UNIVERSITY of RWANDA

COLLEGE OF MEDICINE & HEALTH SCIENCES
SCHOOL OF MEDICINE & PHARMACY

PATTERN AND MANAGEMENT OF ORTHOPEDIC PATHOLOGIES CONSULTING OUTPATIENT DEPARTMENT AT A REFERRAL LEVEL HOSPITAL, CASE OF RWANDA MILITARY HOSPITAL: A *CROSS SECTIONAL STUDY*

A dissertation submitted in partial fulfilment of the requirements for the award of the Degree of Master of Medicine in Orthopedics of the University of Rwanda

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DECLARATION

Researcher:

I hereby declare that this dissertation: "**Pattern and management of orthopedic pathologies consulting outpatient department at referral level hospital, case of Rwanda Military Hospital.**" is my own work and has not been submitted to any university for the award of degree.

Signed……Date…….

Dr Salvador KAMARAMPAKA

Supervisor:

I hereby declare that this dissertation has been submitted with my approval as supervisor.

Signed……Date……

Prof John BYIMANA

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I am grateful to all my colleagues and surgical staff, without whose help; this dissertation would not have been possible.

Last but not least, I would like to thank my wife, my parents, brothers and sisters, and all members of my family for their invaluable support.

Thank you.

KAMARAMPAKA Salvador, MD

DEDICATION

To my wife Aline Flora NAKUZWE,

My children KUZO Aubrey Ardan and KUZO Braden Álvaro

My parents,

My brothers and sisters

LIST OF ABBREVIATIONS

MSD: Musculoskeletal Diseases

HIC: High Income Countries

LMIC: Low and Middle Income Countries

HIV: Human Immunodeficiency Virus.

RMH: Rwanda Military Hospital

WHO: World Health Organization

DALYS: Disability-Adjusted Life Years

CT-Scan: Computed Tomography Scan

MRI: Magnetic Resonance Imaging

OPD: Outpatient Department

SPSS: Statistical Package for Social Sciences

S-spine: Sacral spine

TH-spine: thoracic spine

L-spine: lumbar spine

C-spine: cervical spine

POP: Plaster of Paris

NSAID: Non-Steroidal Anti-Inflammatory Drugs

MUA: Manipulation Under Anesthesia.

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ABSTRACT

Background: Musculoskeletal conditions are a common cause of long-term pain and physical disability affecting many people worldwide. Additionally, these conditions have an enormous economic and social impact on the individual, society and national health systems. Although the burden of disease due to musculoskeletal conditions is said to be on the rise in the developing world, the full extent of this burden remains unknown.

Methods: This was a hospital-based cross-sectional study done from 1st to31st March, 2019. Relevant data on patient demographics, presenting musculoskeletal condition and treatment received was collected from 313 patients seen in the orthopedics Outpatient Department service at a referral hospital: Rwanda Military Hospital. Demographic data, orthopedic pathologies, and management of musculoskeletal diseases were all recorded and analyzed. The distribution of variables was measured using frequencies and percentages and where necessary, the association was analyzed using the Pearson's chi-square test; which was considered statistically significant if the $p<0.05$.

Results: the study consist of a total of 313 patients, with predominant number of male patients 216 (69.0%) whereas female patients were 31.0 %. Majority of patients were in the 15-65 year age group; accounting to 82.4 %. The 0-14 year age group accounted for 13.1%, whereas those above 65 years accounted for only 4.5% of the patients.. Trauma was the leading cause of consultation followed by infection and degenerative pathologies accounting respectively 49.5%, 13.7% and 11.2%. The most affected body parts are tibia, femur, humerus and fibula respectively accounted 13,1%, 10.5%, 6.7% and 4.8%. The majority of the patients in our study, 67% consulted late, at more than 3months from the onset of their condition.

Conclusion: traumatic, infective and degenerative conditions were the most common musculoskeletal disorders. There were more male than female patients. As the individual diagnosis, tibia was the mostly affected body site and lumbar sacral segment was the commonest affected joint, followed by the knee. Looking on the prevalent disease category, majority of them are preventable. Most of patients present late, after three months from the onset of their conditions. One of the factors that can be attributed to this late presentation is the big number of

patient waiting appointment of orthopedic surgeon; however this should be a subject of further studies.

Key words: musculoskeletal diseases, degenerative diseases, osteoarthritis, work related musculoskeletal disease

CHAPTER 1: INTRODUCTION

1.1 Introduction

Orthopedic pathologies are disorders affecting musculoskeletal system. The musculoskeletal system is composed of muscles, bones, joints, tendons, ligaments, cartilage and other connective tissues[1]. They are linked together to allow movement, shape of the body and protection of the vital organs[2]. Due to these anatomical aspects, musculoskeletal diseases (MSD) interfere with daily activities of the patient and lead to different types of deformities which may cause extent impact on the affected person[3].

MSD constitute a real global health concern affecting not only the affected person, but also the family and society. They are the most common cause of severe long-term pain and physical disabilities. They are also responsible for frequent medical consultation which results in increased absenteeism from work and this impose considerable economic burden on the affected person and on society in general [4]. Globally the burden of MSD is affecting hundreds millions of people worldwide[3].The global prevalence ranges from 14% to 42% ; with predominance of knee osteoarthritis in senior citizens of over 70 years[5]and predominance of lower back symptoms in population of less than 70 years.[6]

The incidence and prevalence of musculoskeletal disorders vary with geographic region, climatic conditions, age and gender. Advanced age, female sex, occupation, changing lifestyles, industrialization, smartphone use and computerization system in most offices are some of the factors that are associated with increased incidence of MSD[5]. The researches have shown that the disease burden due to musculoskeletal disorders is most likely to increase dramatically over the next decade and beyond[7].

The available literature on musculoskeletal disorders is mostly from High Income Countries (HIC). In these countries, degenerative disorders were the commoness[8–14]. However, in Low and Middle Income Countries (LMIC) studies on MSD are few and they focused mostly on traumatic and infection.[15-21] In Rwanda, there is no study done focusing on pattern and management of MSD. The only single study done in Rwanda was a national survey on physical disability[21]. This study aims to identify patterns MSD and management offered at referral hospital level.

1.2 Problem statement and Justification of the study

In Rwanda, the burden of orthopedic pathologies has been ignored for a long, as in other developing countries mainly because policymakers put less attention on them due to perception that most of musculoskeletal diseases are considered as a consequence of aging, chronic conditions and are less fatal than Cardio-vascular, neurological and communicable diseases like malaria and Human Immunodeficiency Virus (HIV).[4.9] The only one study on musculoskeletal impairment available in Rwanda looked on physical disability in general, not focused on the burden and pattern of orthopedic musculoskeletal disorders[21]. Therefore, there is no full picture of burden of orthopedic pathologies in Rwanda. It is crucial to know the pattern of orthopedic pathologies and document it, in order to orient the policymakers on planning strategies and management arsenal needed to treat these patients.

This study aims to describe the patterns of musculoskeletal diseases seen, and their management at Rwanda Military Hospital (RMH) orthopedic outpatient's department. RMH is one of the referral hospitals in Rwanda. The results from the present study will give an overview of MSDs at RMH which will help to draw the future management and enrich the research archives on musculoskeletal disorders.

1.3 Research question

What is the burden of musculoskeletal conditions in orthopedic outpatient department at Rwanda Military Hospital?

1.4 Hypothesis

There is a wide range of orthopedic pathologies and knowing them would influence management.

1.5 General objective

1. To describe the pattern and management of musculoskeletal diseases in orthopedic patients consulting in the outpatient department at RMH.
2. To highlight the burden of orthopedic pathologies in Rwanda

1.6 Specific objectives

1. To determine the epidemiology of musculoskeletal diseases in orthopedic patients consulting in outpatient department at RMH
2. To describe the management of common musculoskeletal diseases seen in outpatients at RMH

CHAPTER 2: LITERATURE REVIEW

2.1 Epidemiology

Musculoskeletal disorders are one of the major causes of physical disability around the world. In 2001, World Health Organization (WHO) reported a loss of 5.1 million people worldwide due to injuries of all categories, with a disability-adjusted life years (DALYS) lost of 12% and predict an increase of DALYS up to 20% by the year 2020[22]. MSD is a worldwide problem, with high growth rate and a large burden but has been neglected[4], especially in low and middle-income countries by keeping more attention on communicable diseases such as malaria, human immunodeficiency virus, diarrhea and tuberculosis. Looking at the burden and gravity of MSD in total, WHO declared 2000 -2010 as the Bone and Joint decade[5] which has been prolonged, due to the perceived significance, up to 2020.[22],[23].

In Rwanda, the only available study is a population-based study on physical disability in general published in 2008, which showed that the most causes of disability were non-traumatic and non-infective conditions with a percentage of 44.4%, followed by traumatic conditions with a percentage of 31.3%. In Sierra Leone, trauma was the major cause of physical disability with a percentage of 12.6% and non-traumatic conditions accounted for 6%, with the back as the most affected part of the body.[20]

There are many factors related to this increased musculoskeletal disease burden such as industrialization, urbanization, changing life-styles[24,25]. This could be the case in our country but we do not have data to justify its correlation.

2.2 Etiology and risk factors

Orthopedic diseases can be categorized as vascular, infectious, inflammatory, traumatic, autoimmune, metabolic, idiopathic, neoplastic, developmental, degenerative and congenital in origin. These disease are in groups of conditions with different pathophysiology but are connected anatomically and by their link with pain. They contribute to restriction of daily living activities with consequence of great negative impact on economics, and health of the affected person and the society in general[3].

The list of risk factors of orthopedic pathologies is very wide and can be categorized as traumatic and non-traumatic. Among them alcohol abuse, corticosteroid use, haemoglobinopathies,

chemotherapy, radiation exposure, aging, malnutrition, immunodeficiency, urbanization and hip trauma are highly associated with MSDs.[26,27,28].

2.3 Work-related and degenerative changes of musculoskeletal system

Musculoskeletal disorders have a big impact on the affected person and on the society in general by physical function impairment association to the pain, decrease of range of motion and deformities which result in inability to work and achieving daily activities. Low back pain is the most prevalent disease of MSD world wide[23] whereas osteoarthritis is more commonly seen in the aged population with a global age-standardized prevalence of knee osteoarthritis of 3.8%, and hip osteoarthritis of 0.85%[29]. On the other hand work- related musculoskeletal disorders are thought to be associated with repetitive movement at a fixed speed[24]or by accumulation of micro traumas secondary to work that leads to the excessive loading of musculoskeletal tissues causing pain or dysfunction[30].

Rwanda, a developing country with industrial production growth rate of 6.9%, is likely to see an increase in work- related musculoskeletal disorders. In addition to industry sector development, degenerative musculoskeletal diseases are also thought to be boosted by expanding use of computers and increment of personal behavior such as using portable devices like smartphone.[11]

Work-related musculoskeletal diseases has been shown to be frequently observed in population working in mining sector and other jobs asking heavy lifting in their daily package activities such as in hospital, hotels, constructions, etc.[31,24]

2.4 Musculoskeletal traumatic injuries

Musculoskeletal traumatic injuries are among the most common cause of MSD, and play a big role in exacerbation of the burden of morbidity and mortality caused by MSD. Industrial sector developments, urbanization, changing life-styles, are factors aggravating the severity of its burden in LMIC. Traumatic injuries are mostly caused by high trauma energy like road traffic accident; fall from height or by low trauma energy like simple fall in elderly people. The etiology and risk factors of traumatic MSD differ in LMIC and HIC, where road traffic accident is the major cause of traumatic MSD in LMIC and injuries from sport participation are main leading cause of MSD injuries in HIC.[15,19,7,32,33]

2.5 Musculoskeletal infection

Musculoskeletal infection is one of reasons of consultation in LMIC especially chronic osteomyelitis and septic arthritis. It is caused by haematogenous spread of micro-organism from a distance site or by direct introduction through the skin.[34] Chronic osteomyelitis is rare in HICs comparing with LMIC,[3536] with an incidence, varying between 1 to 13 per 100000in developed countries, and 200 per 100000 in developing countries[37]. [38] Septic arthritis is also a rare condition in developed countries, with an estimated pediatric incidence of 1:100000 in HIC[37]and 1: 1000 before in LMIC five years[18]. The most affected joints in septic arthritis is the knee followed by the shoulder joint.[38,18]

2.6 Musculoskeletal Tumors

Tumors represent a small number of MSDs compared to other etiologies of MSDs, but they are associated with severe morbidity and mortality. The musculoskeletal system as the other tissues can be affected by neoplasm arising from cartilage, skeletal muscle, synovium, and the tendon sheaths of the upper and lower limbs[39]. They are grouped into benign tumors or malignant tumors. The incidence of musculoskeletal tumors ranges between 1-1.5% of all malignancies with benign bone tumors three to four times more than malignant bone tumors[40]. The distribution of musculoskeletal tumors varies with age, with benign tumors, osteosarcoma and Ewing's tumor more common in young age, and multiple myeloma and metastases more common in the elderly.

2.7 Congenital musculoskeletal diseases

The musculoskeletal system, as another system in the body, can be affected by congenital malformations, and represent 11% off all congenital malformation with an equal sex ratio. The origin of congenital malformation is 25% from genetic origin and the rest 75% from environmental factors[41]. Congenital musculoskeletal disorders represent a big number of diseases and some of them can be obviously seen at birth, or can be subtle but detected through new born examination like congenital developmental dysplasia of the hip. They may also not be evident at birth but manifest later in life, such as scoliosis.

2.8 General considerations in the management of MSD

As MSD grouped a big number of pathologies, management of them will differ depending on the group of diseases, but generally it will be either non operative or operative. Some conditions are

challenging, like managing musculoskeletal tumors in sub- Saharan region, due to lack sophisticated diagnostic equipment such as Computed Tomography Scan (CT-Scan) and Magnetic Resonance Imaging (MRI), or late presentation and consultation. This will be associated with high morbidity and mortality despite many treatments modalities available, such as chemotherapy, radiotherapy, limb salvage procedures and amputation. Another challenging management is for osteomyelitis because of some micro organs such as staphylococcus has a capacity of adherence on avascular tissue surface like sequestrum and foreign implants and create a biofilm resistant to antibiotics[42].

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Study design

This study is a cross sectional study in nature, and include all orthopedic patients presenting to the outpatient department at Rwanda Military Hospital, during the study period, from 1st to 31st of March, 2019.

3.2 Study site

The study was conducted at one of the referral and teaching hospital in Kigali city. Rwanda Military Hospital (RMH), having a bed capacity of 350. Currently it has seven orthopedic surgeons and it is covering the big part of Kigali city and Eastern Province. It is offering specialized services, among them include care of MSDs, but there is no established specialized units for MSDs.

3.3 Sampling

3.3.1 Sample size

Sample size is calculated using prevalence of 8 % representing MSD found in annual hospital registry of all outpatient departments (OPD) patient presenting at RMH. The average number of patients consulting in OPD in all departments at RMH is 103390 patients per year and among them 8152 (8%) represent the average of orthopedic out patients. We used the formula to calculate sample size in descriptive study.

The confidence interval is 95%, with standard error of 0.05.

$$\mathbf{n = Z^2\, P(1 - P)/D^2}$$

With Z=1.96; P=0.23; D=0.05, we got sample size of a minimum of 113 patients. However, we have recruited 313 participants. The recruitment was done in four days of consultation per week. Each day, at least 15 patients were received in orthopedic OPD. This sample has been collected in a period of one month.

3.3.2 Inclusion criteria

All patients seen in orthopedic OPD at RMH with musculoskeletal disorders, who have signed consent for adults and parental assent for minors, were enrolled in our study.

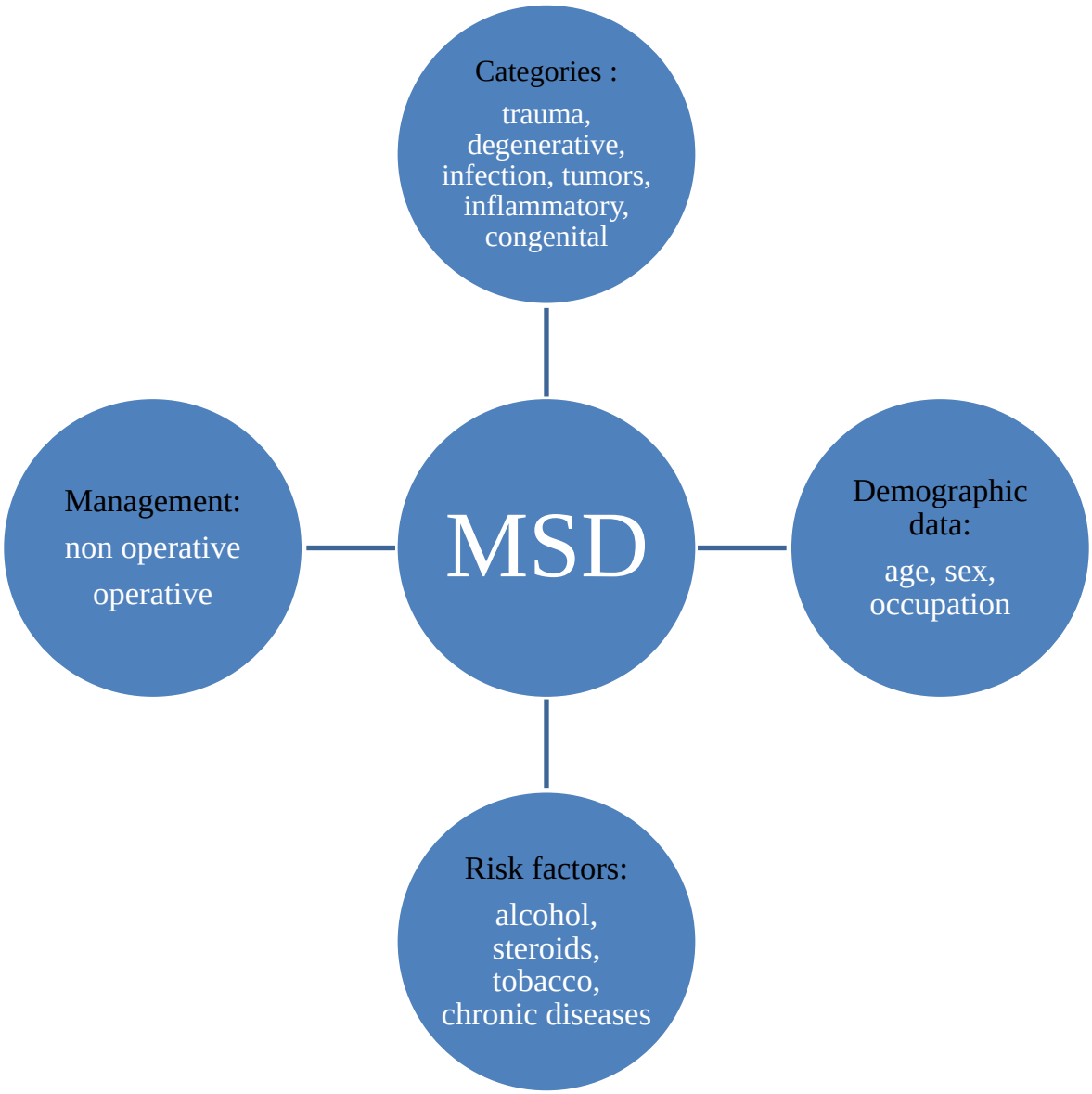
3.3.3 Exclusion criteria

We excluded from this research, all patients who had refused to give consent / assent. We excluded also patient who have consulted OPD department more than one time in this period of study for the same condition.

3.4 Conceptual framework

The study of patterns of musculoskeletal diseases at Rwanda Military Hospital was conceptualized as an establishment of relationship between MSD and determinants, which give variability in musculoskeletal diseases in general.

Figure1. Conceptual framework



3.5 Data collection and analysis

Participants were recruited in orthopedic OPD and demographic data, diagnosis of orthopedic diseases, nature of diseases, and management proposed were collected with questionnaires and recorded using EpiData 3.1 version

Data was analyzed using SPSS. In analysis, the distribution of orthopedic pathologies; age and gender distribution within different orthopedic pathologies; musculoskeletal disease diagnosis; risk factors of different orthopedic pathologies; and management planned for the orthopedic pathologies diagnosed were analyzed.

3.6 Ethical considerations

3.6.1 Confidentiality

The confidentiality was respected by protection of participant identity with a code. The identity of the participants was kept confidential; participants have been given unique number identifiers. The participant's names and number identifiers were kept on a list, stored in a safe locker and were available only to the principal investigator. After completion of the study, all participants' identifiers were destroyed in order to protect confidentiality.

3.6.2 Risks to participants

The risks to participant in this study were minimal. Participants and next of kin were asked questions, assessed and managed as any patient according to normal medical management. There were no extra care charges. Participation was voluntary and participants did not get any compensation.

3.6.3 Informed consent and assent

Informed consent and assent in Kinyarwanda and English, was obtained after full explanation to participant and to next of kin. We have got assent from participants with age between 7 and 17 years, if he/she was able to understand our explanations and to communicate. The participant had right to withdraw from our study at anytime and without any consequence.

3.6.4 Ethical approval

The research protocol was presented to the department of surgery and CMHS/IRB for review and approval (No 120 / CMHS IRB / 2018) and we got approval from RMH ethical committee.

CHAPTER4. RESULTS

The population of our study was composed of 313 participants from outpatient department at RMH. Results were grouped in Demographic data, Distribution of orthopedic pathology among patients, management characteristics and association analysis between variables. In the following tables our results are shown with the most significant findings.

A univariate descriptive analysis was used to describe the distribution of a single variable. It included frequencies, presented in the form of tables, figures/charts. To try to respond to the research questions, this study performed some cross tabulations where specific variables were compared to all socio-demographic categories. Proportions were compared between groups using a chi-square test, to highlight the association between the key variables with their P-values: 0.05 or less were considered statistically significant. If the P-value is less than the significance level (0.05), we cannot accept the null hypothesis. Thus, we conclude that there is a relationship between the two chosen variable and vice versa.

4.1 Patient demographic characteristics

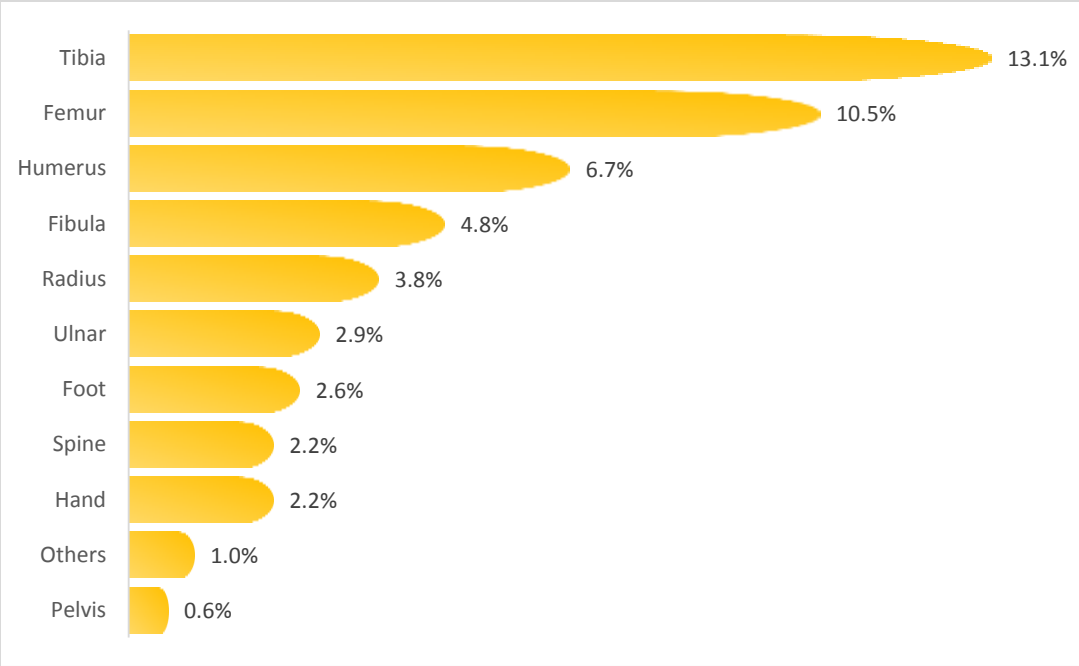
Table 1: Distribution of the respondents based on gender, age group, diagnosis, count, and percentage

Age group	Count	%
0-14 years	41	13.1%
15-65 Years	258	82.4%
>65 Years	14	4.5%
Total	**313**	**100.0%**
Gender		
Male	216	69.0%
Female	97	31.0%
Total	**313**	**100%**
Diagnosis		
Trauma	155	49.5%
Infection	43	13.7%
Degenerative	35	11.2%
Congenital	9	2.9%
Inflammatory	7	2.2%
Tumor	6	1.9%
Neurological	4	1.3%
Vascular	4	1.3%

There were more male patients216 (69.0%) than female patients (31.0 %). The majority of patients were in the 15-65 year age group accounting to 82.4 %. The 0-14 year age group and those above 65 years accounted 13.1%, and 4.5% respectively. The study found that trauma was the leading cause of consultation followed by infection and degenerative pathologies accounting respectively 49.5%, 13.7% and 11.2% respectively.

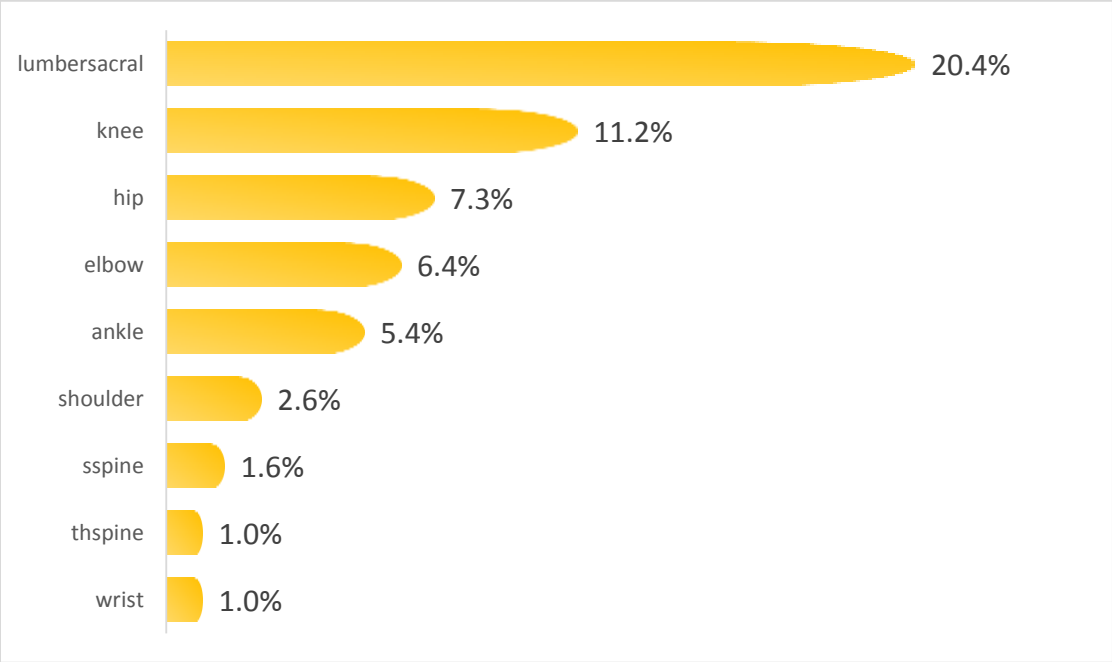
4.2 Distribution of orthopedic pathology by body site

Figure2. Distribution of orthopedic pathology by body site



The figure above shows that the most affected body parts in the sampled population are tibia, femur, humerus and fibula respectively amount 13,1%, 10.5%, 6.7% and 4.8%

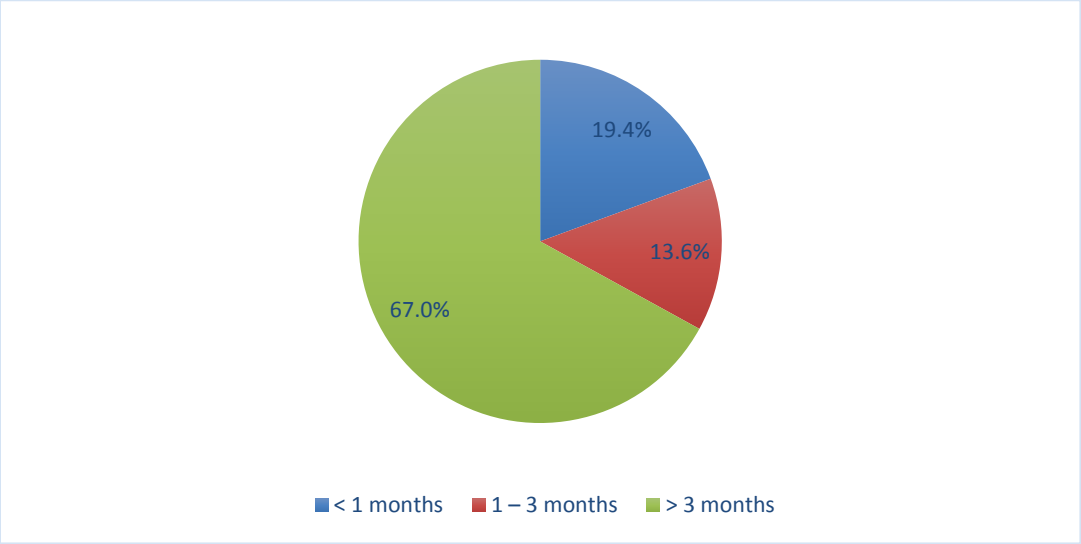
Figure3. Distribution of orthopedic pathology by joints



The figure above showed lumbar sacral was the most affected joint followed by knee, hip, elbow and ankle, respectively represented in our study as 20.4%, 11.2%, 7.3%, 6.4% and 5.4%

4.3 Time of onset of diseases and consultation

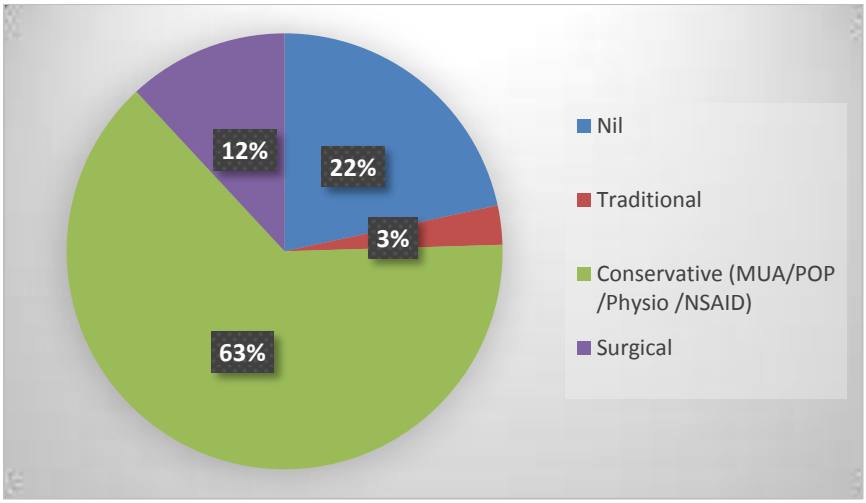
Figure4. Time of onset of diseases and consultation



The figure above showed that time of onset of musculoskeletal condition to presentation for treatment among the consulted clients in the sample population was above three months in 67.0%, less than one month in 19.4% and between one to three months is all about 13.6%.

4.4 Previous treatment received by patients

Figure5. Previous treatment received by patients



The figure above showed that a significant number of the patients have been treated conservatively before, 22% of the respondents came without any treatment before, 12% come for

post-operative follow up and 3% of the respondents presented after consulting the traditional healers.

4.5 Relationship between trauma with some key variables

Table2. Relationship between trauma with some key variables/ demographic variables

Variables	**Trauma**		
Age	**YES**	**NO**	**Chi-2 (P-value)**
0-14 years	18 (11.6%)	23 (14.6%)	0.92 (0.5629)
15-65 Years	131 (84.5%)	127 (80.4%)	
>65 Years	6 (3.9%)	8 (5.1%)	
Sex	**YES**	**NO**	**Chi-2 (P-value)**
Female	43 (27.7%)	54 (34.2%)	1.5 (0.218)
Male	112 (72.3%)	104 (65.8%)	
Body site	**YES**	**NO**	**Chi-2 (P-value)**
Spine	0 (0%)	7 (4.4%)	7.02 (0.008)
Humerus	10 (6.5%)	11 (7%)	0.03 (0.857)
Femur	24 (15.5%)	9 (5.7%)	7.95 (0.005)
Tibia	24 (15.5%)	17 (10.8%)	1.53 (0.215)
Time of on set	**YES**	**NO**	**Chi-2 (P-value)**
< 1 months	53 (34.4%)	7 (4.5%)	85.33 (0.000)
1 – 3 months	36 (23.4%)	6 (3.9%)	
> 3 months	65 (42.2%)	142 (91.6%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
Nil	17 (11%)	50 (32.1%)	26.97 (0.000)
Traditional	4 (2.6%)	5 (3.2%)	
Conservative	105 (68.2%)	92 (59%)	
Surgical	28 (18.2%)	9 (5.8%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
hip	13 (8.4%)	10 (6.3%)	0.487 (0.485)

knee	19 (12.3%)	16 (10.1%)	0.357 (0.55)
Lumbar sacral	2 (1.3%)	62 (39.2%)	69.28 (0.000)
Management	**YES**	**NO**	**Chi-2 (P-value)**
None operative	44 (28.4%)	94 (59.5%)	30.71 (0.000)
Operative	111 (71.6%)	64 (40.5%)	

The assessment of association between trauma with demographic and other variables showed that trauma was mostly diagnosed in patients in age group of 15-65 years, but having trauma was not found to be associated with age (p=0.5629). Males were more likely to be involved in trauma than females but there was no statistically significant association between trauma and gender (p=0.218). The most involved body part was femur and tibia with statistically significant association for the femur (p=0.005) but not for the tibia (p=0.215).

Most patients consult more than 3 months after onset of symptoms and the opted management in trauma was mostly operative. There was statistically significant association for both variables (p=0.000).

4.5 Relationship between infections with some key variables

Table3. Relationship between infection with some key variables/demographic variables.

Variables	**Infection**		
Age	**YES**	**NO**	**Chi-2 (P-value)**
0-14 years	11 (25.6%)	30 (11.1%)	6.90 (0.032)
15-65 Years	30 (69.8%)	228 (84.4%)	
>65 Years	2 (4.7%)	12 (4.4%)	
Sex	**YES**	**NO**	**Chi-2 (P-**

			value)
Female	8 (18.6%)	89 (33%)	3.57 (0.059)
Male	35 (81.4%)	181 (67%)	
Body site	**YES**	**NO**	**Chi-2 (P-value)**
Spine	0 (0%)	7 (2.6%)	1.14 (0.286)
Humerus	10 (23.3%)	11 (4.1%)	21.86 (0.000)
Femur	7 (16.3%)	26 (9.6%)	1.74 (0.187)
Tibia	16 (37.2%)	25 (9.3%)	25.46 (0.000)
Time of on set	**YES**	**NO**	**Chi-2 (P-value)**
< 1 months	3 (7%)	57 (21.4%)	12.84 (0.002)
1 – 3 months	1 (2.3%)	41 (15.4%)	
> 3 months	39 (90.7%)	168 (63.2%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
Nil	9 (21.4%)	58 (21.6%)	5.20 (0.158)
Traditional	2 (4.8%)	7 (2.6%)	
Conservative	22 (52.4%)	175 (65.3%)	
Surgical	9 (21.4%)	28 (10.4%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
hip	1 (2.3%)	22 (8.1%)	1.84 (0.174)
knee	2 (4.7%)	33 (12.2%)	2.14 (0.143)
Lumbar sacral	0 (0%)	64 (23.7%)	12.81 (0.000)
Management	**YES**	**NO**	**Chi-2 (P-value)**
None operative	9 (20.9%)	129 (47.8%)	10.84 (0.001)
Operative	34 (79.1%)	141 (52.2%)	

The assessment of association between infection with demographic and other different variables showed that infection was mostly seen in the young group. The most affected bones were the tibia and humerus with (p=0.000). Most of cases presented late with (p=0.000).

4.6 Relationship between degenerative conditions with some key variables

Table4. Relationship between degenerative conditions with some key variables/demographic variables.

Variables	**Degenerative**		
Age	**YES**	**NO**	**Chi-2 (P-value)**
0-14 years	0 (0%)	41 (14.7%)	13.69 (0.001)
15-65 Years	30 (85.7%)	228 (82%)	
>65 Years	5 (14.3%)	9 (3.2%)	
Sex	**YES**	**NO**	**Chi-2 (P-value)**
Female	25 (71.4%)	72 (25.9%)	30.0 (0.000)
Male	10 (28.6%)	206 (74.1%)	
Body site	**YES**	**NO**	**Chi-2 (P-value)**
Spine	5 (14.3%)	2 (0.7%)	26.16 (0.000)
Time of on set	**YES**	**NO**	**Chi-2 (P-value)**
< 1 months	0 (0%)	60 (21.7%)	18.20 (0.000)
1 – 3 months	0 (0%)	42 (15.2%)	
> 3 months	33 (100%)	174 (63%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
Nil	1 (2.9%)	66 (23.9%)	15.47 (0.001)
Traditional	0 (0%)	9 (3.3%)	
Conservative	32 (94.1%)	165 (59.8%)	
Surgical	1 (2.9%)	36 (13%)	
Previous treatment	**YES**	**NO**	**Chi-2 (P-value)**
hip	2 (5.7%)	21 (7.6%)	0.15 (0.694)
knee	6 (17.1%)	29 (10.4%)	1.41 (0.235)
Lumbar sacral	20 (57.1%)	44 (15.8%)	32.62 (0.000)
Management	**YES**	**NO**	**Chi-2 (P-value)**

None operative	23 (65.7%)	115 (41.4%)	7.47 (0.006)
Operative	12 (34.3%)	163 (58.6%)	

The association between degenerative conditions with demographic and other variables showed that degenerative conditions were mostly seen in age group of 15-65 years. Females are more affected than males and the spine is the most affected than other body part.

CHAPTER5. **DISCUSSION**

Musculoskeletal diseases are a considerable contributor to the global burden of disease. So far, the level of their contribution in LMIC is not fully known. The only study done in Rwanda on musculoskeletal disease focused on physical disability attributable to musculoskeletal pathologies. Our study was a baseline study. Its aim was to describe the patterns and management of musculoskeletal disease at RMH. RMH was chosen among four other referral hospitals offering specialist orthopedic services in Rwanda because it has most number of orthopedic surgeons and offering expertise in different orthopedic subspecialties. In this chapter, we are discussing our results with reference to similar studies conducted in different settings including the LMIC and HIC.

Musculoskeletal disease encompasses a wide range of conditions grouped in our study into eight diagnostic categories: trauma, infection, degenerative, congenital, inflammatory, tumor, neurological and vascular. Trauma was the leading cause of the musculoskeletal disorders at 49.52%, followed by infection at 13.74%., and degenerative pathologies accounting 11.2% (table 1).

5.1 Diagnosis category and Age distribution of patients

The age has been grouped in three groups, representing pediatric group (0 to 14years), 15 to 65 years which represents the productive age group and above 65 years representing senior citizens[43]. MSDs account more than half of noted conditions in people over the age of 50[44]. In our population, trauma was the leading diagnosis in all age groups. Overall, about 50% MSDs were caused by trauma (table1) and this is similar to findings in a study done in South Africa, in an under-resourced area of Cape Town which showed that trauma was the leading cause at 54%.[45] Trauma was predominant in 15 to 65 age group but its distribution with age group is not statistically significant (p=0.5629).

5.2 Diagnosis category and gender distribution of patient

Gender is one of the factors that determine the patterns of MSD. In our study, we have found the predominance of male patients of 69.01% (216 males as opposed to 97 females), but this is statistically not significant (p=0.218). In a study done in general population of Rwanda, studying physical disability, female and male were equally represented[21]. Male predominance can be

attributed to the trauma encountered during daily activities. The male predominance was also found in other studies in LMIC and HIC countries. In Zambia Emmanuel Makasa et al has found male predominance at 61.2%.[25] Most of studies in LMIC and HIC has shown that female were predominant than male or with an equal ratio.[20,21,46]

5.3 Affected body parts and joints

lumbar- Sacral was the most affected joint, followed by knee, hip, elbow and ankle joint, 20.4%, 11.2%, 7.3%, 6.4% and 5.4% respectively (figure 2). Most of studies done on musculoskeletal diseases reported the spine to be the most affected body parts[20]which is similar to our study.

The most affected bone was the tibia, followed by femur and humerus with proportion of 13.1%, 10.5% and 6.7% respectively (figure 1).

5.4 Time from onset of condition to presentation

Most of our patients, 67%, presented after a period of more than three months from the time of onset of their musculoskeletal diseases symptoms. Those who sought treatment in less than one month were 19.4% and between one to three months were 13.6%. (figure3). Other researchers should analyze the reason of late presentation at referral hospitals. However, this may be caused by referral system; where the delay can be attributed to the process of obtaining a transfer or by being treated at a lower health facility and being transferred later. On the other hand, the big number of patient waiting appointment of orthopedic surgeon, which takes mostly 6 weeks and above can be also the cause of delay presentation. The delay consultation, especially for trauma cases would be considered neglected as they present in a period of more than 12 weeks. Fractured bones mostly present already united, according to the Time of union by Volpin & Gorsky[47], either in mal position, non-union, delayed union, severe deformity and shortness of the affected limb. Neglected fractures are a challenge to the surgeon as they are difficult to manage and outcomes are usually are not good[48].Our findings are similar to the study done in Zambia where 76.6% of the sampled patients presented after 3 months of onset of symptoms. Although it needs confirmation through research, the late presentation of patients at health facilities could be due to the large number of patient on waiting list of consultation at referral hospitals.

5.5 Musculoskeletal infection

In our study, infection is the second most common cause for consultation in orthopedic clinic 13.7% (table1). Chronic osteomyelitis was the mostly type found. The individual is contaminated either by haematogenous spread of micro-organism from a distance site or by direct introduction through the skin.[34] Chronic osteomyelitis and septic arthritis are rare conditions in HICs comparing with LMIC.[353637]We have found that tibia and humerus are more affected bone 37.2% and 23.3% respectively with statistical significant association with a (p=0.000), (table3). The infection was mostly detected in the young group with a statistically significant association with a (p=0.032), even if there is a need of confirmation through researches, the association between young age group and infection is that this group contains individuals on high risk of trauma whereas the protective barrier role of the skin is compromised. This could be one of the cause of high rate of infection in this group.

5.6 Diagnosis category and proposed management to be offered

In our study, non-operative management was more seen in degenerative and occupational conditions. Surgery was frequently proposed in trauma and infection. The initial management of degenerative disease is mostly non operative intervention, and surgery is adopted if unbearable pain and interfering with daily activities of the person.[44]

Degenerative diseases most seen in the 15-65 year age group with statistical significant (p=0.001). Females were affected by degenerative conditions than males with statistical significant (p=0.000). The spine was the commonest body part involved with degenerative conditions a statistical significance (p=0.000), (table 4). Our findings are similar to the results of a study done in Sierra Leone on the burden of musculoskeletal diseases in Sierra Leone where the back was the most affected part of the body, with 33%[20].

5.7 Study Limitations

Time constraints was the major limitation of this study, as some musculoskeletal diseases can be influenced by seasonal patterns, we need further researches on MSDs covering all seasons of the year. On the other hand, as this study is an observational study in nature, it has also limitation in rare diseases such as tumors. The period of one month have been chosen because it was possible

to get the calculated sample size number of 113 participants, while we got more than three times in month. Therefore, this could not affect the validity of the results.

CHAPTER6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Large number of traumatic, infective and degenerative conditions marks the patterns of MSDs at RMH. Male patients were more commonly affected than female ones. As the individual diagnosis, lumbar- sacral spinal degenerative conditions were the most prevalent. The knee was the most affected joint followed by the hip. The preferred management is surgery in traumatic and infection conditions. Most of patients consult late, after three months from the onset of their conditions. The big number of patient waiting appointment of orthopedic surgeon and the reason that most patients consult referral hospitals after being followed longtime at other health facilities can explain this delay consultation.

6.2 Recommendations

1. To do a study on how to improve the delay of presentation in OPD in order to reduce neglected conditions such as neglected dislocations and fractures.
2. To do a study on management and outcome of most prevalent MSDs.
3. To do a study on how establish specialized units like spinal, trauma, oncology, pediatric, hand, and arthroplasty units in referral hospitals can be helpful in proper management of patients.
4. To perform other studies and evaluate patterns and management of MSDs in other referral hospitals in Rwanda in order to draw common guidelines to be used in all referral hospitals.

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APPENDIX 1

PATIENT EVALUATION FORM:

1. Identification number.....

2. Residential Address……..

3. Age/Sex.....

4. Patient Category

(a) Follow-up patient…….

(b) New patient…….

5. Referred

(a) Yes/No

(b) If yes, Referring hospital……

7. Orthopedic diagnosis……

8. Type of condition

(a) Trauma……..

(b) Congenital…….

(c) Tumor…….

(d) Bone/Joint Sepsis……

(e) Inflammatory……

(f) Neurological……

(g) Vascular ……

(h) Degenerative……

9. Site on body……

10. Side of body.....

11. Time from onset to presentation for treatment

(a) < 1 months……

(b) 1 – 3 months…….

(C) > 3 months…….

12. Previous Treatment Received

(a) Nil…….

(b) Traditional…….

(c) Conservative (MUA/POP /Physio /NSAID……

(d) Surgical…….

13. Underlying diseases

(a) Cardiac failure

(b) Diabetes mellitus

(c) Asthma

(d) Chronic kidney disease

(e) HIV/AIDS

14. Others Risk Factors

(a). Drug use

(b) Tobacco

(c) Steroids use

(d) Alcohol use

15. Occupation …….

16. Affected joint

(a) Spine

(b) Shoulder

(c) Elbow

(d) Wrist

(e) Hip

(f) Knee

(g) Ankle

17. Management done

(a) Surgery

(b) Non operative

APPENDIX 2.

INFORMED CONSENT AND ASSENT FORM

Name of Research: **PATTERN AND MANAGEMENT OF ORTHOPEDIC PATHOLOGIES CONSULTING OUTPATIENT DEPARTEMENT AT A REFERRAL LEVEL HOSPITAL, CASE OF RWANDA MILITARY HOSPITAL.**

Principle Investigator: **Dr Salvador Kamarampaka, orthopedic consultant and resident in Orthopedics**

Our research requires participation of all patients with orthopedic conditions presented in OPD at RMH.

Informed consent (for Parents/guardians of children aged between 0 to 18 years, and participants with age above 18years)

- My name is **Dr Kamarampaka Salvador,** my job is to research about orthopedic diseases presenting in OPD at this hospital you have consulted. We want to know the pattern of orthopedic diseases presenting in OPD and plan accordingly.
- I am inviting you/your child to participate in this research. You do not have to decide today whether or not you/your child may participate in the research. Before you decide, you can talk to anyone you feel comfortable with.
- Your decision for participation in this study is entirely voluntary. If you choose not to consent, they will be no change to services you/your child receive at this hospital. You may also choose to change your mind later and stop participating.
- There may be some words that you do not understand. I will take time to explain. If you have questions later, you can ask them to me.
- Orthopedic diseases are those affecting musculoskeletal system. The pattern of musculoskeletal diseases in Rwanda is still unknown, that is why this study is important and will help in planning and making strategies in management of orthopedic conditions

- We are going to ask you/ your child, questions on your/his or her presenting orthopedic conditions and other possible conditions that can be related directly or indirectly to the present disease.
- The assessment of you/ your child is with no risk. If anything unusual happens to you, you should feel free to tell us.
- You/ the child whom you are a guardian will not directly benefit from this research but you/ he or she will contribute greatly to the science by helping us in improvement of management of orthopedic condition in RMH.
- The information that we collect from this research project will be kept confidential. Any information about you/your child will have a number on it instead of his/her name.
- The knowledge that we get from this study will be shared with you before it is made widely available to the public.

Informed assentfor participants aged between 7 to 18 years

- I am going to give you information and invite you to be part of the research. You can choose whether or not you want to participate. We have discussed this research with your parent(s)/guardian and they know that we are also asking you for your agreement.
- If you decide to participate in the research, your parent(s)/guardian also have to agree. But if you do not wish to participate, you do not have to be in research.
- You may discuss anything in this form with your parents or friends or anyone else you feel comfortable talking to. You can decide whether to participate or not after you have talked it over. You do not have to decide immediately.
- There may be some words you don't understand or things that you want me to explain more about because you are interested or concerned. Please ask me to stop at anytime and I will take time to explain).
- We are looking the pattern of musculoskeletal diseases in Rwanda which is still unknown, and this will help in planning and making strategies in management of orthopedic conditions.
- If you decide not to be in the research, its okay and nothing changes. This is still your hospital; everything stays the same as before. Even if you say "yes" now, you can change your mind later and it’s still okay.

- We are going to ask you questions related to your presenting orthopedic conditions and other possible conditions that can be related directly or indirectly to the present disease.
- The assessment is with no risk. If anything unusual happens to you, you should feel free to tell us.
- You will not directly benefit from this research but you will contribute greatly to the science by helping us in improvement of management of orthopedic condition in RMH..
- We will not tell other people that you are in this research and we won't share information about you to anyone who does not work in the research study.
- When we are finished the research, we will be telling more people, scientists and others, about the research and what we found.

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact any of the following:

Dr Salvador KAMARAMPAKA, Mobile: 0788813247

Dr Albert NZAYISENGA, Telephone: 0788863341

<u>Contacts from CMSH-IRB</u>

- **Chairperson of the CMHS IRB, Mobile: 0788490522**
- **Deputy Chairperson of the CMHS IRB, Mobile: 0783340040**

Certificate of Informed Consent/Assent

I have read this information (or had the information read to me) I have had my questions answered and know that I can ask questions later if I have them. I agree to take part in the research.

Name and signature of participant

_____

Name and signature of parent/guardian (for participant with age 0 - 18 years):

_____

Date:_____

If illiterate:

I have witnessed the accurate reading of the consent/assent form to the participant /parent/guardian. I confirm that the individual has given consent freely.

Name and signature of witness _____

Thumb print of participant/parent/guardian

Date:_____

Statement by the researcher/person taking consent/assent

I confirm that the participant/parent/guardian was given an opportunity to ask questions about the study, and all the questions asked by him/her have been answered correctly. I confirm that the individual has not been coerced into giving consent/assent, and the consent/assent has been given freely and voluntarily.

Name and signature of Researcher/person taking the assent_____

Date _____

APPENDIX 3

URUPAPURO RUTANGA UBURENGANZIRA NTA GAHATO

Inyito y'ubushakashatsi: **PATTERN AND MANAGEMENT OF ORTHOPEDIC PATHOLOGIES CONSULTING OUTPATIENT DEPARTEMENT AT A REFERRAL LEVEL HOSPITAL, CASE OF RWANDA MILITARY HOSPITAL.**

Umushakashatsi: **Dr Salvador Kamarampaka, umuganga wigiye kuvura indwara z' amagufwa n ' umuganga wiga kuvura indwara z'amagufa.**

Ubu bushakashatsi burareba abantu bivuza bataha indwara z' amaufwa mu bitaro bya gisirikari mu Rwanda

Upupapuro rutanga uburenganzira nta gahato(ababyeyi/abarinzi b'abana bafite imyaka hagati ya 0 na 18; n abandi barengeje imyaka 18)

- Amazina yanjye ni **Dr Kamarampaka Salvador**, nkaba ndi gukora ubushakashatsi bugamije kumenya ishusho nyayo y indwara za amagufwa zigaragara mu barwayi baza kwivuza bataha ku bitaro bya gisirikari mu Rwanda.
- Twishimiye gusaba ko wowe/umwana wawe/uhagarariye wadufasha muri ubu bushakashatsi nta gahato. Singombwa ko uhita ufata icyemezo aka kanya. Ushobora no kubanza kubaza ibibazo umuntu uwariwe wese waguha inama.
- Kujya muri ubu bushakashatsi kuri wowe cyangwa umwana wawe/Uhagarariye ni kubushake kandi nta gahato. Uramutse utabyemeye, nta mpinduka zizaba ku bufasha ibitaro biguha, cyangwa biha umwana wawe. Ushobora no guhindura icyemezo igihe cyose ubyumva kabone niyo ubushakashatsi bwaba bwatangiye.
- Hari amagambo agoye kumva, ariko ndayagusobanurira, kandi nibindi bisobanuro byose ucyenera ubimbaze ndabiguha
- Orthopaedic diseases ni indwara zifata urwungano nyiribakwe. Mu Rwanda nta shusho nyayo y izi ndwara tuzi, akaba ariyo mpamvu nyamukuru igenderewe muri ubu bushakashatsi.
- Turakubaza ibibazo ku birebana n uburwayi bwawe, hamwe nibindi bibazo bifitanye isano nabwo cyangwa bifite aho bihuriye n uburwayi ufite.
- Ibyo tugukorera cg dukorera umwana mu bushakashatsi nta ngaruka bimugiraho. Ugize ibyo ubona bikubangamiye cyangwa bibangamiye umwana, ntubyihererane ahubwo ubitubwire maze tugufashe/tumufashe.
- Nta nyungu zindi uzakura cyangwa umwana ubereye umurinzi azakura muri ubu bushakshatsi usibye ko muzaba mudufashije mu iterambere ry ubuvuzi bw' indwara za amagufwa mu Rwanda.

- Amakuru yose ku bushakashatsi tuzayabika mu buryo bwibanga, azamenywa natwe turi mu bushakashatsi gusa.
- Ubushakashatsi niburangira, ibyavuyemo tuzabigaragaza mu binyamakuru bya siyansi kujyirango bijyirire benshi akamaro.

<u>Urupapuro rw'abana rutanga uburenganzira nta gahato (bafite imyaka hagati ya7 na 18)</u>

- Ndakugezaho ibijyanye nubushakashatsi tugiye gukora, kandi ngusabe nuburenganzira bwo kubuzamo nta gahato.Ushobora guhitamo kubujyamo cyangwa kutabujyamo.Twaganiriye numubyeyi wawe/uguhagarariye ku ibyo tugiye kugusaba
- Niwemera kuza mu bushakashatsi, turasaba nababyeyi uburenganzira, ariko uguhitamo ni ukwawe, kuko ushobora no kwanga kubujyamo.
- Wemerewe kuganira kubyo tugusaba nuwariwe wese mbere yo gufata icyemezo.kandi icyemezo si ihame kuduha umwanzuro nonaha.
- Hari amagambo agoye kumva, ariko ndayagusobanurira, kandi nibindi bisobanuro byose ucyenera ubimbaze ndabiguha
- Impamvu nyamukuru y'ubu bushakashatsi ni ukugira ngotugire ishusho nyayo y' indwara za amagufwa ziboneka mu barwayi baza kwisuzumisha bataha.
- Kutemera kuza mu bushakashatsi kwawe ntacyo bihindura ku ubufasha bwiza uhabwa nibitaro.Wemerewe kuba wahindura icyemezo, niyo ubushakashatsi bwaba bwatangiye
- Turakubaza ibibazo ku birebana n uburwayi bwawe, hamwe nibindi bibazo bifitanye isano nabwo cyangwa bifite aho bihuriye n uburwayi ufite
- Ibyo tugukorera nta ngaruka bikugiraho. Ugize ibyo wumva bikubangamiye ntubyihererane, ahubwo ubitubwire maze tugufashe.
- Nta nyungu zindi uzakura muri ubu bushakshatsi usibye ko muzaba mudufashije mu iterambere ry ubuvuzi bw' indwara za amagufwa mu Rwanda.
- Amakuru yose ajyanye nawe mu bushakashatsi tuzayabika mu buryo bwibanga, azamenywa natwe turi mu bushakashatsi gusa.
- Ubushakashatsi niburangira, ibyavuyemo tuzabigaragaza mu binyamakuru bya siyansi kujyirango bijyirire benshi akamaro.

Ugize icyibazo kubijyanye nubushakshashatsi wabaza aba bakurikira:

- **Dr Salvador KAMARAMPAKA, Telefoni: 0788813247**
- **Dr AlbertNZAYISENGA, Telefoni: 0788863341**
- **<u>Abahagarariye ubushakashatsi muri Kaminuza y'u Rwanda</u>**
  1. **Chairperson of the CMHS IRB, Telefoni: 0788490522**
  2. **Deputy Chairperson of the CMHS IRB, Telefoni: 0783340040**

Kwemeza itangwa ry'uburenganzira

Ndemeza ko nasomye/nasomewe ibikubiye muri iyi nyandiko kandi nkanasubizwa neza ibibazo byose nabajije kubijyanye nubu bushakashatsi. Nemeye kujya/ko umwana wanjye ajya muri ubu bushakashatsi ntagahato.

Amazina numukono by'umwana

_____

Amazina numukono by'umubyeyi/uhagarariye umwana (ufite imyaka hagati ya 0 na 18) :

_____

Itariki:_____

Niba atazi gusoma:

Nk'umugabo, ndemeza ko umwana/umubyeyi/umurinzi yahawe ibisobanuro byose ku bushakashatsi. Ndemeza ko yemeye kujya muri ubu bushakashatsi ntagahato.

Amazina numukono by'umugabo:

_____

Igikumwe cy'umwana/umubyeyi: ☐

Kwakira uburenganzira

Ndemeza ko umwana/umubyeyi/umurinzi w'umwana yahawe umwanya wo kubaza ibibazo byose ku bushakshatsi kanndi ko yahawe ibisubizo bishimije. Ndemeza ko umwana/ umubyeyi/umurinzi w'umwana yemeye kujya mu bushakashatsi nta gahato ashyizweho.

Amazina n'umukono by'uwakiriye uburenganzira_____

Itariki _____