

**RATE AND INDICATIONS FOR REVISION TOTAL KNEE  
ARTHROPLASTY IN PATIENTS WHO WERE OPERATED AT  
MUHIMBILI ORTHOPEDIC INSTITUTE BETWEEN 2007 AND 2018**

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School of Medicine**



**RATE AND INDICATIONS FOR REVISION TOTAL KNEE  
ARTHROPLASTY IN PATIENTS WHO WERE OPERATED AT  
MUHIMBILI ORTHOPEDIC INSTITUTE BETWEEN 2007 AND 2018 A  
RETROSPECTIVE HOSPITAL BASED STUDY**

**By**

**Allen O. Kisanga**

**A dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of  
Master of Medicine (Orthopaedics and Traumatology) at**

**Muhimbili University of Health and Allied Sciences  
October, 2021**

**CERTIFICATION**

The undersigned certifies that he has read and hereby recommend for examination by Muhimbili University of Health and Allied Sciences a dissertation entitled: **“Rate and causes of revision total knee arthroplasty in patients operated at Muhimbili orthopaedic institute: a retrospective hospital based study”**, in (partial) fulfilment of the requirements for the degree of Master of Medicine (Orthopaedic’s and Traumatology) of Muhimbili University of Health and Allied Sciences.

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Date: \_\_\_\_\_

**DECLARATION AND COPYRIGHT**

I, **Dr. Allen Kisanga**, 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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## **DEDICATION**

I dedicate this dissertation to my beloved wife Dr. Agnes Temba and my children Addon, Albert and Ariella, for their encouragement, prayers, and patience throughout my course and making me firm and proud of them.

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**LIST OF ABBREVIATIONS**

MMED	-	Masters of Medicine
MOI	-	Muhimbili Orthopedics Institute
MUHAS	-	Muhimbili University of Health and Allied Sciences
OA	-	Osteoarthritis
OT	-	Orthopedics and Traumatology
RTKA	-	Revision Total Knee Arthroplasty
SD	-	Surgical debridement
SPSS	-	Statistical Program for Social Sciences
SSA	-	Sub Saharan Africa
THA	-	Total Hip Arthroplasty
TKA	-	Total Knee Arthroplasty
TKR	-	Total knee replacement
UKR	-	Unicondylar Knee Replacement

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## DEFINITIONS OF KEY TERMS

**Knee Joint** –is a hinge joint of synovial variety, which mainly allows for flexion extension and corkscrew movement at the end of the extension. It is formed by articulation parts of femoral condyles proximally and tibia condyles distally.

**Arthroplasty** is a surgical replacement of a joint with artificially produced alloy implants.

**Total knee arthroplasty** is a surgical replacement of both the femoral and tibia articular surfaces with artificially produced alloy implants of the knee joint.

**Partial replacement** is replacement of only one or some of the surfaces but not entire joint.

**Revision total knee arthroplasty** is the surgical replacement of the primarily placed artificial knee joint implant.

**Reoperation** is a follow-up surgery on the primary TKA in which components with bone interface were not removed or exchanged

## ABSTRACT

**Introduction:** Revision total knee arthroplasty (TKA) is a complex and technically demanding surgery usually following a failed primary TKA. It is projected that by the year 2030, TKA revisions in the United States will grow by approximately 600%, to an estimated 268,200 cases per year where the acceptable worldwide revision rate is between 4.9-7.9%. However, in sub-Saharan Africa revision total knee arthroplasty has been rarely studied. To our knowledge, this is the first study to estimate the prevalence and causes of TKA revision at Muhimbili Orthopedic Institute, Tanzania.

**Objective:** To determine the rate and indications for revision total knee arthroplasty in patients operated at Muhimbili Orthopedic Institute between 2007 and 2018.

**Materials and Method:** Retrospectively, data for all primary TKA and revision TKA procedures performed from 2007 to 2018 was collected for the rate and causes of failures, demographics, and time elapse from primary TKA to revision TKA. Data was collected from patient care notes and arthroplasty register books using data extraction forms then analyzed by SPSS version 24. It was summarized including frequency distribution, proportions, means and SD. Proportion was determined for categorical variables while mean/median and standard deviation was determined for numerical variables. Ethical clearance was obtained from the MUHAS Research and Publication Committee.

**Results:** Overall, 607 primary TKA procedures were carried out in this period 2007-2018. The overall revisions following primary TKA in this period was 40 cases, indicating a revision incidence rate of 6.59%, 95% CI 4.75-8.8%. Two thirds (60%) of patients who had TKA revision were females. The predominant cause of revision TKA was aseptic loosening of implants which occurred among 19 participants (3.1%) followed by infections in 13 patients (2.14%) revision. Other causes for revision were knee instability (1.2%), and knee stiffness (0.2%). The total follow-up time to revision was 165.5 years and the median duration from initial surgery until revision was 3.8 years, IQR 1.4-6.6 years.

**Conclusion:** The overall revision TKA surgeries for a period of 11 years(2007-2018) was 40 cases with the incidence rate of 6.59%.Most of the revisions were due to aseptic loosening of implants (3.1%) and knee infections (2.1%).More females underwent TKA revision in this period of follow up compare to males. The median time to revision was 3.8 years.

## 1.0 INTRODUCTION

### 1.1 Background Information

TKA is the international standard of care for treating advanced degenerative and rheumatologic knee diseases and certain knee fractures. It is the most successful and effective surgical option to reduce pain and restore function for patients with severe osteoarthritis <sup>(1,2)</sup>. It is the most commonly performed surgical orthopaedic procedure within the USA <sup>(3)</sup>

Despite being a reliable treatment for end-stage OA, unfortunately, the prosthesis lifespan is limited, and a significant number of subjects face the prospect of knee arthroplasty revision due to various causes including loosening, persistent pain, instability and infection <sup>(4)</sup>. It is estimated that by the year 2030, TKA revisions in the United States will grow by approximately 600%, to an estimated 268,200 cases year <sup>(5)</sup>. Furthermore, greater than 50% of these revision procedures are expected to occur in the younger age groups by 2011 <sup>(6,7)</sup>. Worldwide revision TKA is rising, with 22,403 procedures in the United States, 15,232 in Australia <sup>(8)</sup>, 6289 in the UK <sup>(9)</sup>. Studies have categorized the failure causes after total knee arthroplasties into early (within the first 2 years after primary TKA) and late revision (thereafter), polyethylene wear and aseptic loosening are most common causes for late revisions <sup>(10)(11)</sup>. Infection and instability were the most common revision causes in the early failure groups <sup>(12)</sup>. Over the last decade failure mechanisms have changed and polyethylene wear as revision cause decreased. Infection on the contrary was increasing <sup>(11)(13)</sup>.

Within 25 years post-TKA, up to 82% of patients will undergo revision surgery hence knowing the causes and rate of revision is important for the improvement of patient care at any given hospital <sup>(14)</sup>. Regardless of the type of the initial surgery, revisions are typical to a TKA and often need stemmed components and additional augments, which must address bone stock and soft tissue integrity, which are often compromised <sup>(6)</sup>.

Studies have demonstrated that aseptic loosening is the predominant cause leading to revision surgery and the aetiology of TKA failure has changed over time and may vary between reports based on many factors including study design patient demographics and other regional factors (15–17).

However, two years follow up study have concluded mechanical complications such as aseptic loosening and instability that warrant revision has decreased due to advancement in implants and surgical techniques whereas septic complications have relatively increased<sup>(18)</sup>.

The revision procedure is difficult, as the surgeon often faces difficulties in handling bone loss and soft tissue insufficiency. The overall outcome thus is, not as good as primary arthroplasty<sup>(19–21)</sup>. Causes of revision need to be addressed to prevent chances of poor outcome from the primary TKA. Outcomes of arthroplasty in sub-Saharan Africa are not widely reported.

Many patients in sub-Saharan Africa (SSA) have conditions that may benefit from total knee replacement. However, these countries commonly do not have adequate resources to offer this service to all eligible patients. Facilities, resources and training of surgeons and allied health professionals are substantially different from those of a high-income country. Tanzania is among the sub Saharan Africa country where revision total knee arthroplasty is being done however is not known whether the causes of revision in our setting are the same to those reported in other parts of the world or are different.

## 1.2 Literature Review

TKA was first performed in the 1970s and is a commonly performed surgical procedure that is beneficial to a majority of recipients and is cost-effective for quality of life assessments<sup>(16)</sup>.

The effectiveness of total knee arthroplasty (TKA) in relieving pain and improving function has been well documented worldwide. The primary surgery offers good results than the revision also it has shown that the overall percentage of revision total knee is low.

Recent estimates suggest the number of revision TKA procedures is expected to increase substantially over the next several decades <sup>(23)(24)</sup>. Although the increase is explained by the increase in demand, longevity from the primary surgery, surgical technique and implant-related factors <sup>(17)(23)</sup>.

Without appropriate measures in place, the burden of revision TKAs may become overwhelming and pose a strain on providers and institutions. Continued insight into the aetiology and epidemiology of revision TKAs may be the principle step towards improving outcomes and mitigating the need for future revisions.<sup>(23)</sup>

Revision TKAs are performed early (within 2 to 5 years after primary surgery) in 60%–80% of the cases to extend the longevity of prostheses and achieve better clinical outcomes<sup>(18)(26)</sup>.

However, revision TKA is indispensable in most cases: patients who undergo primary TKA eventually need revision TKA due to wear of implants, aseptic loosening, infection, instability, mal alignment and periprosthetic fractures<sup>(18)(27)</sup>.



### **1.2.1 Social-demographic characteristics in revision total Knee Arthroplasty**

Throughout the world, there is growing recognition that socio demographic disparities influence the outcomes of major surgeries such as TKA, and such disparities have recently triggered discussions on the adjustment of quality measures for sociodemographic risk factors<sup>(28)(29)</sup>.

Population aging, and growth in sports-related injuries have been mentioned to manifest as a greater future burden of osteoarthritis (OA)<sup>(30,31)</sup>. It has shown that patients undergoing TKA are mostly elderly women, with primary knee osteoarthritis <sup>(32)</sup>.

As per 2010 data, an estimated of 4.7 million individuals (3.0 million females, 1.7 million males) are living with a total knee replacement<sup>(33)</sup>.

Also, it has been shown that being younger and living longer increases the chances for failure and subsequently ending into revision., It is estimated that by the year 2020, 1.3 million primary TKAs will be performed in a year along with 127000 revisions<sup>(33)</sup>. The consequential rise in failed TKAs is inevitable, and it presents a significant financial and health-related burden to patients and healthcare systems<sup>(17)</sup>.

Another study reported that the age and gender of the patient are major factors affecting the outcome of primary TKA <sup>(17)</sup>. Data from many arthroplasty registries worldwide concur that the rate of revision will increase with decreasing age of the patients<sup>(34,35)</sup>.

A study done in Brazil shows Patients undergoing TKA are mostly elderly women, with primary knee osteoarthritis and co morbidities that evolve to infection <sup>(32)</sup>.

Generally, most published data on total knee replacement reflects the situations in the developed countries however in the developing countries specifically the sub-Saharan Africa total knee arthroplasty and its subsequent failure remain insufficiently reported.

Peter SE Davies et al in their systemic review found that patient with TKA were younger than those seen with osteoarthritis in high-income countries, which may indicate an increased prevalence of avascular necrosis than that which was reported<sup>(36)</sup>. In Sub Saharan African population there is a huge number of patients with condition warranting TKA, however, the service is limited due to inadequate resources and expertise accommodate all eligible patients, making the availability of data on the demographics of a patient with conditions which require joint replacement to be less available<sup>(16,28)</sup>.

Many studies in developed countries have explored the causes of revision TKA for their social demographic characteristic. In the developing world causes might reflect different patterns on the total knee revision since there is a paucity of information on the causes of revision total knee concerning social demographics characteristics in our setting

### **1.2.2 Rates of revision Total Knee Arthroplasty**

Time to revision after joint arthroplasty is an important factor for assessing the quality of joint replacements, monitoring implant performance, and informing health policy planning decisions Monitoring the incidence of revisions over time re-quires survival analysis because for some patients, time to revision is unknown because they are lost to follow-up, die before receiving a revision, or are alive and unrevised at the end of the observation period<sup>(38)</sup>.

Lee E Bayliss et al in their population based cohort study has shown that for patients who had total knee replacement and followed over a period of 10years, the implant survival rate is 96.1% and 20years follow up the implant survival rate is at 89.7%. Their study also indicated that lifetime risk of requiring revision surgery in patients who had total knee replacement over the age of 70 years is about 5% with no difference between sexes, those who had surgery younger than 70 years, however, the lifetime risk of revision increased for younger patients, up to 35% for men in their early 50s, with large differences seen between male and female patients ,female were 15% lower than men of the same age group. The median time to revision for patients who had surgery younger than age 60 was 4.4 years<sup>(39)</sup>.

Finding from a systematic and meta-analysis review shows that 82% of TKR last for 25 years in patients with osteoarthritis, however, no study is available to account for how long specific knee replacement will last.<sup>(14)</sup> Pooled data from registries worldwide identifies that the most common indication for revision surgery is aseptic loosening (29.8%), followed by infection (14.8%) and pain 9.5%<sup>(40,41)</sup>

However, loosening in the first few years most likely reflect the failure to gain fixation and in later years is often due to loss of fixation by secondary bone resorption<sup>(41)</sup>.

A study done by Fehring TK et indicated that the total number of early revision TKAs and the overall rate of revision could be reduced by 40% and 25%, respectively, if all TKAs were routinely cemented with careful balancing of the ligaments<sup>(12)</sup>

### **1.2.3 Indications for revision Total Knee Arthroplasty**

A study which was done in the USA by Delanois RE, et al. showed that infection and mechanical loosening were the leading cause for the indication of revision total knee and the most common revision TKA procedure performed was all component revision<sup>(23)</sup>. However in a 10years comparative study by Sharkey PF et al, the most common failure mechanisms were: aseptic loosening (39.9%), infection (27.4%), instability (7.5%), periprosthetic fracture (4.7%), and arthrofibrosis (4.5%)<sup>(11)</sup>.

In a recent meta-analysis and systematic study have shown that mechanical complication such as aseptic loosening and instability has decreased whereas septic complications have relatively increased, therefore surgeons should be cautious for the occurrence of infection<sup>(14)</sup>. In low-income countries, TKR is increasing in number due to an increased availability of surgical resources and expertise<sup>(28)</sup>. A study done in Malawi by Lubega et al revealed good short term results following primary TKA done in 154pts, from this study, only 2.6% with mean duration of follow-up of 4 years were revised due to early periprosthetic joint infection, aseptic loosening, and late periprosthetic joint infection, with no perioperative deaths<sup>(37)</sup>.

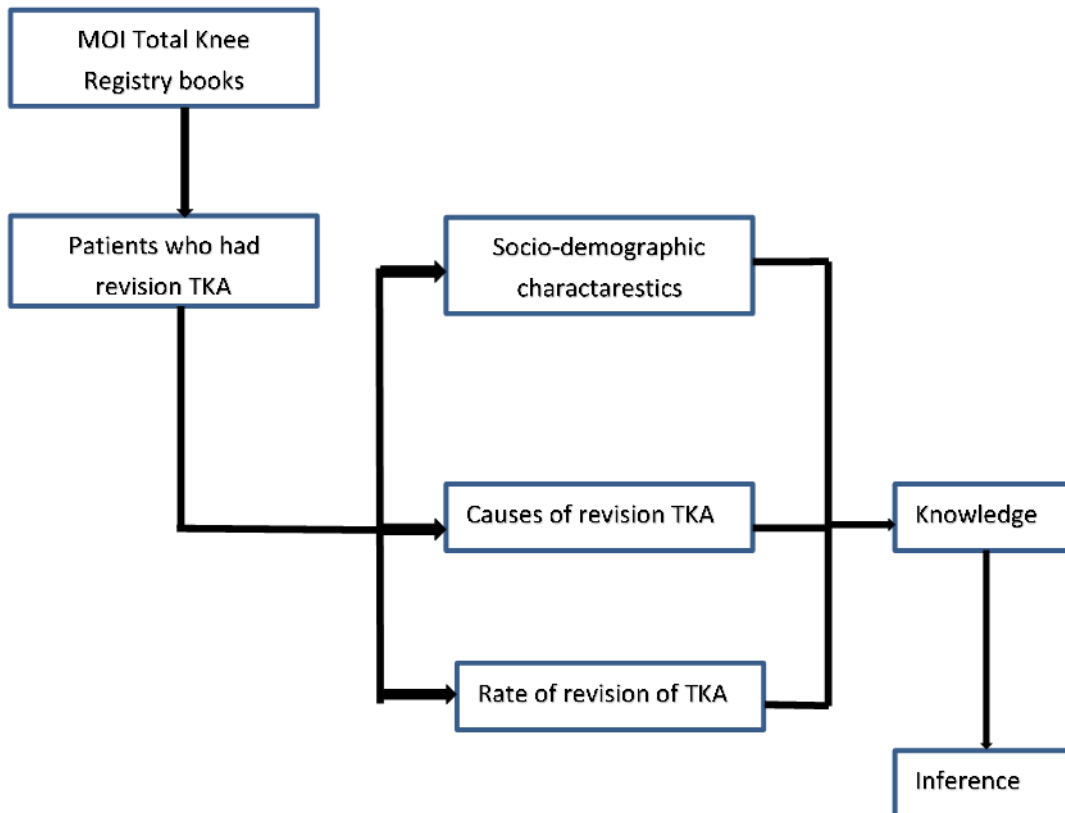
Generally the modality of failure of the primary TKA is well documented in the developed countries from many studies that have been conducted, In sub Saharan Africa especially Tanzania the number of patients requiring TKA is increasing due to the growing availability of expertise and facilities, and are now admitting patients for revision but there is no published data to show the indications for revision surgeries. There is a need to report on the indications for revision to improve on the outcome of primary TKA given that the revision surgery is difficult and costly and its outcome is inferior to the primary surgery.

Given time, all knee replacements will fail and knowing when this failure might happen is important. The time limit for the prosthesis to fail is reported in many studies as mentioned above, but locally there is no data to indicate the longevity of TKA. This study will shed light in this area to improve the outcome of primaryTKA in patients who are being operated in MOI.

### 1.3 Problem Statement

Revision total arthroplasty is the surgical replacement of the primarily placed artificial knee joint implants with incidence of 4.9-6.9% worldwide. Several studies have shown the causes of revision total knee arthroplasty to be associated with loosening, infection, periprosthetic fracture and instability. In sub-Saharan Africa there is a paucity of data on the causes of revision total knee, therefore, this study will shed light on the rates and causes of revision total knee in patients who were operated at Muhimbili Orthopedic Institute in Tanzania for the past eleven years of carrying out primary total knee replacement.

### 1.4 Conceptual Framework



## **1.5 Rationale of the Study**

Revision total knee arthroplasty has been rarely studied and reported in sub-Saharan Africa including Muhimbili Orthopedic Institute in Tanzania; hence this study is necessary to fill the existing gap in knowledge in our setting. Our findings will shed light on the prevalence and causes of revision TKA in patients operated at Muhimbili Orthopedic Institute and can be used as inference to other coming studies on revision arthroplasty of the knee joint.

## **1.6 Research Question**

What is the rate and indications for revision Total Knee Arthroplasty among patients with primary total arthroplasty done at Muhimbili Orthopedic Institute?

## **1.7 Objectives**

### **1.7.1 Broad Objective**

The broad objective was to determine the rate and indications for revision total knee arthroplasty in patients who were operated at Muhimbili Orthopedic Institute between 2007 and 2018 to provide inferences that can be used to minimize RTKA.

### **1.7.2 Specific Objectives**

- i) To determine the proportion of revisionTKA on patients who underwent primary TKA at MOI between 2007 and 2018
- ii) To determine the indication for revision TKA in patients who underwent revision TKR between 2007 and 2018
- iii) To determine the time to revision after primary TKR among patient treated at MOI between 2007 to 2018

## **2.0 RESEARCH METHODOLOGY**

### **2.1 Study design**

This was a retrospective hospital based cross-sectional study among patients who underwent primary total knee arthroplasty at Muhimbili Orthopedic Institute (MOI) and subsequently had revision surgery. Our study included all patients who underwent TKA (both primary and revision) at MOI from 2007 until 2018 whose medical records could be retrieved from their medical files. Data was obtained from files, arthroplasty registry books, electronically stored files in Medpro 5 database.

### **2.2 Study setting**

The study was conducted at MOI Dar-es-salaam, Tanzania, which is a specialized institute of Orthopedics, Traumatology and Neurosurgical care with a bed capacity of 380. It is the main referral centre for patients with orthopaedic conditions and trauma serving both the city of Dar es Salaam and the country at large. The institute is also involved in carrying out research with a view of improving patient care and management. It is the also a teaching hospital for the department of Orthopedic and Traumatology of MUHAS.

### **2.3 Study population**

All patients who had primary total knee arthroplasty and subsequent had revision total knee arthroplasty done at MOI between 2007 and 2018 were recruited for the study.

### **2.4 Duration of study**

The study was conducted for a total duration of six months, starting from the development of a proposal to data collection and reporting of data.

### **2.4.1 Inclusion criteria**

All patients who had a primary total knee arthroplasty between 2007 and 2018

All patients who had revision total knee Arthroplasty between 2007 and 2018

Patients with primary TKR done in MOI.

### **2.4.2 Exclusion criteria**

Missing documented surgeries

Patients with primary arthroplasty done in other hospitals

## **2.5 Sample size considerations**

Being a retrospective study, all patients operated at MOI for either primary or revision TKA between 2007 and 2018 were included. Note, TKA procedures were first carried at MOI from 2007 and have continued to be performed regularly ever since. During data collection, we obtained 607 patients who had primary TKA procedure performed during the period of observation. From these, only 40 patients underwent revision TKA at MOI.

## **2. 6 Variable**

### **2.6.1 Dependent variables for the study**

Patients with revision total knee replacement.

### **2.6.2 Independent variables**

Independent variables included all causes of RTKA (infection, instability, loosening, and periprosthetic fracture and knee stiffness) and their demographic data (age, sex, education level, occupation etc.,) rates of revision TKA.



### **2.6.3 Data collection**

File numbers were obtained from the total knee arthroplasty registry book. These file numbers were used to trace files from MOI archived files and electronic database for all patients from 2007 to 2018. All total knee arthroplasty books were obtained from main theatre and information from these books were used to trace more information from MOI statistics office, file archive and Electronic files medpro5. By using coded designed extraction forms socio-demographic, causes for revision, time from primary and revision TKA were collected.

### **2.6.4 Investigation tools and validity and reliability issues**

Data extraction pilot was tested. The tool was modified to ensure it consistently extracts data from both hard files and electronic database.

### **2.7. Data management and Analysis**

Data were managed by statistical software (SPSS version 24). Continuous variables were summarized by median and interquartile range. For comparison, Wilcoxon test was used to compare median between two groups. For categorical variables – summarized by frequency and proportions were used to summarize the data and the difference in proportion were tested by using Fisher exact test. A 95% confidence interval (CI) was estimated to quantify the precision of estimates in the population. A 5% alpha (p value) was used to determine statistical significance during analysis and interpretation.

### **2.8 Ethical Clearance**

Ethical clearance was obtained from MUHAS Research and Publication Committee and the permission to conduct the study was issued from MOI Executive Director. Confidentiality of the data was observed throughout the study by ensuring limited access to database to only the study investigator. No information, which could personally identify a patient (e.g., names, phone number etc.) as an individual, was extracted from the files. No harm was intended using the patient's data. Patient's names were encrypted to other people.

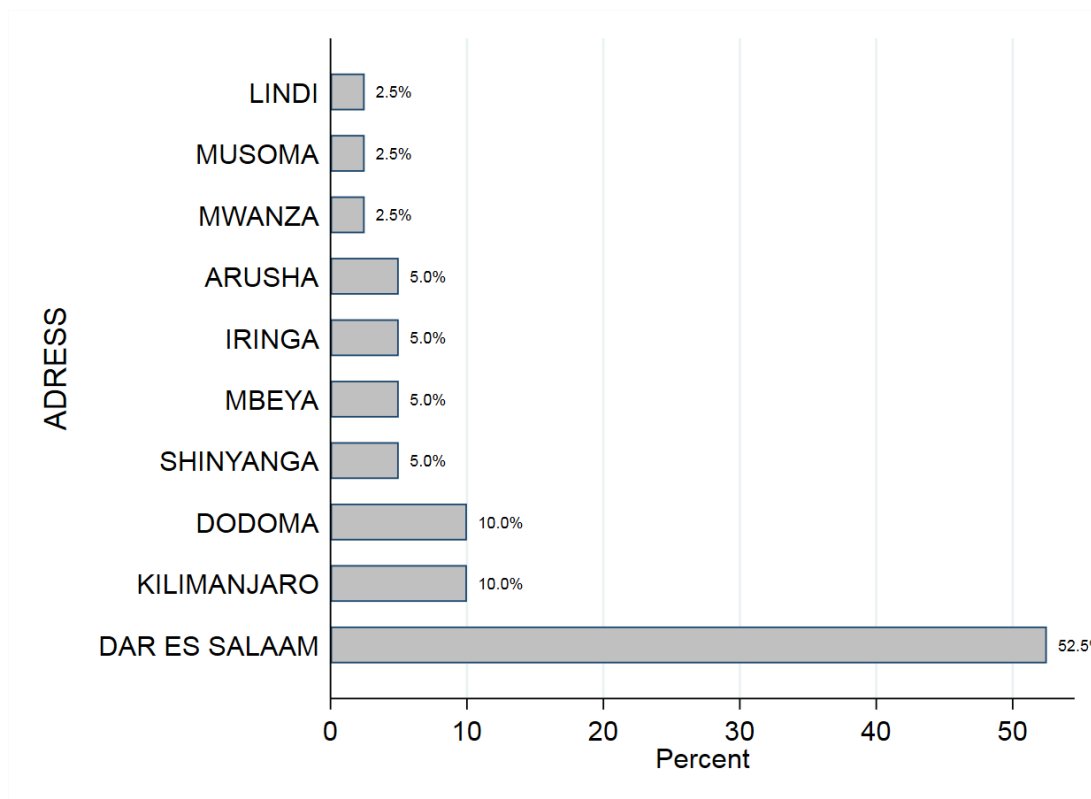
## **2.9 Study limitations**

1. Some files were missing and other was having insufficient information for the study, these were excluded from the study.
2. Limited funds confined the study to one centre (MOI), and thus a multicenter study will give a more conclusive result.

### 3.0 RESULTS

#### 3.1 Socio-demographic characteristics

Retrospectively obtained data from 40 patients who underwent revision TKR between 2007 and 2018. Most patients who needed revision TKA were females 24 (60%). The participant's median age was 71.5 years, IQR 63.5 to 75 years (Table 1). There was no any significant difference in age between females and males with median 72 years, IQR 64-75 years vs., 69.5 years, IQR 62.5-75.5 years respectively, p value 0.93, Most of the participant's that is 21 participants (52.5%) were residing in DSM while the other half were from other regions within Tanzania (see figure 1).



**Figure 1: Residence of study participants who underwent revision of TKA at MOI.**

**Table 1: Participant characteristics overall and stratified by sex**

<b>Characteristic, n (%)</b>	<b>Total, 40 (100)</b>	<b>Male, 16 (40)</b>	<b>Female, 24 (60)</b>
<b>Age in years, median (IQR)</b>	71.5 (63.5-75)	69.5 (62.5-75.5)	72 (64-75)
<b>Employment status, n (%)</b>			
Businessman/woman	1 (2.5)	1 (100)	-
Formally employed	5 (12.5)	3 (60.0)	2 (40.0)
Self employed	3 (7.5)	2 (66.67)	1 (33.33)
Not employed	13 (32.5)	4 (33.33)	9 (69.23)
Retired	18 (45.0)	6 (33.33)	12 (66.67)
<b>Education level, n (%)</b>			
Primary	22 (55.0)	9 (40.9)	13 (59.1)
Ordinary secondary	10 (25.0)	3 (30.0)	7 (70.0)
Advanced secondary	6 (15.0)	3 (50.0)	3 (50.0)
University	2 (5.0)	1 (50.0)	1 (50.0)
<b>Affected knee, n (%)</b>			
Left	25 (62.5)	10 (40.0)	15 (60.0)
Right	15 (37.5)	6 (40.0)	9 (60.0)
<b>Causes for revision, n (%)</b>			
Aseptic loosening	19 (47.5)	6 (31.58)	13 (68.42)
Infection	13 (32.5)	6 (46.15)	7 (53.85)
Instability	7 (17.5)	3 (42.86)	4 (57.14)
Stiffness	1 (2.5)	1 (100.0)	-
<b>Type of revision, n (%)</b>			
Both components revised	20 (50.0)	7 (35)	13 (65.5)
Femoral component revised	2 (5.0)	1 (50.0)	1 (50.0)
Tibia component revised	5 (12.5)	2 (40.0)	3 (60.0)
Implant removal and arthrodesis	2 (5.0)	1 (50.0)	1 (50.0)

Implant removal, SD, spacer	6 (15.0)	4 (66.67)	2 (33.33)
Joint washout and tibia articular liner exchange	1 (2.5)	-	1 (100.0)
SD, component retaining	2 (5.0)	-	2 (100.0)
SD, joint washout, tibia articular liner exchange	1 (2.50)	-	1 (100.0)
SD, sleeve placement, re- implantation	1 (2.50)	1 (100.0)	-

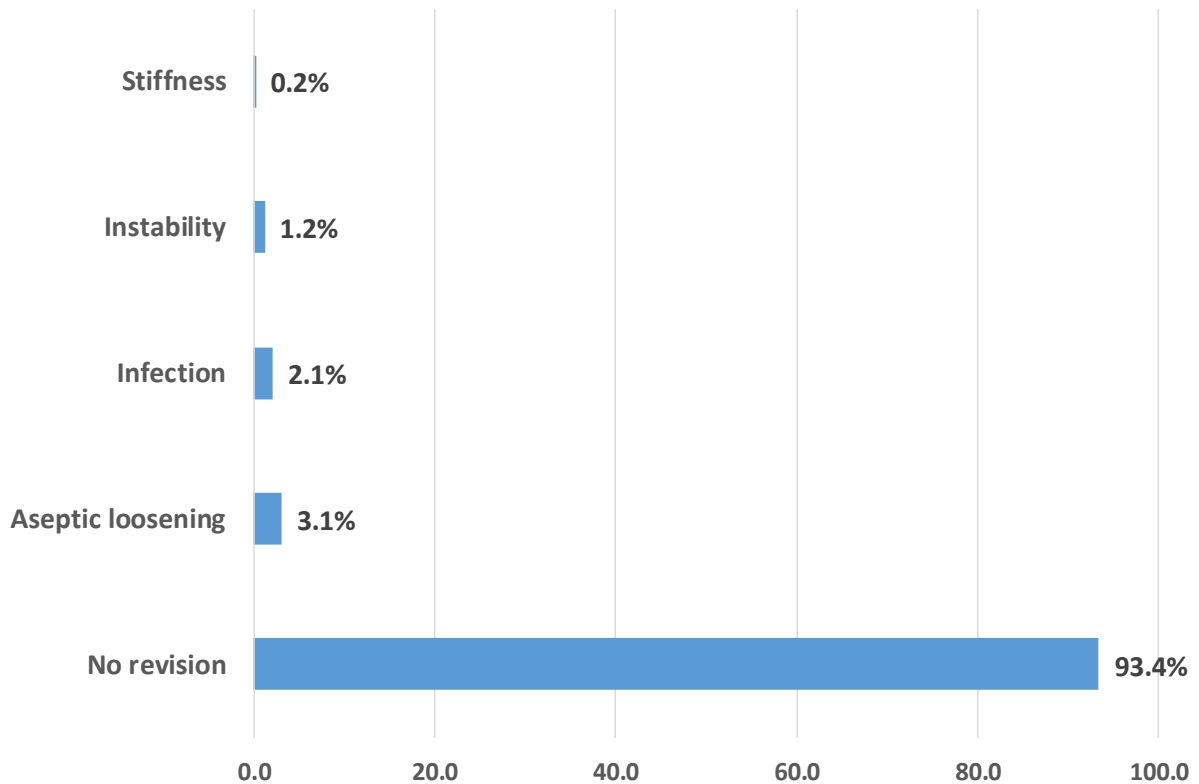
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Note: n, number; IQR, Inter quartile range; SD, Surgical debridement

Majority of study participants had primary level education 22 (55%) followed by those who completed ordinary secondary education 10 (25%) (See Table 1). Participants had more TKA revisions in the left lower limb 24 (64.86%, 95% CI 45.8%-84.0%) than the right lower limb 13 (35.14%, 95% CI 9.2%-61.1%), however this difference was not statistically different (*p* value 0.08).

### 3.2 Incidence of revision of TKA and predominant causes

Since 2007 when the first TKA performed at MOI, there have been 607 patients who were documented to have TKA until 2018. Out of these patients, 40 patients came back to MOI for revision of TKA. Thus, the proportion of TKA revisions on patients who were operated between 2007 and 2018 was 6.59%, 95 % CI 4.75-8.87%.The predominant cause of revision TKA was aseptic loosening of implants which occurred among 19 participants (3.1%) followed by infections which resulted in a total of 13 (2.1%) revision (see Figure 2).



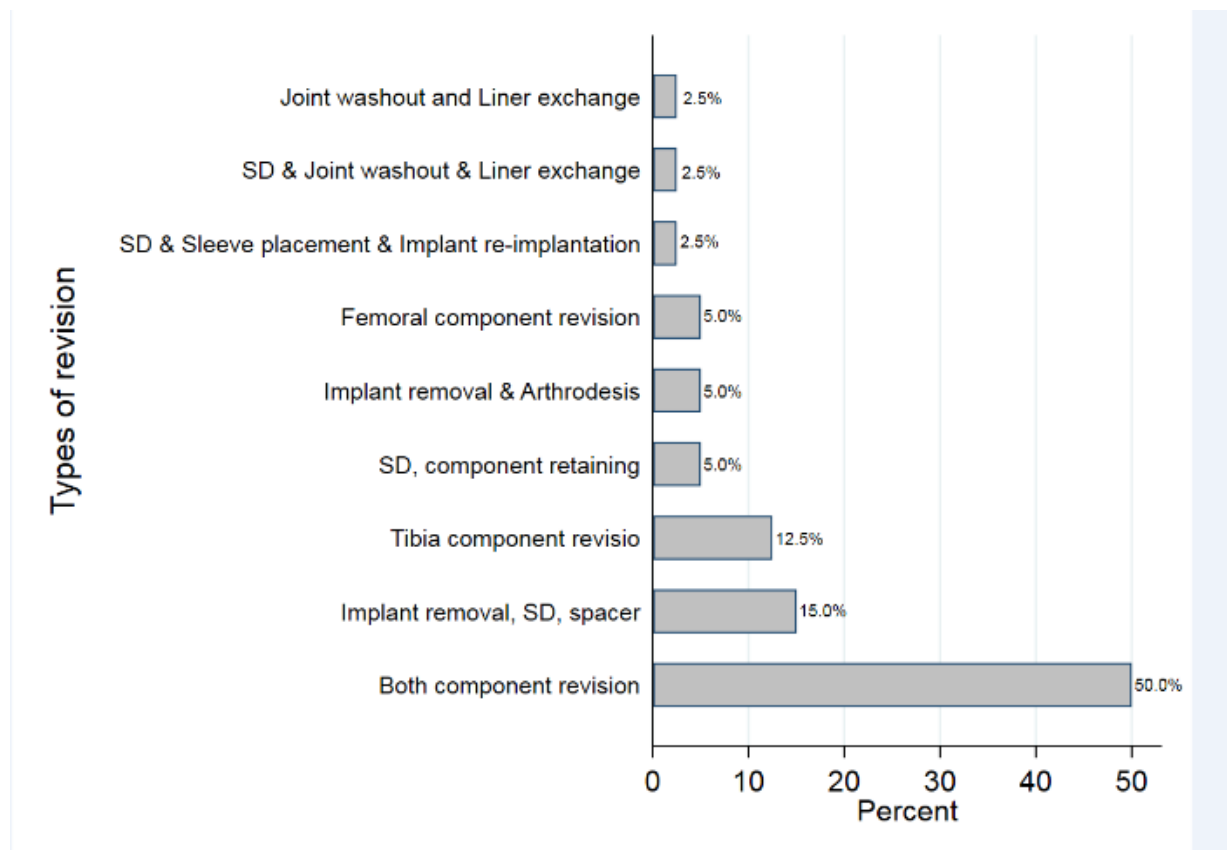
**Figure 2: Causes of revision among adults who underwent revision of TKA between 2007 and 2018 at MOI.**

### **3.3 Time to revision TKR after primary TKA**

The total follow-up duration was 165.36yrs, 95% CI 126.28-204.45yrs. The median duration from initial surgery until revision was 3.8yrs, IQR 495 – 2'425 days (or 3.8 years, IQR 1.36 – 6.6 yeas). The study showed that significantly more patients had late revisions (i.e., above 2 years) as compared to those who had revisions within two years of surgery i.e., 28 patients with late revisions 70%, 95% CI 53-87% vs., 12 patients with early revisions 30%, 95% CI 4.1-55.9%, p value 0.02,the results were statistically significant. Lastly, aseptic loosening was significantly associated with late revision 16 (100%) while infection was associated with early revision as compared to patients who had late revisions i.e., 69.23% vs., 30.77%, *p value*>0.001.

### 3.4 Types of revisions carried out

Of all 40 revisions that were performed between 2007 and 2018, both components (i.e., tibia and femoral) were predominantly revised together during TKA and this occurred among 20 patients (50.0%). The next common set of procedures that were done during TKA revisions were implant removal, surgical debridement and placement of a spacer. This set of procedures was done among six patients (15.0%) (See Table 1 and Figure 3).



**Figure 3: Common TKA revision types performed among adults between 2007 and 2018 at MOI.**



## **4.0 DISCUSSION**

### **4.1 Social demographic characteristics**

This cross-sectional study aimed at determining the incidence of TKA revisions and common causes, which leads to revision. Patients' data from 2007 until 2018(11yrs) was reviewed. It was found that during this period, over 607 patients underwent primary TKA and only 40 patients had revision TKA making an incidence rate at 6.59%.

Majority of these patients were females and of advanced age where the median age was 71.5 which looks similar to sum of previous studies<sup>(8)(19)</sup>. Nearly half of the patient were from Dar es Salaam, followed by Kilimanjaro and Dodoma Not surprising and this is due to the immediate catchment population that is served by MOI.

### **4.2 Incidence rate and causes of TKA revision**

The incidence rate of 6.59% is echoed with findings of other previous studies around the world which have reported revision rates of 1.4%,2.2%,and 3.3% in follow up of 3,10, and 5 years respectively<sup>(24)(43)(44)</sup>. Pabinger C et al in their systematic review reported overall of 10 years worldwide revision rate in TKA to be 6.2% ranging from 4.9% to 7.8%<sup>(40)</sup>. In this study incidence revision rate of 6.59% is within the world range shown with above study. Thus, the fact that MOI is a specialized consultant hospital where TKA was firstly carried out in the country; this finding shows that the rate of revision total knee in this centre is within normal limits.

A large meta-analysis reported a very low annual TKA revision rate of only 0.49%, 95% CI 0.41 to 0.58 among adults from 52 published studies that were systematically reviewed and analyzed<sup>(45)</sup>. Other authors from the USA, reported variations in rates of revision TKA which were still higher than what we are reporting from MOI Delanois et al., reported a TKA revision rate of 33.2% from the South census region and could account for the difference seen to be linked to racial background which reflect disparities in access to care<sup>(23)</sup>

In this study, it was found out that cause of TKA revision was due to aseptic loosening (47.5%) and infection (32.5%). These findings were similar to those by Anne et al, where infection was the cause of revision among 36.1% of all revisions <sup>(8)</sup>.

In the contrary, in their setting aseptic loosening was only the cause of revision among 21.9% of participants<sup>(8)</sup> Aseptic loosening was the predominant cause of TKA revision in another study that analyzed data from 844 patients between 2010 and 2011 attended from 6 hospitals in the USA<sup>(46)</sup>. Lombardi *et al.* reported nearly 31.2% of patients who needed TKA revisions were due to aseptic loosening. By far the study which had near similar result to our study was that reported by Peter et al., where the 39.9% of all TKA revisions were due to aseptic loosening<sup>(11)</sup> In their study they analyzed a total of 781 revisions in a 10 years span and found infection among 27.4% as a cause for revision<sup>(11)</sup>

Another study by Delanois et al analyzed TKA revision between 2009 and 2013 from the USA, infection was the aetiology of TKA revision among 20.4% of patients and thus lower than in this study <sup>(23)</sup>.It is documented worldwide that most TKA revisions are due to aseptic loosening, infection and implant or polyethylene wear.<sup>(8)(6)(11)(47)</sup>. Owing to differences in patient backgrounds and lifestyles, the causes of TKA failures in sub-Saharan Africa especially Tanzania may differ compare to other parts of the world.

### **4.3 Time until TKA revision**

The study found that nearly three quarter of our study participants had late TKA revisions i.e., revision after at least two years since the primary surgery. This observation was also reported by Postler *et al* whereby in 289 surgeries performed the mean time for revision from primary TKA was 6.2 years with a range of 0.1-24.4 years)<sup>(8)</sup>.Another study which was done in the USA looked at causes and time lapse until revision TKA from 2010 until 2011 Here they analyzed a total 844 revisions and found the mean time to revision was 5.9 years and that 35.3% of all revisions occurred early i.e., less than two years <sup>(48)</sup>.

This proportion is close to what we report in our study where we found 30% of all patients had early revision. Another study reported from USA had comparable proportions of time until TKA revisions where early revisions comprised of 37.6% vs., late revisions 62.4% among 781 revisions done in a span of 10 years <sup>(11)</sup>.

#### **4.4 Limitations**

This study was limited by a number of factors, first, this was a retrospective study that only included analysis of patient who had primary TKA done in MOI and had subsequent revision TKA. Patients who had primary surgery done in other hospitals were excluded from the study. However, this was done purposely so that to establish the true incidence rate of TKA revisions done at MOI. There were a limited number of patients with revision TKA, only 40pts had revision TKA in this time. Type of primary TKA implant was not considered since some of the revision had different implants that might have explained the difference that we found. In addition, the causes of primary TKA was not considered, some of the causes might have predisposed the patients to early or late revisions. Lastly, the lack of electronic database especially among initial patients whose records were only stored in paper files, we acknowledge that some of the records might have been lost and thus resulting in underestimation of our outcome. Future studies are to benefit from the current electronic database that captures and stores medical history better than paper files.

## **5.0 CONCLUSION AND RECOMMENDATIONS**

### **5.1 Conclusion**

The incidence of revision TKA at MOI for the past eleven years was low at 6.59% with most of the revision being secondary to aseptic loosening of implants 3.1% and post-operative infection 2.1%. Most of the patients who had being revised were female compare to males. The median time for revision was at 3.8 years.

### **5.2 Recommendations**

Aseptic loosening and infection were the main causes of revision in this study. Further studies are needed to explore the factors behind this finding to improve the outcome of primary TKA in our setting.

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**APPENDICES**

**Appendix 1: Data abstraction Form**

**RATES AND CAUSES OF REVISION TOTAL KNEE ARTHROPLASTY IN MOI**

**1. DEMOGRAPHIC DATA FOR PRIMARY AND REVISION TKA**

**I. FORM CODE**

**II. HOSPITAL REGISTRATION NUMBER**

**III. AGE**

**IV. GENDER**   M/F

**V. PHYSICAL ADDRESS.**

a) REGION:.....

**VI. EDUCATION LEVEL** *put a tick in the box.*

a. NONE

b. PRIMARY

c. SECONDARY

d. GRADUATE

DATE OF PRIMARY TKA.....

DATE OF REVISION TKA.....

**2. SITE OF SURGERY**

a. RIGHT

b. LEFT

c. BOTH

**3. CAUSES OF REVISION TKA.**

- a. ASEPTIC LOOSENING
- b. INFECTION
- c. INSTABILITY
- d. IMPLANT FAILURE
- e. PERIPROSTHETIC FRACTURE
- f. QUADRICEPS DISRUPTIONS.
- g. PATELLA CLUNK
- h. KNEE STIFFNESS
- i. OTHERS-----

**4. TYPE OF REVISION**

- a. TOTAL REPLACEMENT
- b. LINER EXCHANGE
- c. EXCHANGE OF TIBIAL COMPONENT.
- d. EXCHANGE FEMORAL COMPONENT
- e. FRACTURE FIXATION WITH COMPONENT RETAINING
- f. SOFT TISSUE BALANCING
- g. OTHERS-----