

**MORBIDITY PATTERNS, OUTCOMES AND ASSOCIATED FACTORS
AMONG PATIENTS ADMITTED IN CORONARY CARE UNIT AT
JAKAYA KIKWETE CARDIAC INSTITUTE, DAR ES SALAAM,
TANZANIA.**

Alexander Joseph, MD

**MMed (Anaesthesiology) Dissertation
Muhimbili University of Health and Allied Sciences
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Muhimbili University of Health and Allied Sciences
Department of Anaesthesiology



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By

Dr. Alexander Joseph

**A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of
Masters of Medicine (Anaesthesiology) at**

Muhimbili University of Health and Allied Sciences

October, 2022

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for examination by Muhimbili University of Health and Allied Sciences a dissertation entitled “**MORBIDITY PATTERNS, OUTCOMES AND ASSOCIATED FACTORS AMONG PATIENTS ADMITTED IN CORONARY CARE UNIT AT JAKAYA KIKWETE CARDIAC INSTITUTE, DAR ES SALAAM, TANZANIA**” in (partial) fulfilment of the requirement for the degree of master of medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences.

.....

Dr. Edwin Lugazia
(Supervisor)

.....

Date

DECLARATION AND COPYRIGHT

I, Alexander Joseph, declare that this dissertation is my own 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.

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Lastly, with great honour, special appreciation my family, especially my parents and Darling Wife for their continuous words of encouragement and prayers every single day, and their patience and understanding whenever I was unavailable during the period of this dissertation development.

DEDICATION

I dedicate this dissertation to all health care workers providing care to critically ill cardiac patients in Tanzania, especially those in coronary care units for their selfless dedication and commitment to improving the level of care offered and helping all people have better health.

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LIST OF ABBREVIATIONS

ACS	Acute Coronary Syndrome
ADHF	Acute Decompensated Heart Failure
AKI	Acute Kidney Injury
AMI	Acute Myocardial Infarction
CCU	Coronary Care Unit
CICU	Cardiac Intensive Care Unit
CKD	Chronic Kidney Disease
CPAP	Continuous Positive Airway Pressure
CPR	Cardiopulmonary Resuscitation
DCM	Dilated Cardiomyopathy
DM	Diabetes Mellitus
ECG	Electrocardiogram
EMD	Emergency Medicine Department
HTN	Hypertension
JKCI	Jakaya Kikwete Cardiac Institute
LVEF	Left Ventricular Ejection Fraction
NSTEMI	Non ST-Elevation Myocardial Infarction
PCI	Percutaneous Coronary Intervention
RHD	Rheumatic Heart Disease
STEMI	ST-Elevation Myocardial Infarction
VF	Ventricular Fibrillation
WHO	World Health Organization

DEFINITION OF TERMS

Acute Coronary Syndrome (ACS); is one of the clinical manifestations of Coronary Artery disease, it encompasses ST-elevation myocardial infarction (STEMI) and non-ST elevation ACS (NSTE-ACS); which encompasses non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA).

Acute Heart Failure; is a rapid onset of new or worsening signs and symptoms of Heart failure. Can manifest as Acute Decompensated Congestive heart failure, acute heart failure with pulmonary edema, cardiogenic shock, hypertensive heart failure.

Acute Myocardial Infarction (AMI); is defined as evidence of myocardial necrosis in a clinical setting consistent with acute myocardial ischaemia. The criteria requires that there should be a rise and/or fall of cardiac biomarker value (preferably cardiac troponin) with at least one of the following: symptoms of ischaemia, new or presumed new significant ST segment or T wave changes, or new left bundle branch block, development of pathological Q waves on ECG, imaging evidence of new loss of viable myocardium or new regional wall motion abnormality, identification of intracoronary thrombus on angiography or autopsy.

Heart Failure; Inability of the heart to pump blood to meet the body's metabolic needs under normal cardiac filling pressure. Can be Acute heart failure or chronic heart failure.

Hypertensive Crisis; is the severe elevation in blood pressure with Systolic blood pressure greater or equal to 180mmHg and/or diastolic greater or equal to 120mmHg.

Non ST-Elevation Myocardial Infarction (nSTEMI); is the type of Myocardial infarction without elevation of the ST-segment on ECG. May present with ST segment depression, T-wave inversion or no changes on ECG. Differs from Unstable angina in that there is elevation of cardiac enzymes.

Pacemaker; is a type of cardiac implantable electronic device that generate artificial electrical pulses. Used in management of arrhythmias and other cardiac conditions

Percutaneous Coronary Intervention (PCI); is a form of intervention used to re-establish coronary reperfusion in patients with Coronary artery disease. Involve placing a stent to an occluded coronary artery.

ST-Elevation Myocardial Infarction (STEMI); is the type of Myocardial infarction with elevation of ST-segment on ECG.

Unstable Angina; is a form of Non-STEMI ACS where there is no rise in cardiac enzyme.

ABSTRACT

Background

Coronary care unit is a specialized unit for caring of critically ill cardiac patients. With the increasing burden of disease it is no doubt this special unit is crucial, however the causes of admission, outcomes and associated factors are not known in our settings.

Objective of this study

To evaluate the causes of admission, mortality rate and disease factors associated with the outcome among patients admitted in coronary care unit at Jakaya Kikwete Cardiac Institute (JKCI).

Methodology

Hospital based cross-sectional study conducted at JKCI. All patients admitted at the Coronary care unit meeting the inclusion criteria were enrolled after consenting. Mayo Cardiac Intensive Care Unit Admission Risk Score (M-CARS) was used as an illness severity score tool to predict the mortality upon admission at the unit. Data was analyzed using SPSS version 23.

Results

115 patients were studied. Acute heart failure was the major indication for admission among patients admitted due to acute illness, with a mortality rate of 31.2%. Admission diagnosis of cardiogenic shock (p-value=0.01), respiratory failure (p-value=0.03), M-CAR score (p-value=0.00), development of sepsis (p-value=0.013), AKI (p-value=0.02), Cerebrovascular accidents (p-value=0.09) during CCU stay were associated with mortality.

Conclusion and Recommendation

Majority of critically ill patients admitted at JKCI CCU have acute heart failure with mortality rate of 31.2%. Patients admitted with diagnosis of; cardiogenic shock, respiratory failure, those with higher M-CARS and those who developed sepsis, AKI, Cerebrovascular accidents during CCU stay were more likely to die in CCU.

A higher mortality rate seen compared to other regions of the world, calls for further studies to determine the cause and hence improve cardiac care in our setting.

The association between high MCAR Score on admission and mortality among patients admitted at JKCI CCU shown could be a hallmark for the use of this novel tool in our setting if further larger studies are done to validate its use.

CHAPTER ONE

1.1 INTRODUCTION

Despite advances in Cardiovascular services still Coronary artery disease is the leading cause of death worldwide (1). In Sub Saharan Africa the prevalence is increasing with increasing risk factors such as obesity, diabetes, hypertension. Majority of cardiovascular related deaths however are due to Stroke, Ischemic heart disease and hypertension. In Tanzania the burden of cardiovascular diseases (CVD) is on the rise with CVDs being the fourth leading cause of death in the country, with hypertensive heart diseases, valvular heart diseases, coronary artery diseases, peripartum cardiomyopathy and non-hypertensive dilated cardiomyopathy being the leading cardiovascular related diseases in adults (2,3). Coronary artery diseases which are the leading cause of death worldwide include Acute coronary syndrome (ACS), which is the manifestation with the most serious consequences due to its poor prognosis (4,5).

Acute coronary syndrome is an ominous manifestation of coronary artery disease and include; ST- elevation Myocardial infarction (STEMI), Non ST- elevation ACS which includes Unstable angina and Non ST-elevation Myocardial Infarction (NSTEMI), with majority of the patients presenting with Non ST-elevation ACS (5). Myocardial infarction is universally defined as a myocardial injury attributed specifically to ischemia, i.e., with clinical evidence of a rise in troponin and at least one of the following: ischemic symptoms or electrocardiographic changes, development of pathologic Q waves, imaging evidence of new loss of viable myocardial or regional wall motion abnormalities consistent with ischemia, and last, identification of a coronary thrombus by angiography or autopsy (6). The pathophysiology of ACS involves coronary vessel occlusion from either rupture of atherosclerotic plaque, intravascular thrombus formation following endothelial Injury, the result is myocardial necrosis and elevation of cardiac enzymes. STEMI usually involves total occlusion of the coronary vessel resulting into changes in ST segment (elevation of the segment) of the affected territory on an Electrocardiogram (ECG). NSTEMI usually occurs following transient total or partial occlusion of the coronary vessels resulting into ST depression or T wave changes on the ECG. Elevated levels of troponin

help differentiate NSTEMI from Unstable angina which has persistent crescendo symptoms (5). ACS diagnosis is made from clinical presentation where patients present with; chest pain radiating to the left arm or right shoulder or both, neck discomfort, fatigue, diaphoresis, ECG changes, Elevated cardiac biomarkers (Troponin I&T, Creatinine Kinase MB) (6). Time is of the essence in the management of ACS, revascularization is important to prevent further necrosis of the injured myocardial cells and prevent complications. Management involves Percutaneous coronary intervention, Use of antiplatelets and anticoagulants (7). Patient with ACS are at increased risk of sudden cardiac arrest, heart failure and life threatening arrhythmias (8).

Heart failure is defined as the inability of the heart to supply adequate amount of blood to the body tissues under normal cardiac filling pressure (9). In Europe and America, Heart failure is a major cause of hospitalization with high morbidity and mortality, with majority of heart failure being secondary to Acute coronary syndrome (10). In Tanzania the pattern of heart failure is different with majority of cases being younger compared to the western world and leading causes are hypertension, Cardiomyopathy, rheumatic heart disease and less so Ischemic heart disease (11). Acute heart failure may present clinically as Acute Decompensated Chronic Heart Failure (ADCHF), Pulmonary Edema, Cardiogenic Shock, Acute heart failure due to Hypertensive crisis, Right sided Heart Failure (9).

As the number of cardiovascular diseases increases the number of patients with Acute cardiovascular illness is expected to also increase hence the need for critical cardiac care.

Coronary Care Unit(CCU) is a specialized unit for care of critically ill cardiac patients (8). During the 1960s it was observed that most patients with Myocardial Infarction died of cardiac arrest before the necessary equipments and staff could reach them while in the general wards this led to the establishment of the coronary care units (12). Coronary care unit offers continuous monitoring of the patients heart rhythm, 24 hours surveillance of patients by well trained staff in the management of critically ill cardiac patients (8,8,13). Initially coronary care unit cared for patients with Acute Myocardial infarction (AMI) to understand the causes of death and prevent them from occurring, but later on CCUs offered care to patients with arrhythmias, heart

failure of other causes, Hypertensive crisis and suspects of AMI with similar prognosis as true AMI patients (13). With increasing number of acute cardiac conditions CCUs are currently admitting even a much wider range of acute cardiac disorders needing highly specialized care hence named Intensive cardiac care units (ICCU) (14).

Various scoring tools are used to predict mortality in Intensive Care Units and tools specific for selected cardiac conditions are available, however there are no scores specific for unselected patients admitted in Cardiac Intensive Care Units (CICU). Mayo Cardiac Admission Risk Score is a novel tool used to predict mortality in patients admitted in Cardiac Intensive Care Unit (CICU). The tool unlike other ICU tools is aimed for unselected patients specifically in CICU, patients are scored based on variables that are present at the time of admission making it easy to use. This tool overcomes some of the potential challenges of other ICU severity scoring tools which use the worst values for their variables during the first 24 hrs and are sensitive to missing data. The tool score patients and stratifies them into low risk, moderate risk and high risk, with high risk patients likely to have >50% mortality and low risk <1% mortality (23). In our setting there is not a tool for predicting mortality hence hindering proper resource allocation in the care of critically ill cardiac patients.

In Tanzania Jakaya Kikwete Cardiac Institute is a public institution providing quality specialized cardiac services playing a major role in carrying the increasing burden of cardiovascular diseases in the country. The hospital was inaugurated in 2015 and has a 104 bed capacity, 6 coronary care beds, Catheterization lab, Cardiac Operating theatres and ICU offering services to patients from all regions of Tanzania and neighboring countries too. Despite being a key player in provision of care for critically ill cardiac patients in the country there is paucity in information regarding the causes of admission, outcome and associated factors among patients admitted at the institute's coronary care unit.

1.2 Statement of The Problem

According to the World Health Organisation (WHO) cardiovascular diseases are the leading cause of death globally with majority of the deaths occurring in people with heart attacks and stroke. Deaths are expected to rise if measures are not taken. In Sub Saharan Africa Non communicable diseases (NCDs) are among the leading cause of death with majority of death resulting from cardiovascular disease (mostly Ischemic heart disease, stroke, hypertension). These deaths have been accounted for by failure of primary and secondary prevention with unavailability of health care facilities and cardiac professionals among the causes. Tanzania being one of the Sub Saharan African Countries is facing increased urbanization and lifestyle changes among its people resulting into increased rates of NCDs majority being Cardiovascular diseases with these rates expected to rise if no preventive measures are taken. With the increased burden of Cardiovascular diseases in the country there has been the necessity for a specialized cardiac center offering specialized care to both critically ill and non-critically ill patients with cardiovascular diseases, playing a secondary prevention role in reducing mortality. Jakaya Kikwete Cardiac Institute plays a major role in carrying this burden as a public institution in the country offering care to critically ill patients with cardiovascular disease, playing a role in secondary prevention of cardiovascular related deaths, however there is paucity of data in the cause of admission, mortality, disease factors associated with mortality among patients admitted at the coronary care unit at the institute hindering proper resource allocation. This study intended to cover this gap and provide the necessary information.

1.3 Conceptual Framework

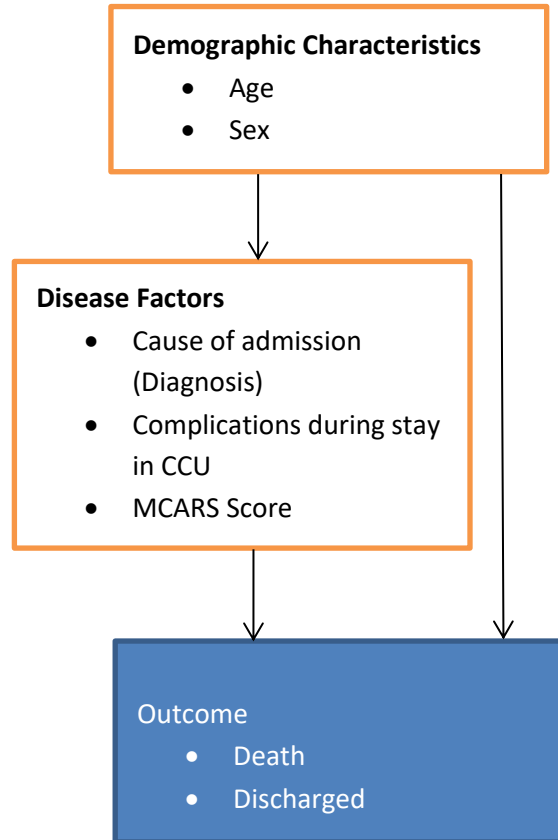


Figure 1: Conceptual framework

Demographic characteristics such as age may affect admission rates and outcomes among patients admitted at the Coronary care unit, as with age advancement comes risk of cardiovascular disease hence majority of admissions are likely to be elderly and with increasing comorbidities among elderly this is likely to affect the outcome. Disease factors such as diagnosis on admission, complications during stay may affect the outcome as end stage diseases are likely to have poor outcome. M-CARS score on admission is also likely to predict the outcome with high score likely to have poor outcome. This study hoped to provide answers and describe the situation at the JKCI-CCU.

1.4 Rationale

The finding obtained will provide the lacking information on the causes of admission, mortality, together with disease factors associated with mortality among patients admitted at the coronary care unit at Jakaya Kikwete Cardiac Institute. This information will be helpful in resource allocation in care of critically ill patients with cardiac disease, hence improvement in the aspect of health care provision of patients with cardiovascular diseases.

This study was also a pre-requisite for completion of my MMED in Anesthesiology program by the University.

1.5 Research Questions

1. What are the indications for admission in the coronary care unit at Jakaya Kikwete Cardiac Institute?
2. What is the mortality rate of patients admitted at the coronary care unit at Jakaya Kikwete Cardiac Institute?
3. What are the disease factors associated with mortality among patients admitted in the coronary care unit at Jakaya Kikwete Cardiac Institute?

1.6 Research Objectives

1.6.1 Broad Objectives

To evaluate the morbidity patterns, outcomes and associated factors in patients admitted in coronary care unit at Jakaya Kikwete Cardiac Institute (JKCI).

1.6.2 Specific Objectives

1. To determine the causes of admission in the coronary care unit at Jakaya Kikwete Cardiac Institute from October 2021 to December 2021.
2. To determine the mortality rate of patients admitted at the coronary care unit at Jakaya Kikwete Cardiac Institute from October 2021 to December 2021.
3. To determine the disease factors associated with mortality among patients admitted in the coronary care unit at Jakaya Kikwete Cardiac Institute from October 2021 to December 2021.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Cause of Admission in Coronary Care Unit

A study done in Saudi Arabia showed more rates of admission among males than females with the overall mean age of admission to the coronary care unit being 65 years of age, females admitted were more older than men. The overall most common causes of admission were Acute coronary syndrome followed by acute heart failure. Cardiac arrest, valvular heart disease were common causes of admission among females whereas Acute coronary syndrome was the major cause of admission among males(15). Findings in a tertiary hospital in Bangladesh did not differ from those in Saudi Arabia where majority of the admissions were due to Acute coronary syndrome with higher rates of male admissions(16). Similarly another study conducted in New York metropolitans involving 6 hospitals with dedicated Coronary care unit showed the mean age of admission was 67 years with majority being males. STEMI, NSTEMI and Unstable angina accounted for majority of the admission(17). Despite ACS being the major reason for admission in a CCU at the University of Virginia, it was also observed that Sepsis, Acute Kidney injury, Acute respiratory failure were among non cardiovascular illness occurring in majority of the admitted patients at the unit(18). A study in Latin America reviewing Heart failure clinical phenotypes and causes among patients admitted at the coronary care unit for 12 years showed mean age of patients admitted with acute heart failure was 62 years, majority being men, majority of the patients clinically presented with Acute heart failure associated acute coronary syndrome and decompensated heart failure. Coronary artery disease was the frequent etiology followed by valvular heart disease and cardiomyopathies(10). A multicenter prospective observational study involving 81% of Italian Coronary care units showed similar results with more rates of male admission, NSTEMI and Acute heart failure being the major cause of admissions. Patients admitted with NSTEMI and Acute heart failure were older compared to those with STEMI. However this study showed increasing number of non-ACS admissions with non-ACS, non Acute heart failure cardiac diseases accounting for 34% of the admissions.(14). The French nation-wide data on Intensive cardiac care unit also showed similar findings from other regions with major reason for admission being ACS followed by Arrhythmias and heart

failure, rates being higher in males, majority of heart failure patients were old whereas ACS patients were young(19). A study evaluating risk factors in patients admitted in coronary care unit with acute myocardial infarction at Tropoli Medical centre Libya showed majority of the patients admitted were males with the mean age being lower in males (58years) than females (65years)(20). Another study done in a specialized Ethiopian hospital to assess treatment outcomes of patients admitted with acute coronary syndrome showed majority of the admissions were male living in urban areas with a mean age of 59years, mostly admitted with STEMI(21). A study done in Kenyatta Hospital Kenya assessing presentation, management and outcomes of acute coronary syndrome showed median age of admitted patients was 58 years with majority being males(22). In Tanzania there is paucity of data on the pattern of admissions of patients at CCU this study will help provide this information.

2.2 Outcomes of patients admitted at Coronary Care Units

From the study assessing patterns of admission and mortality in a coronary care unit in Saudi Arabia the overall mortality was 7.7% for all patients admitted at the unit and 23.4% for patients that were cared for at the unit (the unit refers some patients as it does not provide percutaneous coronary intervention). Majority of the patient that died were patients admitted with a diagnosis of Cardiac arrest(15). Another study in Bangladesh tertiary hospital showed a lower CCU mortality of 5.0%, non-cardiac causes accounting for 40% of the deaths, majority of the death occurred within 24 hours of admission, mainly with a diagnosis of NSTEMI and sepsis. Other causes of death other than ACS were Chronic Kidney Disease(CKD), Dilated cardiomyopathy(16). A single institution study in Latin America evaluating mortality of patients admitted with AHF at the CCU showed an overall in-hospital mortality of 17.9% majority presented with cardiogenic shock and Pulmonary oedema(10). In a 6 hospital study in New York metropolitan area the CCU mortality rate was 5.6% (2.2-9.2%)(17). Similarly a study in Tertiary care hospital at university of Virginia showed similar mortality rate of 7% (18). The BLITZ multi centers study conducted in Italy showed an ICCU crude mortality of AHF was 5.4% and 8% for non reperfused STEMI, 3.5% for those who were intervened by thrombolysis, 3.1% for those who underwent Percutaneous coronary intervention (PCI) (14). The French nation wide study

showed a low mortality (4%) among patients admitted with Acute coronary syndrome, 10% among patients with Acute heart failure, who were older than patients with ACS. Longer hospital stays were also observed among patients with acute heart failure than ACS(19). In Libya a tertiary hospital study found 17.7% mortality rate among patients admitted with Acute Myocardial infarction with majority of the death occurring in those with cardiogenic shock(20). In Ethiopia a specialized hospital study on treatment outcomes of patient admitted with ACS showed 24.5% in hospital mortality majority being patients with STEMI, majority developing heart failure and cardiogenic shock as a complication(21). In our setting this study will be the first to provide information on the outcomes of patients admitted in our coronary care unit.

2.3 Factors associated with mortality of patients admitted in coronary care units

In a study assessing morbidity pattern and outcomes among patients admitted in a tertiary hospital in Saudi Arabia Age greater than 50 years, Cardiac arrest and acute coronary syndrome were found to be associated with death(15). Similarly a single center retrospective study in Bangladesh showed majority of the patients who died aged more than 60 years of life, had a diagnosis of ACS and sepsis and most had comorbidities (HTN, CKD, DM)(16). A single institution retrospective cohort study assessing clinical phenotypes, aetiologies, management and mortality among patients with heart failure in Latin America showed that Pulmonary Oedema and Cardiogenic Shock were independent predictors of in-hospital mortality.

The study also showed hospital mortality were associated with renal dysfunction, older age, low systolic blood pressure, hyponatraemia, use of inotropes, use of vasopressors. On the other side use of intravenous diuretics was associated with better in hospital outcomes(10). Another study in six New York metropolitan hospital assessing mortality in CCU showed factors associated with worse survival were cardiac arrest, systolic heart failure, respiratory failure and sepsis. The study also found higher mortality rates in patients who received inotropic support, mechanical ventilation, defibrillation post cardiac arrest in CCU, emergent dialysis, right heart invasive monitoring and intra-aortic balloon pump(17). Similarly a study in New Virginia also showed Sepsis, respiratory failure, cardiogenic shock, cardiac arrest and hemorrhage were strongly associated with mortality in CCU(18). Another study done in Italy covering 81% of the

country's CCUs (BLITZ-3 study) showed advanced age and elevated creatinine values were associated with increased CCU mortality(14). A specialized hospital study in Ethiopia similarly showed patients admitted with Acute coronary syndrome who developed in hospital cardiogenic shock were more likely to die, where those started in Beta blocker on the first day of admission and those with Left ventricular ejection fraction >30% had improved survival(21). The Kenyatta hospital study on patients admitted with ACS showed a 17% hospital mortality rate, the study also showed increased mortality among patients with STEMI, elevated creatinine levels(22).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a prospective hospital based cross-sectional study conducted at Jakaya Kikwete Cardiac Institute.

3.2 Study duration

The study was conducted from October 2021 to December 2021

3.3 Study population

This study was conducted among all adult patients admitted at Jakaya Kikwete Cardiac Institute Coronary Care Unit during the study period.

3.4 Study setting

Jakaya Kikwete Cardiac Institute is a public institution providing quality specialised cardiac services playing a major role in carrying the increasing burden of cardiovascular diseases in the country. The institution is located in Ilala District, Dar es salaam. The hospital was inaugurated in 2015 and has a 104 bed capacity, 6 coronary care beds, Catheterization lab, 3 Cardiac Operating Theatres and 2 Intensive Care Units (adult and Pediatrics with 8, 7 beds capacity respectively) offering inpatient cardiac services to patients from all regions of Tanzania and neighboring countries too.

The 6 bed Coronary care unit receives patients from different regions of the country and some patients from foreign countries. It receives admissions of critically ill cardiac patients from the emergency department, wards (patients with worsened conditions) and patients who have undergone some catheterization lab procedures such as Pacemaker insertion, PCI.

3.5 Sample size

The sample size was obtained through this formula for finite population

$$n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$$

then inserting n

$$n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}}$$

Where:

z is the z score for 95% confidence interval; 1.96

ε is the margin of error; 0.05

N is population size; 101 patients admitted in 3 months at the unit obtained from the records.

\hat{p} is the mortality rate at the unit in the 3 months; 25%

The minimum sample size required for the study was 75 patients.

3.5.1 Inclusion criteria

1. All adult patients admitted at Jakaya Kikwete Cardiac Institute Coronary Care Unit who consented to participate in the study.
2. All adult patients admitted at Jakaya Kikwete Cardiac Institute Coronary Care Unit whose consent were provided via proxy through the next of kin during the study period.

3.5.2 Exclusion criteria

1. All patients who were admitted with advanced directives of Do Not Resuscitate (DNR) plan

3.6 Sampling technique

Consecutive sampling was employed where all patients meeting the inclusion criteria admitted during the study period were enrolled into the study. Investigator explained to the relative/patient about the research and its purpose. Patient/relative who agreed was then given an informed consent form to sign and participate in the study. The procedure was repeated for all patients admitted during the study period meeting the inclusion criteria.

3.7 Study variables

i. Dependent variables

Outcomes of the patient following admission (Died or Discharge Alive)

ii. Independent variables

Age (in years), Sex (Male/ Female), Ethnicity (Black, Caucasian, Asian), Diagnosis for admission, Source of admission (EMD, from General wards, from the Cathlab, from OPD clinic), Complications during stay, Mayo Cardiac Intensive Care Unit Admission Risk Score (M-CARS).

Categorical variables were; Sex, Ethnicity, Diagnosis for admission, Source of admission, comorbidities, complications during stay in CCU.

Numerical Variables were; Age and M-CARS score.

3.8 Data collection procedures

Data was collected by the principle investigator with the help of a research assistant a Nurse who was trained on the research topic, how to obtain consent for participation and the data collection tool. The research assistant helped in data collection in the absence of the principle investigator at JKCI. Principal Investigator/Research assistant obtained consent from the patient/ next of kin for patients who were non-responsive due to critical illness, A semi structured questionnaire/checklist was used and a severity score structured for Cardiac intensive care Units called Mayo Cardiac Admission Risk Score for mortality (M-CARS) was used to predict mortality. After consent all data was collected from the patients' files and management charts. Data collected included; Age, Sex, Ethnicity, Diagnosis for admission, comorbidities, Source of admission, Mayo Cardiac Admission Risk Score (M-CARS), complication during stay in CCU, Outcome of the patients. Patients outcome in CCU (Discharged alive or death) was followed up during stay in CCU during the study period.

3.9 Validity and reliability of the study tool

Mayo Cardiac Intensive Care Unit Admission Risk Score (M-CARS) is a new simple illness severity scoring tool that is used for Coronary care unit. The tool utilizes seven (7) variables,

Diagnosis at Admission (Cardiac arrest, shock, Respiratory failure), Braden skin score (assess risk of pressure sores during hospital stay/frailty), Laboratory Investigations (Red cell distribution width, Blood Urea Nitrogen, anion gap).

Patients with a diagnosis of cardiac arrest, shock during admission are given two points and zero points in their absence where patients with respiratory failure are given one point.

The Braden skin score is a simple evidence based bedside nursing tool designed to identify patients at elevated risk of pressure ulcer (frailty) in the hospital, which assesses mobility/activity, sensory perception, nutrition, moisture, and friction/shear to provide an evaluation of skin integrity and overall patient status. The Braden Scale uses a scores from less than or equal to 9 to as high as 23. The lower the number, the higher the risk is for developing an acquired ulcer or injury. A braden score of 19-23 indicates no risk, 15-18 mild risk, 13-14 moderate risk, 9-12 high risk, less than 9 severe risk of developing ulcers. The braden score chart below on appendix 1 clearly shows how to assess and score a patient. Patient with a braden skin score ≤ 12 is given two points, 13-15 is given 1 point and >15 is given zero points.

Blood Urea Nitrogen (BUN), a biomarker evaluating renal function, its known to predict mortality in critically ill, Patients with BUN levels $>23\text{mg/dl}$ on admission are given one point in the score where as those with \leq are given zero points.

The anion gap (obtained from blood gas analysis), a marker of elevated anion that are not usually measured (eg lactate, sulphates and phosphates) in blood, has also been known to predict mortality in critically ill patients. Patients with anion gap >14 on admission are given one point where as those with less are given zero points.

The Red cell Distribution width (obtained from the complete blood count panel), defined as the range of variation of red blood cell volume and a marker of anisocytosis, known to be a strong predictor of mortality in critically ill patients with MI. Patients with $\text{RDW}>14.3$ are given a score of 1 where as those with less are given zero point.

The tool has a total score of 10 and score < 2 are shown to have less than 1% mortality where as score >6 have more than 50% mortality. The score separates patients into low- (score <2), intermediate- (score 2–4), and high-risk (score >4) categories. (23)

The score has been shown to be superior to other established ICU score such as SOFA score, APACHE-II score, OASIS in predicting mortality among patients in CICU. The score also overcomes the need to follow up patients for 24 hours after admission to record the worst value as the parameters in the score it take into account finding at the time of admission (23). However differences may be observed when using the tool due to demographic differences, resources availability and management of patient in our settings compared to where the setting where the tool has been used. Currently there is no tool used for scoring patients at the CCU hence do not have the proper way of predicting outcomes and hence proper resource allocation. This study evaluated if this tool could be useful in predicting the outcome (mortality) in our setting. Authors and the research assistant were well trained in using the tool.

3.10 Pre testing of data tool and piloting

Since there is not a tool used to predict outcome among patients admitted at JKCI CCU, M-CARS was a new tool. Research assistants were well trained on each parameter of the tool and how to score patients, this was followed by practical application on patients at the JKCI CCU where patients who were admitted at the time of training were used to fill each parameter on the tool and a total score was obtained. The tool has seven (7) parameters to fill; Diagnosis at Admission (Cardiac arrest, shock, Respiratory failure), Braden skin score (assess risk of pressure sores during hospital stay/frailty), Laboratory Investigations (Red cell distribution width, Blood Urea Nitrogen, anion gap), all these parameters were assessed and obtained from patients admitted at JKCI CCU during the time of admission. Piloting of the tool was conducted for 5 days among patients admitted at the facility and the data was included in the study.

3.10 Data management and Statistical analyses

All data was analyzed using SPSS version 23.0. Descriptive statistics was summarized using frequency and proportion for categorical variables while measures of central tendency with

respective measures of dispersion for continuous variables. Magnitude of association between the categorical variables and outcome (mortality) was interpreted using chi-square test and $P\text{-value} < 0.05$ was the criteria for statistical significance.

3.11 Ethics statement

Ethical clearance was sought from the Muhimbili University of Health and Allied Sciences' Research Ethics and Publication committee. Permission to undertake the study at Jakaya Kikwete Cardiac Institute was obtained from the Research and Training Unit at the Institute. Before commencement of the study, consent was obtained from the patient/relative. During consenting patient/relatives was informed that the study will not interfere/ affect their current and daily management activities in any way and they have the right to agree or disagree to participate in the study or withdraw from the study at any time as they are willing.

High level of confidentiality was maintained, patients' names or registration numbers were not recorded during data collection or analysis (study numbers were used). The data collected from patients were used strictly for the purpose of this study.

3.12 Dissemination of the research findings

Research report will be available at MUHAS library for future users since this study forms the baseline for other future studies. Research findings will also be presented at Jakaya Kikwete Cardiac Institute, MUHAS SOM Symposium, MUHAS Scientific Conference, University research repository for educational and research purposes. The findings will also be submitted for publication in the peer-reviewed journal.

CHAPTER FOUR

4.0 RESULTS

This study involved a total of 115 patients who were admitted at the JKCI CCU between October 2021 and December 2021. Among admitted patients 64 (55.7%) were patients with acute severe cardiac conditions admitted for management of their medical conditions, whereas 51 (44.3%) were post catheterization lab procedure admitted for close observation and monitoring before discharge to the ward.

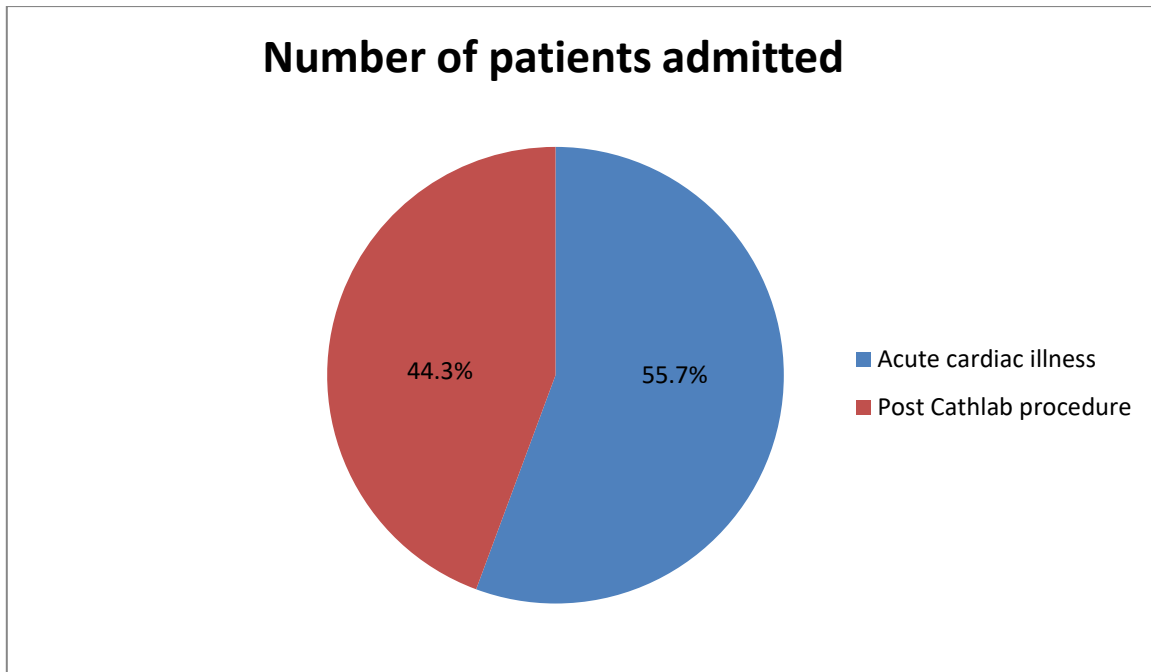


Figure 2: Number of patients admitted in JKCI CCU

4.1 Demographic Characteristics

Among patients admitted at the JKCI CCU during the study period majority were aged 65 years and above (52.2%), with the mean age of admission being 61yrs. There were more females (51.3%) admitted in the unit compared to males. Majority of the patients were black Africans (92.2%). 44.3% of the patients were admitted from the catheterization lab having underwent Percutaneous Coronary Intervention or Pacemaker Insertion brought to the unit for close monitoring and observation, with the rest being admitted from the EMD, General ward and OPD due to acute illness.

Table 1: Demographic and clinical characteristics of patients admitted at Jakaya Kikwete Cardiac Institute Coronary Care Unit.

Variable	Frequency (n)	Percent (%)
Age groups		
18-44	21	18.3
45-64	34	29.6
>=65	60	52.2
Gender		
Male	56	48.7
Female	59	51.3
Ethnicity		
Black	106	92.2
Caucasian	3	2.6
Asian	6	5.2
Sources of Admission		
EMD	41	35.7
Transferred from General Ward	18	15.7
Post Cathlab Procedure	51	44.3
From OPD Clinic	5	4.3

4.2 Causes of Admission Among Patient Admitted in JKCI CCU

The coronary care unit admits both critically ill cardiac patients and patients post cathlab procedure who are brought for observation and close monitoring. Major indication for admission among critically ill cardiac patients was acute heart failure manifesting as Acute decompensated heart failure secondary to dilated cardiomyopathy (14.8% of all admissions).

Hypertension was the major comorbidity among patients admitted in CCU with 85.3% of the admitted patients being hypertensive and 44.1% of the patients had diabetes mellitus.

Table 2: Causes of admission, Comorbidities among patients admitted at Jakaya Kikwete Cardiac Institute Coronary Care Unit

Variable	Frequency (n)	Percent (%)
Causes of Admission to CCU		
Acute coronary syndrome	11	9.6
Hypertensive crisis	1	0.9
ADHF secondary to DCM	17	14.8
ADHF secondary to RHD	6	5.2
Pulmonary Embolism	5	4.3
Arrhythmia	10	8.7
Post PPI	22	19.1
Post PCI	29	25.2
Cardiogenic shock	9	7.8
Hypertensive Heart Failure	3	2.6
Respiratory Failure	2	1.7
Cormobidities		
Diabetes	45	44.1
Hypertension	87	85.3
CKD	10	9.8
HIV	6	5.9
TB	1	1.0
PostCABG surgery	1	1.0

4.3 Outcomes of patients admitted at JKCI CCU

The mortality rate among critically ill cardiac patients admitted at JKCI CCU was found to be 31.2%.

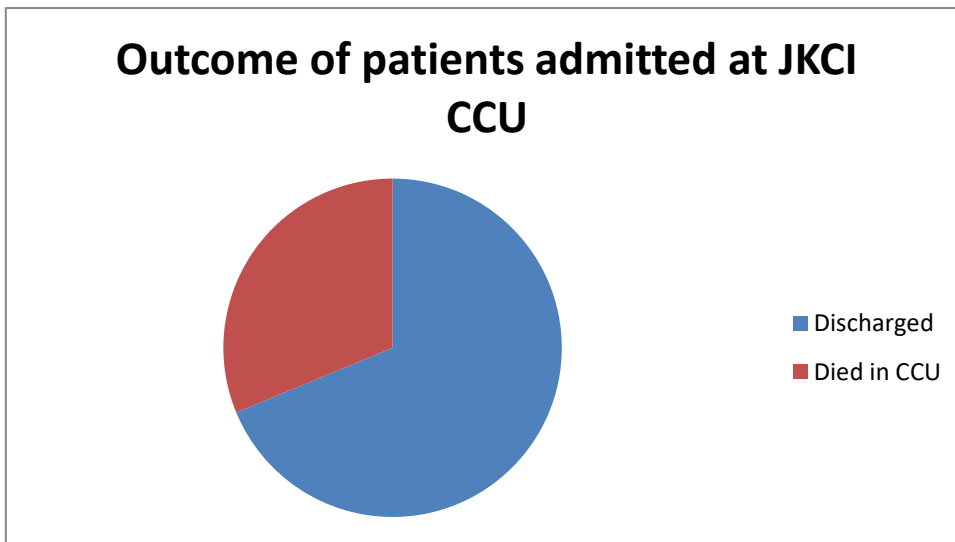


Figure 3: Outcome of critically ill patients admitted in JKCI CCU

4.4 Factors Associated with Mortality

Table 3: Association between Demographic characteristics and Mortality

Variables		Outcomes		P-value
		Discharged Alive	Died in CCU	
Gender	Male	22 (71%)	9 (29%)	P =0.711
	Female	22 (66.7%)	11 (33.3%)	
Age	20-44	11 (64.7%)	6 (35.3%)	P =0.76
	45-64	15 (75%)	5 (25%)	
	>=65	18 (66.7%)	9 (33.3%)	
Ethnicity	Black	39 (67.2%)	19 (32.8%)	P =0.594
	Caucasians	2 (100%)	0 (0%)	
	Asians	3 (75%)	1 (25%)	

From the table above there was no significant association between Gender (p-value=0.711), Age (p-value=0.76) or ethnicity (p-value=0.594) and mortality among critically ill cardiac patients admitted at the JKCI CCU.

Table 4: Association between Source of Admission and Outcome (Mortality)

Variables	Outcomes		P-value
	Discharged Alive	Died in CCU	
Emergency Department	29 (70.7%)	14 (29.3%)	P=0.651
Transfer in from General Ward	11 (61.1%)	7 (38.9%)	
From OPD Clinic	4 (80%)	1 (20%)	

From the table above there was no significant association between source of admission and mortality among critically ill cardiac patients admitted in CCU.

Table 5: Association between Diagnosis of admission and Outcome (Mortality)

Variables		Outcomes		P-value
		Discharge Alive	Died in CCU	
Acute coronary syndrome	Yes	10(90.9%)	1(9.1%)	P-value=0.081
	No	34(64.2%)	19(35.8%)	
Hypertensive crisis	Yes	1(100%)	0(0%)	P-value=0.497
	No	43(68.3%)	20(31.7%)	
ADHF secondary to DCM	Yes	13(76.5%)	4(23.5%)	P-value=0.423
	No	31(66.0%)	16(34.0%)	
ADHF secondary to RHD	Yes	4(66.7%)	2(33.3%)	P-value=0.908
	No	40(69.0%)	18(31.0%)	
Pulmonary Embolism	Yes	3(60%)	2(40%)	P-value=0.660
	No	41(69.5%)	18(16.4%)	
Arrhythmia	Yes	9(81.8%)	2(18.2%)	P-value=0.304
	No	35(66.0%)	18(34.0%)	
Cardiogenic shock	Yes	2(22.2%)	7(77.8%)	P-value=0.01
	No	42(76.4%)	13(12.3%)	
ADHF secondary to HHD	Yes	2(66.7%)	1(33.3%)	P-value=0.936
	No	42(68.9%)	19(31.1%)	
Respiratory Failure	Yes	0(0%)	2(100%)	P-value=0.03
	No	44(71.0%)	18(29.0%)	

From the table above there was a significant association between cardiogenic shock, severe respiratory distress on admission and mortality. Patients admitted due to cardiogenic shock, respiratory failure were more likely to die in CCU.

Table 6: Association between Complications during stay in CCU and Outcome (Mortality)

Variables		Outcomes		P-value
		Discharge Alive	Died in CCU	
Electrolyte Imbalance	Yes	14(66.7%)	7(33.3%)	P-value=0.802
	No	30(69.8%)	13(30.2%)	
Sepsis	Yes	3(33.3%)	6(66.7%)	P-value=0.013
	No	41(74.5%)	14(25.5%)	
AKI	Yes	0(0%)	4(100%)	P-value=0.002
	No	44(73.3%)	16(26.7%)	
Acidosis	Yes	8(50%)	8(50%)	P-value=0.062
	No	36(75.0%)	12(25.0%)	
Arrhythmia	Yes	6(85.7%)	1(14.3%)	P-value=0.305
	No	38(66.7%)	19(33.3%)	
Cerebrovascular Accident	Yes	0(0%)	4(100%)	P-value=0.009
	No	44(73.3%)	16(26.7%)	
Intestinal Obstruction	Yes	1(100%)	0(0%)	P-value=0.497
	No	43(68.3%)	20(31.7%)	
Hypoglycemia	Yes	2(66.7%)	1(33.3%)	P-value=0.936
	No	42(68.9%)	19(31.1%)	

The table above shows a significant association between sepsis, AKI, Cerebrovascular accidents and mortality. Patients who developed these complications during stay in CCU were more likely to die in CCU.

Table 7: Association between M-CARS Score and Outcome (Mortality)

Variables		Outcome		P-Value
		Discharged Alive	Died in CCU	
M-CARS Score	<2	14(100%)	0(0%)	P=0.00
	2-4	30(76.9%)	9(23.1%)	
	>4	0(0%)	11(100%)	

Table above shows a significant association between M-CARS score and mortality (p-value=0.00) among patients admitted at JKCI CCU. Patients with M-CARS Score >4 are more likely to die in CCU.

CHAPTER FIVE

5.1 DISCUSSION

This was a hospital based cross-sectional study conducted at Jakaya Kikwete Cardiac Institute Coronary care unit for a period of 3 months, the study aimed at determining the cause of admission at the coronary care unit, mortality rate at the coronary care unit and disease factors associated with mortality among patients admitted at the coronary care unit.

The study involved a total of 115 patients, patients admitted were both critically ill cardiac patients admitted for management of the medical condition and post cathlab procedure patients admitted for monitoring and close observation (44.3%).

The study showed no association between age, gender or ethnicity and mortality. This is different from studies done in Saudi Arabia, Bangladesh, Latin America and Italy where Advanced Age was found to be associated with death among patients admitted in CCU (10,14,15,16).

5.1.1 Causes of Admission at JKCI CCU

The study showed JKCI CCU admits both critically ill patients and post catheterization lab procedures (these were patients who were relatively stable and underwent Percutaneous coronary intervention or Permanent pacemaker insertion admitted to the unit for observation and monitoring before being discharged to the ward). Among critically ill patients Acute heart failure was the major indication for admission presenting as Acute decompensated chronic heart failure secondary to Dilated cardiomyopathy in the majority.

This study showed to differ from studies done in Saudi Arabia and Bangladesh where majority of the patients were admitted due to Acute coronary syndrome (15,16). Similarly studies done in the latin America, United States in New York (multihospital study) and University of Virginia also showed Acute coronary syndrome was also the major cause of admission in CCU(10,17,18). Multicentre studies in Europe in Italy and France showed similar results with Acute coronary syndrome being the major cause of admission followed by acute heart failure and arrhythmias(14,19).

5.1.2 Mortality rate among patients admitted at JKCI CCU

This study showed the mortality rate among critically ill cardiac patients admitted at JKCI CCU was 31.2%.

The mortality rate is higher compared to single institution studies in Asia and America which had mortality rates of 5-7.7% (15,16,18). Similarly multicenter studies done in developed countries showed lower mortality rates of 2.2-10% (14,17–19). Study done in Libya and Ethiopia Tertiary hospitals showed mortality rates of 17.7%, 24.5% respectively, however these study evaluated only patients admitted with Acute Myocardial Infarction (20,21).

The mortality of 31.2% is still high when compared to the study done in Saudi Arabia with a mortality rate of 23.4% for comparable patients cared for at the unit (15).

The mortality found in this study is high compared to other studies. The possible explanations for this high mortality in our setting could be due to; the different nature of patients (most of the patients present with Acute heart failure) and severity of illness among admitted patients in our setting, poor adherence to medication among patients with chronic heart disease, poor health seeking behavior, delayed referral from other facilities, quality of care offered in our setting as significant proportion of patients transferred from the general ward and EMD died in CCU.

5.1.3 Disease Factors Associated with Mortality

The study showed a significant association between admission diagnosis of cardiogenic shock, respiratory failure and mortality. Patients admitted with these diagnoses were more likely to die in CCU. Moreover the study also showed patients who developed sepsis, AKI, Cerebrovascular accidents during CCU stay were more likely to die in CCU. The study also showed there was a significant association between M-CARS score and mortality with patients having a score of >4 having 100% mortality.

These results are different from those of studies done in Saudi Arabia, Bangladesh and Italy which showed old age, cardiac arrest, Acute coronary syndrome, elevated creatinine levels were associated with mortality (14–16). However similarly to our study sepsis was also associated with mortality (16).

Similarly to our study a single institution study in Latin America showed Cardiogenic shock, hypotension and renal dysfunction were associated with in-hospital mortality. The study however also showed other factors such as Old age, hyponatremia, were associated with in-hospital mortality (10).

Multicentre studies done in New York and New Virginia showed sepsis, cardiogenic shock, respiratory failure to be associated with poor survival similar to our study, however these study also showed other factors cardiac arrest, hemorrhage were associated with poor outcome (17,18).

A study done in Ethiopia on patients admitted with myocardial infarction showed cardiogenic shock was associated with mortality. However this study only involved patients admitted with myocardial Infarction (21).

M-CARS as a novel tool for predicting outcome among patients admitted in CICU was used in this study and found that patients with a score <2 had no mortality where as those with score >4 had 100% mortality, this is different from the study done to validate the tool which showed patients with scores less than 2 had $<1\%$ mortality and those with score >6 had $>50\%$ mortality, from this study the mortality was higher at a low M-CARS score suggesting possible poor level of care among critically ill patients admitted at the unit compared to where the tool was validated. (23).

5.2 Strengths and Limitations

5.2.1 Study Strength

This study was the first of its kind in our setting showing causes of admission, mortality rate and factors associated with mortality thus helping proper resource allocation in the care of critically ill cardiac patients

The study investigated a tool that predicts mortality in unselected patients specifically in CICU, patients are scored based on variables that are present at the time of admission and scored only once upon admission making it easy to use. This tool overcomes some of the potential challenges

of other ICU severity scoring tools such as SOFA, APACHEIII, APACHE-IV, and OASIS which use the worst values for their variables during the first 24 hrs.

MCARS has also been shown to have less sensitivity to missing data compared to other ICU severity score.

This study has shown promise towards the use of this useful tool in our setting as it will help in resource allocation among critically ill admitted patients and hence improve care of critically ill cardiac patients.

5.2.2 Study Limitations

This was a cross sectional study, just a snapshot of the situation at the JKCI CCU at the time of the study period.

Patients were not followed up after discharge from the Coronary Care Unit, some might have died immediately after discharge from the unit.

Exact time of the day/night patients were admitted was not recorded as this may have affected the outcome having implication in improving patients outcome.

This was also a single institution study thus may not be used to generalize the situation in other hospitals.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study showed the coronary care unit admits both patients with acute illness and post catheterization patients (patients post percutaneous coronary intervention and post permanent pacemaker insertion). Majority of the patients admitted with acute illness had Acute decompensated chronic heart failure (predominantly secondary to dilated cardiomyopathy).

The CCU mortality rate among patients admitted with acute illness was 31.2%. Patients with admission diagnosis of cardiogenic shock, respiratory failure, patients who developed AKI, Acidosis, sepsis, cerebrovascular accident were more likely to die in CCU. Patients with a higher M-CARS score classified as high risk patients were more likely to die in CCU.

6.2 Recommendation

This study showed a higher mortality rate among critically ill patients admitted at JKCI CCU, this warrants further studies to determine the cause of this high mortality rate compared to other regions of the world and hence improve cardiac care in our setting.

This study showed an association between high MCAR Score and mortality among patients admitted at JKCI CCU. MCARS being a new tool, was developed specifically for mortality risk prediction in unselected patients admitted in CICU. Currently at JKCI CCU there is no scoring tool to predict mortality among patients admitted. This study has shown light on the use of this novel scoring tool in predicting mortality in our setting, we would recommend further large studies are done to validate the use of this tool in our setting as it is simple to use and will help in identification of high risk patients and hence proper resource allocation in the care of patients.

REFERENCES

1. Sun T, Cai C, Shen H, Yang J, Guo Q, Zhang J, et al. Anion Gap Was Associated with Inhospital Mortality and Adverse Clinical Outcomes of Coronary Care Unit Patients. *Biomed Res Int.* 2020;2020:11.
2. Roman WP, Martin HD, Sauli E. Cardiovascular diseases in Tanzania: The burden of modifiable and intermediate risk factors. *J Xiangya Med.* 2019;4(6):33–33.
3. Hertz JT, Kweka GL, Bloomfield GS, Limkakeng AT, Loring Z, Temu G, et al. Patterns of emergency care for possible acute coronary syndrome among patients with chest pain or shortness of breath at a Tanzanian Referral Hospital. *Glob Heart.* 2020;15(1):1–12.
4. Fuster V, Kovacic JC. Acute coronary syndromes: Pathology, diagnosis, genetics, prevention, and treatment. *Circ Res.* 2014;114(12):1847–51.
5. Kotecha T, Rakhit RD. CMJv16n6S-Rakhit.indd. *Clin Med (Northfield Il).* 2016;16(6):43–8.
6. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth Universal Definition of Myocardial Infarction (2018). Vol. 138, *Circulation.* 2018. 618–651 p.
7. Smith JN, Negrelli JM, Manek MB, Hawes EM, Viera AJ. Diagnosis and management of acute coronary syndrome: An evidence-based update. *J Am Board Fam Med.* 2015;28(2):283–93.
8. Khush KK, Rapaport E, Waters D. The history of the coronary care unit. *Can J Cardiol.* 2005;21(12):1041–5.
9. Hummel A, Empen K, Dörr M, Felix SB. De Novo Acute Heart Failure and Acutely Decompensated Chronic Heart Failure. *Dtsch Aertzblatt Online.* 2015;298–310.
10. González-Pacheco H, Álvarez-Sangabriel A, Martínez-Sánchez C, Briseño-Cruz JL, Altamirano-Castillo A, Mendoza-García S, et al. Clinical phenotypes, aetiologies, management, and mortality in acute heart failure: a single-institution study in Latin-America. *ESC Hear Fail.* 2021;8(1):423–37.

11. Makubi A, Hage C, Lwakatara J, Kisenge P, Makani J, Rydén L, et al. Contemporary aetiology, clinical characteristics and prognosis of adults with heart failure observed in a tertiary hospital in Tanzania: The prospective Tanzania Heart Failure (TaHeF) study. *Heart*. 2014;100(16):1235–41.
12. Julian DG. The evolution of the coronary care unit. *Cardiovasc Res*. 2001;51(4):621–4.
13. Alonso JJ, Sanz G, Guindo J, García-Moll X, Bardají A, Bueno H. Intermediate Coronary Care Units: Rationale, Infrastructure, Equipment, and Referral Criteria. *Rev Española Cardiol (English Ed)*. 2007;60(4):404–14.
14. Casella G, Zagnoni S, Fradella G, Scorcu G, Chinaglia A, Pavesi PC, et al. The Difficult Evolution of Intensive Cardiac Care Units: An Overview of the BLITZ-3 Registry and Other Italian Surveys. *Biomed Res Int*. 2017;2017.
15. Al-Ghamdi MA. Morbidity pattern and outcome of patients admitted in a coronary care unit: a report from a secondary hospital in southern region, Saudi Arabia. *J Community Hosp Intern Med Perspect* [Internet]. 2018;8(4):191–4. Available from: <https://doi.org/10.1080/20009666.2018.1500421>
16. Alam MZ, Hoque SJ, Islam MJ, Hossain MS, Rahman A, Mohibullah A. Mortality in Coronary Care Unit of a Tertiary Level Hospital of Bangladesh. *Bangladesh Hear J*. 2018;33(1):28–31.
17. Ratcliffe JA, Wilson E, Islam S, Platsman Z, Leou K, Williams G, et al. Mortality in the coronary care unit. *Coron Artery Dis*. 2014;25(1):60–5.
18. Holland EM, Moss TJ. Acute Noncardiovascular Illness in the Cardiac Intensive Care Unit. *J Am Coll Cardiol*. 2017;69(16):1999–2007.
19. Roubille F, Mercier G, Delmas C, Manzo-Silberman S, Leurent G, Elbaz M, et al. Data on nation-wide activity in intensive cardiac care units in France in 2014. *Data Br* [Internet]. 2017;13:166–70. Available from: <http://dx.doi.org/10.1016/j.dib.2017.05.018>
20. Abduelkarem AR, El-Shareif HJ, Sharif SI. Evaluation of risk factors in acute myocardial infarction patients admitted to the coronary care unit, Tripoli Medical Centre, Libya. *East Mediterr Heal J*. 2012;18(4):332–6.

21. Desta DM, Nedi T, Hailu A, Atey TM, Tsadik G, Asgedom SW, et al. Treatment outcome of acute coronary syndrome patients admitted to Ayder Comprehensive Specialized Hospital , Mekelle , Ethiopia ; A retrospective cross-sectional study. 2020;1–17.
22. Bahiru E, Temu T, Gitura B, Farquhar C, Huffman M, Bukachi F. Presentation, Management and outcomes of acute coronary syndrome: a registry from Kenyatta National Hospital in Nairobi, Kenya. *Cardiovasc J Afr.* 2018;29(4):225–30.
23. Jentzer JC, Anavekar NS, Bennett C, Murphree DH, Keegan MT, Wiley B, et al. Derivation and Validation of a Novel Cardiac Intensive Care Unit. 2018;8(10):11.

APPENDICES

Appendix: 1 - Questionnaire

**TITLE: MORBIDITY AND OUTCOMES OF PATIENTS ADMITTED IN
CORONARY CARE UNIT AT JAKAYA KIKWETE CARDIAC INSTITUTE IN DAR
ES SALAAM, TANZANIA.**

CHECKLIST

1. ID No;.....
2. Patient's information
 - a. Date of Birth (Age in years):
 - b. Gender: 1. Male 2. Female
3. Ethnicity: 1. Black 2. Caucasian 3. Asian
4. Admission source:
 1. Emergency Department
 2. Transfer from General wards
 3. Post Cathlab procedure
 4. Transfer from other institutions(MNH,MOI)
5. Date of Admission:.....
6. Admission diagnosis (Tick ones that apply):

	Yes	No
ACS (acute coronary syndrome)		
Hypertensive Crisis		
ADHF sec to DCM		
ADHF sec to RHD		
Cardiogenic shock		
Right sided heart failure		
Arrhythmias		
Pulmonary Embolism		
Post Pacemaker insertion		
Post PCI		
Other diagnosis		

Elaborate if other diagnosis;.....

7. Cormobidities;.....

8. Complications during CCU stay:

.....

9. Braden Skin Score

RISK FACTOR	SCORE/DESCRIPTION				1	2	3	4
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	1. COMPLETELY LIMITED – Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, OR limited ability to feel pain over most of body surface.	2. VERY LIMITED – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, OR has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	3. SLIGHTLY LIMITED – Responds to verbal commands but cannot always communicate discomfort or need to be turned, OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. NO IMPAIRMENT – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	1. CONSTANTLY MOIST – Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. OFTEN MOIST – Skin is often but not always moist. Linen must be changed at least once a shift.	3. OCCASIONALLY MOIST – Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. RARELY MOIST – Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	1. BEDFAST – Confined to bed.	2. CHAIRFAST – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. WALKS OCCASIONALLY – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	4. WALKS FREQUENTLY – Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position	1. COMPLETELY IMMOBILE – Does not make even slight changes in body or extremity position without assistance.	2. VERY LIMITED – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. SLIGHTLY LIMITED – Makes frequent though slight changes in body or extremity position independently.	4. NO LIMITATIONS – Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern ¹ NPO: Nothing by mouth. ² IV: Intravenously. ³ TPN: Total parenteral nutrition.	1. VERY POOR – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, OR is NPO ¹ and/or maintained on clear liquids or IV ² for more than 5 days.	2. PROBABLY INADEQUATE – Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement OR receives less than optimum amount of liquid diet or tube feeding.	3. ADEQUATE – Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN ³ regimen, which probably meets most of nutritional needs.	4. EXCELLENT – Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICITION AND SHEAR	1. PROBLEM - Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	2. POTENTIAL PROBLEM – Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. NO APPARENT PROBLEM – Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
TOTAL SCORE	Total score of 12 or less represents HIGH RISK							

10. MCARS Scoring Tool

Variable	Value	Points Assigned
Admission value of BUN	>23 mg/dL	1
	≤23 mg/dL	0
Admission value of anion gap	>14	1
	≤14	0
Admission Braden skin score	≤12	2
	13–15	1
	>15	0
Admission value of RDW	>14.3	1
	≤14.3	0
Admission diagnosis of cardiac arrest	Yes	2
	No	0
Admission diagnosis of shock	Yes	2
	No	0
Admission diagnosis of respiratory failure	Yes	1
	No	0

11. M-CARS Score:.....

12. Outcome:

1. Discharged Alive
2. Dead
3. Still in CCU

13. Date of death or discharge:.....

14. Length of stay (in days):.....

**Appendix: 2 details on using illness severity scoring tool for coronary care unit patients
Mayo Cardiac Intensive Care Unit Admission Risk Score (M-CARS)**

Admission value of BUN

Patients admitted with Blood Urea Nitrogen (BUN) levels $>23\text{mg/dl}$ on admission are given one point in the score where as those with \leq are given zero points.

Admission value of Anion Gap

Patients with anion gap >14 on admission are given one point where as those with less are given zero points.

Admission Red cell Distribution Width (RDW)

Patients with $\text{RDW} > 14.3$ are given a score of 1 where as those with less are given zero point.

Admission Braden skin score

Patients with a braden skin score ≤ 12 on admission are given two points, 13-15 is given 1 point and >15 is given zero points.

Admission Diagnosis of Cardiac arrest

Patients with a diagnosis of cardiac arrest (had a cardiac arrest) upon admission are given two points and zero points in the absence of cardiac arrest.

Admission Diagnosis of Shock

Patients with shock during admission are given two points and zero points in the absence of the diagnosis.

Admission Diagnosis of Respiratory Failure

Patients with respiratory failure during admission are given one point and zero in the absence of respiratory failure.

The total score is 10. Patients are classified as low- (if score <2), intermediate- (if score 2–4), and high-risk (if score >4) categories.

Appendix 3: Consent Form

Introduction

I am Dr. Alexander Joseph a second-year resident at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MMed Anesthesiology.

I am conducting a study on Morbidity patterns, Outcomes and Associated factors in patients admitted in coronary care unit at Jakaya Kikwete Cardiac Institute (JKCI) from October 2021 to December 2021.

Participation in the study;

This study will not affect your current and daily management or activities. However this study is not expected to cause harm to you in any way. You have rights to agree or disagree to participate in the study or withdraw from the study at any time as you wish.

Confidentiality;

All the information you provide are solely for research purposes only, your name will not be included in the study.

Risk of participation

No anticipated risks or harm that may result from participating in this study.

Benefits

The study will offer an understanding on causes of admission, mortality rates and factors affecting mortality at the Jakaya Kikwete Coronary care unit and help allocate appropriate resources in the management of patients.

Contact person

For any questions or concerns regarding this study, please contact;

Principal Investigator

Dr. Alexander Joseph

Phone: +255714367286

Email: alexanderjosephmrosso@gmail.com

P.O. Box 65001, Dar es Salaam.

Supervisor

Dr. Edwin Lugazia

Phone: +255754283900/ +255713283900

Email: elugazia@gmail.com

P.O. Box 65001, Dar es Salaam,

OR

Director of Research and Publication

Dr. Bruno Sunguya (MUHAS)

P. O. Box 65001, Dar es Salaam,

Tel. no 2150302-6.

Signing consent

Please sign below if you agree to participate in this study

I (initials)..... have read and understood the contents of this form and I have been given a satisfactory explanation with all my questions answered. I, therefore, consent to participate in this study.

Signature of Participant

Date consent signed

KIBALI- Swahili version

Utangulizi

Naitwa, Alexander Joseph ni mwanafunzi wa mwaka wa pili wa uzamili katika taaluma ya udaktari wa dawa za nusu kaputi katika chuo kikuu cha afya ya sayansi shirikishi, Muhimbili. Ninafanya utafiti juu ya Sababu za kulazwa wagonjwa, matokeo baada ya kulazwa pamoja na vitu mbalimbali viambatanavyo na matokeo hayo kwa wagonjwa wanaolazwa katika wodi ya wagonjwa wa moyo mahututi katika hospitali ya moyo ya Jakaya Kikwete Dare es salaam katika kipindi cha Oktoba 2021 na Desemba 2021.

Kushiriki kwenye utafiti;

Utafiti huu hautaathiri usimamizi na huduma zako za sasa na za kila siku au shughuli zako zingine. Walakini utafiti huu hautarajiwa kusababisha madhara kwako kwa njia yoyote. Unayo haki ya kukubaliana au kutokubali kushiriki katika utafiti au kujiondoa kutoka kwa utafiti wakati wowote unavyotaka.

Usiri wa taarifa zako;

Taarifa utakazotoa zitatumika tu kwa ajili ya utafiti na si kwa ajili ya jambo lingine lolote. Kutokuandika jina lako kenye fomu hii kwa ajili ya usiri wa taarifa zako inakubalika, Mawasiliano;

Kwa maswali au taarifa/tatizo kuhusu utafiti huu, wasiliana;

Mtafiti mkuu

Dkt. Alexander Joseph

Simu: +255714367286

Barua pepe: alexanderjosephmrosso@gmail.com

S.L.P 65001, Dar es salaam

Msimamizi

Dkt. Edwin Lugazia,

Simu: +255754283900/+255713283900

Barua pepe: elugazia@gmail.com

S.L.P 65001, Dar es salaam,

AU

Mkurugenzi wa Utafiti na Uchapishaji,

Dkt. Bruno Sunguya (MUHAS)

S. L. P 65001, Dar es Salaam

Sim. no 2150302-6.

Kukubali kushiriki


Tafadhali thibitisha hapa chini kama umekubali kushiriki kwenye utafiti huu

Mimi..... nimesoma na kuelewa yaliyoandikwa kwenye fomu hii. Hivyo nakubali kwa ridhaa yangu kushiriki katika utafiti huu.


Sahihi ya mshiriki.....

Tarehe.....

Appendix 4: Ethical Clearance



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/834 Date: 25/08/2021

MUHAS-REC-08-2021-834

Alexander Joseph,
 MMed in Anaesthesiology
 School of Medicine
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: MORBIDITY PATTERNS, OUTCOMES AND ASSOCIATED FACTORS AMONG PATIENTS ADMITTED IN CORONARY CARE UNIT AT JAKAYA KIKWETE CARDIAC INSTITUTE, DAR ES SALAAM, TANZANIA.

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: 25/08/2021
 EXPIRATION DATE OF APPROVAL: 24/08/2022

STUDY DESCRIPTION:
Purpose:
 This prospective observational cross sectional study will determine the causes of admission, mortality and factors associated with mortality among patients admitted at the coronary care unit at Jakaya Kikwete Cardiac Institute helping to improve health care policies and management of acute critical cardiac conditions.

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-%20785.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/>.



Prof. Bruno Sunguya
Chairman, MUHAS Research and Ethics Committee



Cc: Director of Postgraduate Studies

Appendix 5: Introduction Letter



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



In reply quote;

Ref. No. HD/MUH/T.104/2019

31st August, 2021

The Executive Director,
 Jakaya Kikwete Cardiac Institute,
 P.O. Box 65141,
DAR ES SALAAM

Re: INTRODUCTION LETTER

The bearer of this letter is Dr. Alexander Joseph, a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MMed. Anaesthesiology.

As part of his studies he intends to do a study titled: *“Morbidity Patterns, Outcomes and Associated Factors Among Patients Admitted in Coronary Care Unit at Jakaya Kikwete Cardiac Institute, Dar es Salaam, Tanzania*

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa

For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Medicine, MUHAS

cc: Dr. Alexander Joseph

Appendix 6: Permission letter



UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT,
GENDER, ELDERLY AND CHILDREN

JAKAYA KIKWETE CARDIAC INSTITUTE (JKCI)



Date:05/10/2021

In reply, please quote; Ref: AB.123/307/01F/18

Dr. Alexander Joseph

Muhimbili University of Health and Allied Sciences (MUHAS)

MMed. Anaesthesiology.

REF: PERMISSION TO CONDUCT RESEARCH

Reference is made to your letter. Your request to conduct research a study titled:
**"Morbidity Patterns, Outcomes and Associated Factors Among Patients Admitted in
Coronary Care Unit at Jakaya Kikwete Cardiac Institute, Dar es Sa!aam, Tanzania .**
Has been, granted institutional permission.

This letter serves as an official document that permits you to collect your data at JKCI for the prescribed duration as per your ethical clearance. It is our sincerely hope that you will abide to the rules and regulations of good clinical practice.

We wish you the very best and hope that your stay at JKCI will be fruitful.

You are required to provide a copy of your final project upon completion and submit it to Department of Research and Training JKCI.

In addition, your local contact person at JKCI will be Dr. Khuzeima Khanbhai (lease with him before you start your data collection).

Best regards,

Dr. Tulizo Shemu Sangi. Box 65141
Dar-es-Salaam

Head of Research Training & Consultancy

C.C: Director of clinical support and services, Director of cardiology, Director of surgical services