine if there were differences in the survival distribution for the different diagnoses of the participants. The survival distribution among different types of diagnosis was not statistically significantly different, $\chi 2(4) = 6.84$, $p = 0.14$.

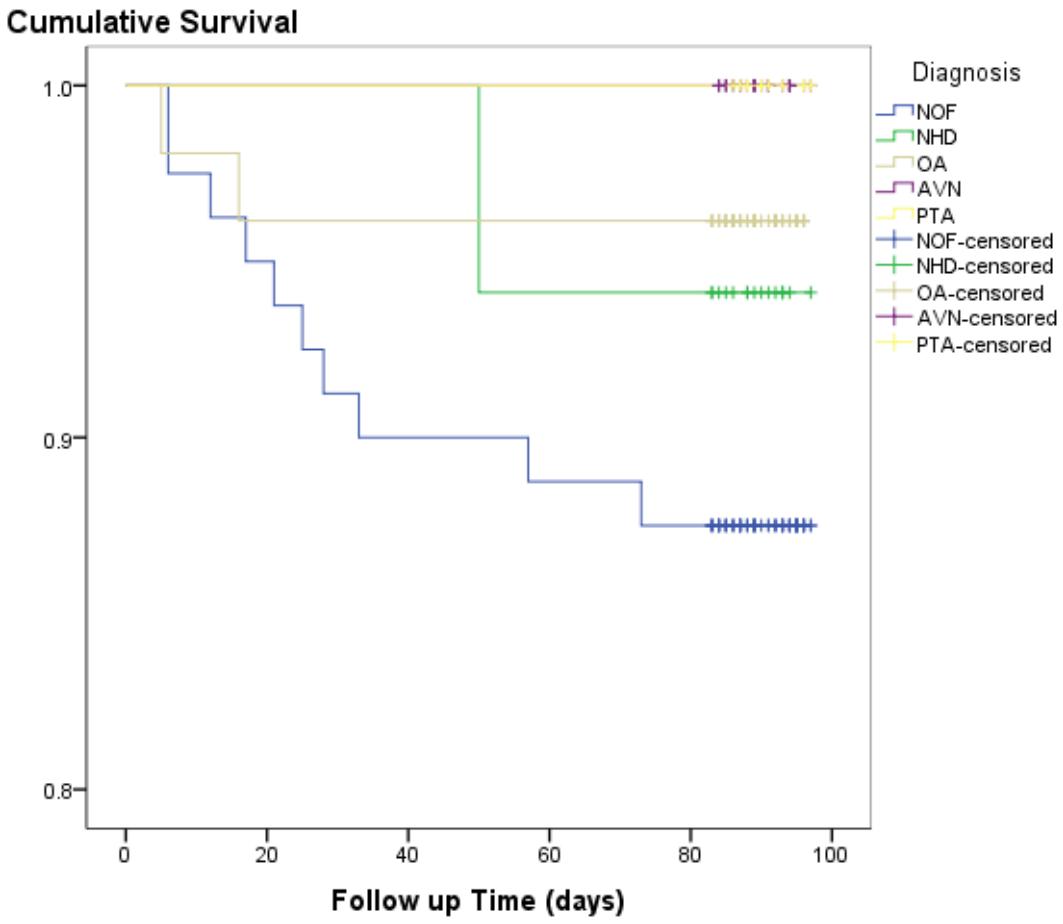


Figure 7: Kaplan–Meier survival plots grouped by diagnosis and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

The data in Figure 8 displays the percentages of individuals who survived based on their education level. The death rate was highest among those with no formal education at 30%, followed by primary education at 5.9%, secondary education at 4%, and college/university education at 7.1%. A log-rank test was conducted to examine if there were any significant differences in survival rates between the education levels of the participants. The results showed no statistically significant difference in survival rates among different types of diagnosis, with a $\chi 2(3)$ value of 9.04 and a p-value of 0.03.

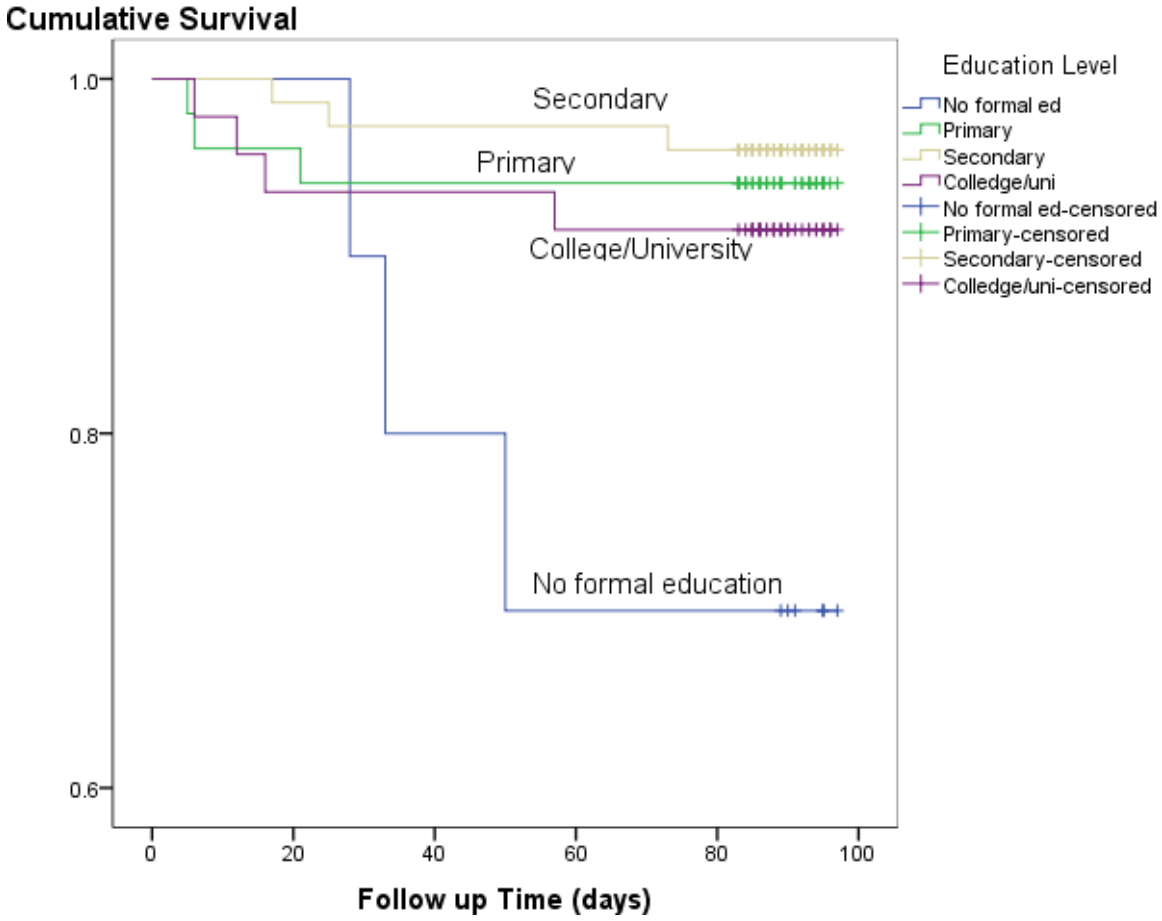


Figure 8: Kaplan–Meier survival plots grouped by education level and compared by the log-rank test among patients who underwent THR at MOI from 2020 to 2021, N = 183.

The chart in Figure 9 displays the percentages of people who survived based on their marital status. Those who were single, widowed, or divorced had a death rate of 4.4%, while those who were married or cohabiting had a higher rate of 8.5%.

A log-rank test was conducted to see if there were any significant differences in survival rates among the different marital statuses. However, the results showed no statistically significant differences in the survival distribution between the groups, with a $\chi 2(1)$ value of 0.96 and a p-value of 0.33.

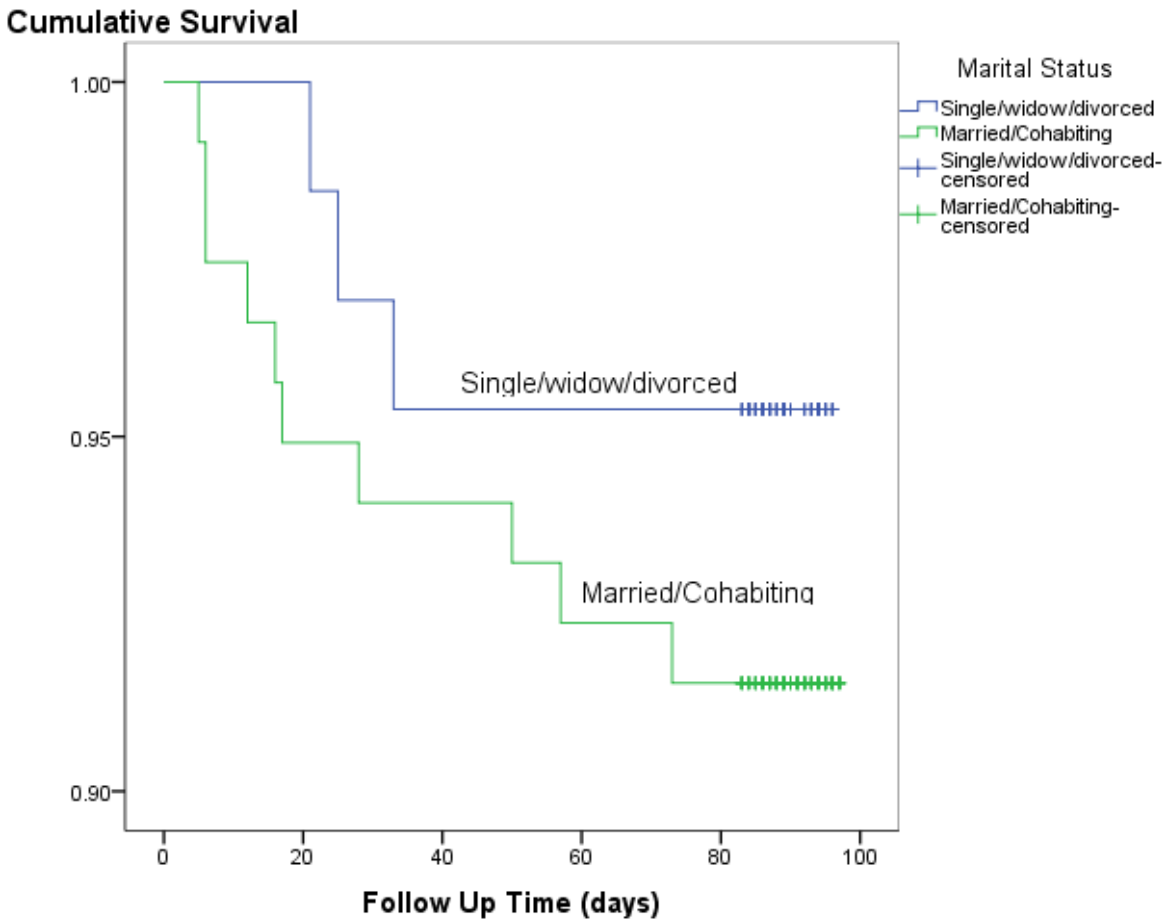


Figure 9: Kaplan–Meier survival plots grouped by marital status and compared by the log-rank test among patients who underwent THR at from of 2020 to 2021, N = 183.

Table 3 below describes the multivariate Cox regression analysis. The Cox regression multivariate analysis was run for all variables that were found to be having a Log-rank test $p<0.05$. Having hypertension and being seropositive for HIV were independent predictors of survival. Hypertension was associated with an increased chance of death by up to 4.8 times higher than not having hypertension. The association was statistically significant with HR = 4.791 at 95% CI (1.353—16.968) and $p = 0.015$. The likelihood of death was eleven times higher among participants who were HIV+ compared to those who were HIV-negative. There was a statistically significant association with HR = 10.963 at 95% CI (2.015—59.642) and p value = 0.006.

Table 3: Prognostic factors associated with mortality among patients who underwent THR at MOI during the period of 2020 to 2021, N = 183.

VARIABLES	95.0% CI for AOR (Lower—Upper)	P value
Age		
< 65 Years	REFERENCE	1
65+ Years	2.574(.615—10.766)	.195
Education		
Informal	REFERENCE	1
Primary	.399(.064—2.498)	.326
Secondary	.307(.050—1.890)	.203
College/University	1.484(.213—10.329)	.690
Diabetes		
No	REFERENCE	1
Yes	1.163(.253—5.341)	.846
Hypertension		
No	REFERENCE	1
Yes	4.791(1.353—16.968)	.015
HIV status		
Negative	REFERENCE	1
Positive	10.963(2.015—59.642)	.006

4.0 DISCUSSION

Approximately one-fourth of postoperative deaths occur after hospital discharge (35). In this study, involving 183 patients who underwent total hip replacement surgery, 14 died (7.7%) within 90 days after surgery. This proportion does not involve death in the operating rooms, however, death after discharge from the hospital was common, accounting for all deaths. The two comorbidities that were independently associated with mortality and had the highest attributable fractions were hypertension and HIV. Hypertensive patients had increased chance of death of five times non-hypertensive. HIV+ patients had increased chance of death of up to eleven times higher than HIV tested negative.

The early 90-day mortality rate for patients who underwent total hip replacement surgery was higher in this study compared to previous regional studies in countries like Botswana (1) and Burkina Faso (30). However, it was similar to the rate in a study conducted across 25 African countries (36). The small sample size of this study may have contributed to the higher mortality rate and could affect the accuracy of the findings. Variations in the study population and methodology may also influence the results. Despite these disparities, the findings are concerning and require further investigation. It is important to note that the study's results may only apply to some populations.

The most common cause of mortality in the immediate post-operative period following THR is cardiovascular disease. In this study, almost 21% of the deaths occurred among hypertensive participants, and hypertensive patients had a hazard ratio five times higher than others. Bass et al. reported a 58% incidence of ischemic myocardial infarction post treatment. This could be likely due to increased cardiac complications. The Menendez et al. study revealed an incidence of MI post TJA of 0.2 %. Subsequently, all patients with co-morbidities were reviewed by physicians preoperatively. Other causes of mortality are pulmonary embolism, cerebrovascular disease, sepsis, and bleeding (8,34). The third mortality reported in this study was found to be due to pulmonary embolism. This occurred after the initiation of the physician review program. The cause of death in the Dossche et al. study from Burkina Faso was due to complications of sickle cell disease resulting in massive haemolysis in one patient and pulmonary embolism in

another (38). This highlights the different disease profiles of patients in developing countries compared to developed countries, necessitating different approaches and strategies to the diseases endemic to these countries.

The result of our study found that HIV+ was associated with an increase in mortality among patients undergoing total hip replacement surgery by a multiple of eleven. A study conducted in Sweden found that HIV+ patients who underwent total hip replacement surgery had an 11-fold higher risk of mortality within 90 days of surgery compared to non-HIV+ patients (31). This highlights the importance of careful patient selection and management in this population to minimize surgical risks. However, a study published in the Journal of Bone and Joint Surgery found that HIV+ patients who received antiretroviral therapy prior to total hip replacement surgery had similar complication rates and mortality rates as HIV-negative patients (39). This suggests that appropriate medical management can mitigate the increased risk associated with HIV+ status in this surgical context.

This study found no significant association between age, gender, and diabetes with mortality rate. However, previous studies have reported a link between advancing age and increased mortality rates. Blom et al. observed a 30-day mortality rate of 0.00% for individuals under 70 years old, 0.048% for those aged 70 to 79, and 1.43% for those aged 80 and above. Philip J et al. identified significant associations between age groups > 80 years or equal and 70-79 years old with increased mortality risk. Bitstock et al. conducted a systematic review of 32 studies and found a consistent observation of male gender as a risk factor for early mortality (11). E.J. Smith et al. investigated the 30-day mortality after elective THA and found a similar association between male gender and higher mortality risk (15). Throughout the course of this study, no instances of in-hospital mortality were observed.

- Study weakness.
- Retrospective : single institution study
- Small sample size

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

On average, one dies in every fourteen patients undergoing total hip replacement surgery within ninety days' post-treatment. Hypertensive patients had an increased chance of death of five times non-hypertensive. HIV+ patients had an increased chance of death, up to eleven times higher than patient who tested negative. for HIV . Therefore, this highlights the different disease profiles of patients in developing countries compared to developed countries, necessitating different approaches and strategies to the diseases endemic to these countries.

5.2 Recommendations

- The study's mortality data were obtained from a small sample size, limiting the findings' generalizability.
- In order to improve the reliability of the results, it is recommended to conduct studies with a larger sample size to obtain more accurate early mortality rate data.
- Underlying health conditions such as hypertension and HIV can worsen mortality rates. Therefore, patients may require more attention and monitoring before and after the procedure. The study emphasizes the significance of evaluating a patient's overall health status to assess the pros and cons of total hip replacement surgery. By doing so, healthcare professionals can identify high-risk patients and implement targeted interventions to enhance outcomes.
- There is a need for prospective multicentre regional study.
- Consider setting up a national or regional arthroplasty database that prospectively captures early mortality data.
- Consider doing an early mortality analysis of all patients that have had THA at MOI since the procedure was commenced at MOI. This will give a larger sample size but challenges of missing data should be anticipated.

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APPENDICES

Appendix I: Data collection form

TITLE: EARLY MORTALITY RATE AND ASSOCIATED RISK FACTOR IN PATIENTS UNDERGOING PRIMARY TOTAL HIP REPLACEMENT AT MOI

PART A: Evaluation

1) Form number: ……
2) Patient ID ……
3) Phone no: ……
4) Age: …….
5) Sex…….
   1) Male 2) Female
6) Marital status …….
   1) Single 2) Married 3) Cohabiting 4) Divorced/widow
7) Education level…….
   1) No formal education 2) Primary education 3) Secondary education
   4) College/university
8) Occupation……
   1) Employed 2) Not employed 3) Business
9) Indication of surgery…
   1) Neck of femur fracture (NOF) 2) Neglected hip dislocation
   3) Osteoarthritis (OA) 4} AVN
   5) Failed hip Screw 6) Post traumatic arthritis…..
10) Date of surgery……
11) Commobidities…1) Yes, 0) No
   1) Diabetic (0 = No, 1= Yes) 2) Hypertensive…(0 = No, 1= Yes)
   3) CKD (0 = No, 1= Yes) 4) HHD (0 = No, 1= Yes)
   5) HIV (0 = No, 1= Yes) 6) SCD (0 = No, 1= Yes)
   7) Others…….(0 = No, 1= Yes) Specify……

PART B: Intraoperative [Data from the Nurse and Anaesthelogy]

12) Mode of anaesthesia

1) Regional 2) General

13) ASA

1) Type-1 2) Type – 2 3)Type – 3 4)Type -4

14) Duration of surgery ……

PART C: Postoperative

15) Outcome…..

1) Died within 90 days 0) Survived

Appendix II: Clearance letter

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR - RESEARCH AND PUBLICATIONS

Ref. No.DA.282/298/01.C/1274 Date: 21/07/2022

MUHAS-REC-07-2022-1274

Disha Deograthias Wadosa,
MMed in Orthopeaditcs and Traumatology,
School of Medicine
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: EARLY MORTALITY RATE AND ASSOCIATED RISK FACTORS IN PATIENT UNDER GOING PRIMARY TOTAL HIP ARTHROPLASTY AT MUHIMBILI ORTHOPAEDICS INSTITUTE.

Reference is made to the above heading.

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

APPROVAL DATE: 21/07/2022
EXPIRATION DATE OF APPROVAL: 20/07/2023

STUDY DESCRIPTION:
Purpose:
The purpose of this retrospective cross-sectional study is to determine the mortality rate and its associated risk factors in patients undergoing primary total hip replacement at MOI.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2013847.pdf and in the MUHAS archives.

The PI is required to:

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

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

Prof. Bruno Sunguya
Chairman, MUHAS Research and Ethics Committee

Cc: Director of Postgraduate Studies

Appendix III: Pemission Letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH
MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI)

AB.145/146/02/210 **8th September 2022**

Director,
Postgraduate Studies
MUHAS,
P.O.Box 65001,
DAR ES SALAAM.

RE: APPROVAL TO CONDUCT RESEARCH

Reference is made to your letter dated 26th August 2022 with reference No:HD/MUH/T.190/2020 regarding the above heading.

On behalf of the management of the Institute (MOI), I would like to officially inform you that permission has been granted for Disha Deogratias Wadosa **[HD/MUH/T.190/2020]** to conduct a research titled **'Early Mortality Rate and Associated Risk Factors in Patient under Going Primary Total Hip Arthroplasty at MOI'** *Therefore*, you are kindly requested to inform him/her to start the research as requested.

It's my hope that you will extend enough cooperation's regarding this matter.

Abdallah Mbuguni
For: Executive Director.

Cc: Medical Doctor-MOI

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