# PROFILEAND OUTCOME OF PATIENTS PRESENTING WITH ACUTE HEART FAILURE IN EMERGENCY MEDICINE DEPARTMENT AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM TANZANIA.

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# PROFILE AND OUTCOME OF PATIENTS PRESENTING WITH ACUTE HEART FAILURE IN EMERGENCY MEDICINE DEPARTMENT AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM TANZANIA

**By**

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**A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Medicine (Emergency Medicine) of the Muhimbili University of Health and Allied Sciences**

**October, 2020**

## CERTIFICATION

The undersigned certifies that he has read and hereby recommended for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: ***"Profile and outcome of patients presenting with acute heart failure in emergency medicine department at muhimbili national hospital, dares salaam Tanzania*",** in partial fulfillment of the requirements for the degree of Master of Medicine (Emergency Medicine) of the Muhimbili University of Health and Allied Sciences (MUHAS), Dar es Salaam, Tanzania.

_____

**Dr. Hendry Sawe**

**Supervisor**

_____

**Date**

## DECLARATION AND COPYRIGHT

I, **Shamila S Rwegoshora**, 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.

Signature _____ Date _____

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## DEDICATION

To my late parents, my Husband Ismail K. Batenga, and my Children (Ayman, Faridah and Ahmad.

## ABSTRACT

**Background:** Heart Failure (HF) is the most common cause of acute dyspnea among elderly patients in the emergency department(ED) and the most common cause of death among patients presenting to the ED with dyspnea. There is rarity of data on the profile and outcome of patients who present with Acute Heart Failure in emergency situations, especially within limited resource settings.

**Aim**: We aimed to determine the profile and outcome of adult patients with AHF who presented to the emergency department of a national referral hospital in a limited resource setting.

**Methods and Material:** This was a prospective cohort study of adult (≥18 years) medical patients presenting to the Emergency Department of Muhimbili National Hospital (ED-MNH) in Dar-es-Salaam, Tanzania with AHF from September 2019 to February 2020. We used the Framingham Criteria to diagnose the patients with AHF. Patient demographic data, clinical presentation and ED management provided, and ED disposition were recorded. Patients were followed in-hospital until death/discharged from the hospital. The primary outcome of mortality was summarized using descriptive statistics and analyzed using counts, proportions, median, interquartile ranges (IQR), 95% confidence interval(CI), relative risk (RR) and p-value.

**Results:** A total number of 12,184(100%) adult patients presented to the ED during study period and742(6.1%)patients presented with difficulty in breathing, in whom we enrolled 196 (26.4%) patients with AHF who were eligible and consented to be in the study. All of the patients presented with difficulty in Breathing 196(100%) and the Chest pain 84 (42.9%) was the frequently encountered ED complaint, Hypertension 92(46.9%) was the most frequently reported comorbidity. Median length of stay was 7days (IQR 3-11days).The most common HF drug used were Diuretics (35.2%).Dilated Cardiomyopathy (33.7%) was the most common final diagnosis. In hospital mortality occurred in 54 (28.6%) patients. Among the risk factors for mortality were receipt of inotropes Relative Risk (RR) 2.4 ($p<0.0001$), receipt of endotracheal intubation (RR) 2.9 ($p<0.001$), Intensive Care Unit (ICU) admission (RR) 4.3 ($p<0.0001$) and admission in non-cardiac ward (RR) 1.7 ($p=0.03$).

**Conclusion:** In this ED of a LMICs, Acute HF affects patients at middle aged adults. Hypertension was the most common comorbidity among these patients. We found high mortality among patient presenting with AHF. Future studies should focus on evaluating and improving risks for AHF so as to improve outcome.

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**LIST OF ABBREVIATIONS:**

| | |
|---|---|
| ACE | Angiotensin Converting Enzymes |
| ACS | Acute Coronary Syndrome |
| ADPE | Acute Decompensated pulmonary oedema |
| AHF | Acute Heart Failure |
| ALT | Alanine Transaminase |
| AST | Aspartate Transaminase |
| BNP | B-type natriuretic peptide |
| BP | Blood Pressure |
| BUN | Blood Urea Nitrogen |
| COPD | Chronic Obstructive Pulmonary Disease |
| CI | Confidence interval |
| CM- | Cardiomyopathies |
| CPR | Cardio Pulmonary Resuscitation |
| CRF | Case Report Form |
| CVS | Cardiovascular System |
| DCM | Dilated Cardiomyopathy |
| DIB | Difficult in Breathing |
| ED | Emergency Department |
| EMD | Emergency Medicine Department |
| FBP | Full Blood Picture |
| Hb | Hemoglobin |
| HEENT | Head, Eyes, Ears, Nose, Throat |
| HF | Heart failure |
| HHD- | Hypertensive Heart Disease |
| HIV | Human Immunodeficiency Virus |
| HR | Heart Rate |
| ICU | Intensive Care Unit |
| INV- | Invasive Ventilation |
| IRB | Institutional Review Board |
| IVF- | Intravenous Fluid |
| LMIC- | Low and middle income countries |
| LVEF | Left Ventricular Ejection Fraction |
| LFT | Liver Function Test |

| | |
|---|---|
| MNH | Muhimbili National Hospital |
| MRDT | Malarial Rapid Diagnostic Test |
| MRN | Medical Record Number |
| MUHAS | Muhimbili University of health and allied sciences |
| NIV | Non Invasive Ventilation |
| PE | Pulmonary Embolism |
| POC | Point of Care |
| POC-USS | Point of Care Ultrasound |
| RBG | Random Blood Glucose |
| RFT | Renal Function test |
| ROSC | Return of Spontaneous Circulation |
| RR | Respiratory Rate |
| SBP | Systolic blood Pressure |
| SPO2 | Saturation of Oxygen |
| SPSS | Statistical package for the Social Sciences |
| SSA | Sub-Saharan Africa |
| Temp | Temperature |
| USA | United States of America |
| VF/Vfib | Ventricular Fibrillation |
| VT | Ventricular Tachycardia |
| WBC | White Blood Cells |

## DEFINITION OF KEY TERMS

- **Acute heart failure or** Acute decompensated heart failure (ADHF)- wide spectrum of illness, ranging from a gradual increase in leg swelling, shortness of breath, or decreased exercise tolerance to the abrupt onset of pulmonary oedema.(1). Acute presentation may be a result of systolic dysfunction and hypo-perfusion, often with acute cardiogenic pulmonary oedema (ACPE) resulting from sudden reduction in chamber compliance.(2)

- **Heart Failure**- Heart failure (HF) is a common clinical syndrome resulting from any structural or functional cardiac disorder that impairs the ability of the ventricle to fill with or eject blood. HF may be caused by disease of the myocardium, pericardium, endocardium, heart valves, vessels, or by metabolic disorders(3)

- **Low income countries-** according to World Bank, are nations that have per capital gross national income of less than $1026.

- **Middle income countries-** according to World Bank, are nations that have per capital gross national income of less than $1026-$4035

- **Pulmonary oedema-** is fluid accumulation in the tissue and air spaces of the lungs.

- **Sub-Saharan countries-** geographically the area of the continent of Africa that lies south of the Sahara either fully or partially.

# CHAPTER 1:

## 1.0 INTRODUCTION

## 1.1 BACKGROUND:

Acute heart failure (AHF) is a syndrome defined by the complaint of acute dyspnoea and the presence by physical examination with at least 2 of the following: rales, oedema, elevated jugular venous pressure (JVP), hepatomegaly and ascites. AHF can occur de novo or as worsening of symptoms in patients with chronic systolic or diastolic HF(4).According to European Society of Cardiology (ESC) published in 2016, AHF is defined as a clinical syndrome characterized by symptoms such as shortness of breath, persistent coughing or wheezing, ankle swelling and fatigue, that may be accompanied by the signs of congestion (5).

HF is the most common cause of acute dyspnea among elderly patients in the emergency department (ED) (6), and the most common cause of death among patients presenting to the ED with dyspnea (7). Signs and symptoms include difficulty breathing, either as exertional dyspnea, (a cardinal symptom of left ventricular failure), orthopnea ,paroxysmal nocturnal dyspnea(sensation of shortness of breath occurs at night that awakens the patient during sleep), Several cardiovascular conditions like acute coronary syndromes, atrial fibrillation, hypertensive cardiomyopathy, third degree atrio-ventricular block, acute pulmonary embolism, as well as non-cardiac conditions ( infections, COPD exacerbation or asthma, renal dysfunction, anemia, hyper or hypo-thyroidism, strenuous exercise, emotional stress, pregnancy (peripartum cardiomyopathy) can trigger heart failure. Additionally, poor compliance with medication, increased salt or fluid intake, surgery, drugs (ie, NSAID, thiazolidinediones) and alcohol abuse may cause a rapid development or deterioration of signs and symptoms of heart failure leading to hospitalization.

HF is estimated to affect 5.8 million Americans and is primarily a disease of the elderly. It has an increasing prevalence with age (8), reaching 17.4% in those 85 or older. Heart Failure is expensive and deadly. In the USA, there was an estimated 30.7 billion dollars spent in 2012 on the care of HF with projections to more than double by 2030 (9) .Further, approximately 50% of patients will die within 5 years of diagnosis (10) and 30-day, 1-year, and 5-year mortality after hospitalization for HF are reported at 10.4%, 22%, and 42.3%, respectively (11).

Heart failure (HF) is emerging as a dominant manifestation of cardiovascular disease in developed countries and rapidly increasing in low-income countries such as those in sub Saharan Africa (SSA) (12).In SSA, HF is not well explored, the diagnosis accounts for over 30% of hospital admissions in cardiovascular and 3–7% in internal medicine units (13).
A study done in Tanzania by *Makubi et al* compared the characteristics and outcomes of patients with heart failure in Tanzania and Sweden. Compared to Sweden, HF patients in Tanzania were younger and more commonly female. After a age and gender matching, HF patients in Tanzania were more likely to have hypertension and anemia, more severe HF despite higher ejection fraction (EF), and worse crude but similar adjusted prognosis (12).

Another study done in Tanzania by *Makubi et al*on,"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" showed resulting in a mortality rate of 22.4% per 100 person-years of observation among HF patients(14).
In treating acute decompensated heart failure, the immediate goal is to re-establish adequate perfusion and oxygen delivery to end organs. This entails ensuring that airway, breathing, and circulation are adequate. Treatment consists of elevating the head of the patient, giving oxygen to correct hypoxemia, reducing preload, afterload and fluid by administering diuretics like furosemide, addition of an ACE inhibitor, use of nitrates and use of antiarrythmics if indicated for the heart failure and if arrhythmic. Also occasional use of vasopressors like dobutamine in the patients with cardiorgenic shock. Ventilation by Continuous positive airway pressure may be applied using a face mask; this has been shown to improve symptoms more quickly than oxygen therapy alone.

In general patients hospitalized for acute heart failure are at high risk for early mortality and re-hospitalization, thus this study will help in identifying patients at risk of morbidity and mortality hence improving efficiency of care in patient presenting to the emergency department with AHF.

## 1.2 LITERATURE REVIEW:

Heart failure (HF) is a major burden on healthcare systems worldwide. Approximately 1% of population are living with heart failure, and heart failure accounts for 1% of all primary diagnoses that result in hospital admission(15). Data from United State showed the prevalence of heart failure showed an increasing trend even though the prevalence of many cardiovascular diseases showed a decreasing trend due to the increased in aging population(9). A report from American Heart Association 2011 update of Heart Disease and Stroke Statistics found that the overall number of people living with heart failure is increasing, due to sizable increases in predisposing diseases or comorbidities (such as diabetes, obesity and hypertension) and due to an aging population in general(9)(10).

### Burden

Heart failure is an important global health problem, affecting about 26 million people worldwide. It is associated with high mortality and is estimated to have cost about US$100 billion in 2012(16). Heart Failure is expensive and deadly. In the USA, there was an estimated 30.7 billion dollars spent in 2012 on the care of HF with projections to more than double by 2030 (9)

In the United States, HF carried a prevalence of 5 800 000 (2% of the entire populace) in 2009 and an estimated yearly incidence of 550 000(18). What triggers a visit to Emergency Department (ED) is the acuteness of the symptoms, though symptoms may vary in severity but they mostly necessitate early intervention, often with intravenous medication and respiratory support. There are over 650,000 emergency department (ED) presentations per year in the United States due to AHF primarily, with over 80% of these patients admitted to the hospital from the ED(19).

Global Public Health Burden of Heart Failure review which was published in 2017 focused on the global epidemiology of HF, has provided data about prevalence, incidence, mortality and morbidity worldwide. In this review showed, In Germany in 2006 the prevalence of HF was 1.6 %, Sweden in 2010 the crude prevalence of HF was 1.8 %, China there are 4.2 million people with HF, with an estimated prevalence of 1.3 %(17).

Heart Failure is rapidly increasing in low and middle income countries such as those in sub Saharan Africa (SSA), however the clinical characteristics, management has not largely explored as in developed countries but it has great personal, social and economic implications due to disabling symptoms and high mortality despite standard therapy, if available (12). The Global Public Health Burden of Heart Failure review of 2017 showed that there are actually no population studies providing insight into prevalence or incidence although etiologies and clinical characteristics have been studied in Sub-Saharan Africa (17).

**Clinical Epidemiology**

The Etiology of HF differs, The available data suggest that while the morbidity due to HF is great in many parts of the world, the etiologies differ(20)(21).

The most common cause of Acute Heart Failure is due to left ventricular systolic and/or diastolic dysfunction, with or without additional cardiac pathology, such as coronary artery disease or valve abnormalities.(22).

The most common underlying cause of HF in high-income countries is coronary artery disease(20),though it has also been studied in ADHERE(Acute Decompensated Heart Failure National Registry)a largest AHF registry of 2005 performed in the United States that patient with medical history of Hypertension had also high proportion(72%)(23). Also in the Framingham Heart Study cohort done in America showed hypertension was the most common risk factor for HF, and it contributed a large proportion of heart failure cases, hazard of developing HF among participants with previous diagnosis of hypertension was high compared to those who were normotensive(24).

Data from acute heart failure report of 2017 on Acute Heart Failure: Definition, Classification and Epidemiology showed Dilated Cardiomyopathy is one of several causes of HF(25).Recent data from the sub-Saharan African Survey of Heart Failure(THESUS-HF)the cause of AHF remains predominantly non-ischemic, it showed Dilated Cardiomyopathy is among of the predominant cause of AHF where by others including hypertension, rheumatic heart disease, and the endemic cardiomyopathies peripartum cardiomyopathy, and endomyocardial fibrosis(20)(26).

With a non-uniform epidemiologic transition to a more Western way of living, prevalence of hypertension, obesity, and diabetes are increasing in sub-Saharan Africa, particularly in urban centers, with a possible effect on the etiology of HF(26).

Heart failure appears to have different characteristics with regard to age and gender in SSA as well as in developed countries as previously reported (27). HF is more prevalent at advanced ages in developed countries, beginning around 60 years, but has almost similar frequency in gender distribution in some studies(28)(12). In contrast, in Developing countries, the gender distribution appears equal but age is much lower than in developed countries (27)(12).

Hypertension shown to carry high frequency inpatient with heart failure in many African countries. One of the multicenter, observational survey on Treatment, and Outcome of Acute Heart Failure in 1006 Africans From 9 Countries In African patients by Albertino Damasceno, MD, PhD et al, showed AHF has a predominantly no ischemic cause, most commonly hypertension (27).Study done in Ghana by Amoah et al on, "Aetiology of heart failure as seen from a National Cardiac Referral Centre in Africa" also showed the main causes of heart failure was hypertension(29). Study done on "risk factors for Heart failures in adult Nigerians also concluded that Hypertension, obesity, alcohol intake and hypercholesterolemia were common in blacks with HF(30).

A comparative study done by *Makubi et al* which was conducted between Tanzania Heart Failure (TaHeF) and the Swedish Heart Failure Registry (SwedeHF) cohorts showed heart failure patient had more frequent hypertension and anemia, more preserved EF yet more advanced HF of longer duration, and less use of HF medications, and crude mortality was greater This study has also showed patients in Tanzania had clinically more severe HF by New York Heart Association classification than those in Sweden. This may be attributed to poor and/or later access to care. Even if access to care was adequate in Tanzania, the higher level of education in Sweden may be associated with higher health literacy and propensity to seek care than in Tanzania(12).

Also SSA studies showed that Heart Failure occurs in middle-aged adults, equally in men and women, and is associated with high mortality. The outcome is similar to that observed in non-African AHF registries, suggesting that AHF has a poor prognosis globally, regardless of the cause (27).

**Acute Heart Failure in the ED**

A retrospective cohort study of adults with at least 1 ED visit for AHF between 2010 and 2011 was performed, derived from population-based multilayer data of state ED and inpatient databases for 2 large and diverse states, California and Florida, During the 1-year follow-up period, 30.8% of patients had ≥2 (frequent) visits, accounting for 55.4% (95% confidence interval, 55.2–55.5%) of all ED visits for AHF. In the multivariable model, significant predictors of frequent ED visits were non-Hispanic black race, Hispanic ethnicity, Medicaid insurance, and lower median household income (all $P<0.001$). At the visit level, patients with frequent ED visits accounted for 55.0% (95% confidence interval, 54.8–5.3%) of all AHF hospitalizations via ED. Approximately one third of patients had frequent ED visits for AHF during a 1-year follow-up period. Non-Hispanic black race, Hispanic ethnicity, and lower socioeconomic status were associated with frequent ED visits for AHF(31).

**Definition of acute heart failure**

Initial evaluation of patients who present with heart failure often includes a focused history, physical examination, electrocardiogram, and measurement of biomarkers (32). Emergency physicians regularly evaluate and manage patients with AHF exacerbation(19). Recent findings from current heart failure reports showed that diagnosis of AHF is made when patients present acutely with signs and symptoms of heart failure, often with decompensation of pre-existing cardiomyopathy (25).

The Framingham criteria is the most widely accepted clinical criteria for diagnosing heart failure. For establishing a definite diagnosis of HF, 2 major criteria or 1 major and 2 minor criteria must be present. Major criteria are: Paroxysmal nocturnal dyspnea or orthopnea, Neck-vein distention, rales, cardiomegaly, acute pulmonary oedema, S3 gallop, increased venous pressure >16 cm of water, hepatojugular reflux. Minor criteria are: ankle oedema, night cough, dyspnea on exertion, hepatomegaly, pleural effusion, Vital Capacity reduced one third from maximum, tachycardia (≥120 bpm) (33).

**Management of acute heart failure in the ED**

AHF is a condition that requires rapid assessment and management. Understanding the appropriate management strategy can allow for more targeted treatment and improved outcomes. The primary management of AHF includes hemodynamic stabilization and symptom relief. Delayed diagnosis and time to treatment can worsen morbidity and mortality (19).

Initial management should focus on assessment and management of the patient's airway, breathing, and circulation. During this time, close monitoring of the patient's respiratory status is recommended to identify patients who may require respiratory support. After the respiratory status has been identified and addressed, management will depend on specific patient characteristics, such as patient hemodynamics, etiology of the exacerbation, patient comorbidities, de novo or chronic heart failure, and laboratory assessment (e.g., cardiac biomarkers, renal function(19).

Treatment should focus on the underlying disease process, with guidelines focusing primarily on blood pressure and hemodynamic status. Patients with AHF with flash pulmonary oedema should receive nitroglycerin and noninvasive positive pressure ventilation, with consideration of an angiotensin-converting enzyme inhibitor, while monitoring for hypotension. Patients with hypotensive AHF should receive emergent specialty consultation and an initial fluid bolus of 250–500mL, followed by initiation of inotropic agents with or without vasopressors. Dobutamine is the inotrope of choice in these patients, with norepinephrine recommended if blood pressure support is needed. If noninvasive positive pressure ventilation is required, providers should monitor closely for acute decompensation. Mechanical circulatory support devices may be considered as a bridge to further therapeutic intervention. High-output heart failure can be managed acutely with vaso-constricting agents, with focus on treating the underlying etiology(19). Loop diuretics provide rapid symptomatic relief of congestive symptoms and improve the effects of angiotensin-converting enzyme inhibitors by decreasing intravascular volume. Most ED patients require IV dosing, because bowel wall oedema may prevent proper GI absorption (1).

One of the most important considerations affecting treatment, after assessing the respiratory status, is the patient's blood pressure. Most guidelines refer to the following cut-offs in determining treatment: hypertensive with systolic blood pressure (SBP) > 140 mm Hg, normotensive with SBP 100–140 mm Hg, and hypotensive with SBP < 100 mm Hg(19).

The STRATIFY study sought to derive an ED based decision tool for identification of patients at low risk of 30-day adverse events (34) whereby the study found that elevated troponin and abnormal renal function were associated with a higher risk for adverse events An elevated cardiac troponin level has also been associated with nearly a 3-fold higher in-hospital mortality(34).

**Outcome of Acute Heart Failure Patients**

Some patients with AHF can be discharged home after stabilization, medication adjustment, and discharge home after arranging close outpatient follow-up within the next 72 hours.

The outcome of heart failure was reported to be poorer in elderly patients than in non-elderly patients (16).

In HIC Like data from Euro Heart Failure Survey II (EHFS II) on hospitalized acute heart failure patients showed a low in hospital mortality on the survey of 6.7% (35). Also data from Acute Decompensated Heart Failure National Registry (ADHERE) of 2004 in USA on Characteristics and outcomes of patients hospitalized for heart failure in the United States also showed very low in hospital mortality of 4.0%(28).

Study in a LIMC in India on, "Epidemiology of acute decompensated heart failure in India", The AFAR study (Acute failure registry study in-hospital mortality for patients admitted from the ED was 30.8%. This suggests that mortality is much higher in LMIC's, and so more information is needed about heart failure in these countries (36).

In SSA, A multicenter, observational survey on Treatment, and Outcome of Acute Heart Failure in 1006 Africans From 9 Countries In African done in 12 African countries also showed a high 6-months in hospital mortality of 17.8%(37).

Predictors of in-hospital mortality among acute heart failure (AHF) patients managed in general wards of sub-Saharan Africa are unknown, yet it poses enormous socioeconomic burden due to high prevalence and mortality, especially among young, economically productive individuals(21), and there are few specialized cardiology centers in the region. Knowledge of

the patients' course before the admission, during the in-hospital phase, and out of hospital follow-up, could aid in identifying patients at higher risk of mortality to whom focused intervention can be directed (38).

One study in United States did Observational analysis of patients 65 years or older with heart failure and discharged to home from hospitals participating in the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure(OPTIMIZE-HF) examined the trends of early outpatient follow-up on 30-day readmission rates and found that patients discharged from an inpatient admission in hospitals with higher early follow-up rates have a lower risk of 30-day readmission. Transitional care is designed to ensure coordination and continuity in care as patients transfer between locations(39). Important elements of transitional care include communication between sending and receiving clinicians, preparation of the patient and caregiver for what to expect at the next site of care, reconciliation of medications, follow-up plans for outstanding tests, and discussions about monitoring signs and symptoms of worsening conditions. For patients with heart failure, the transition from inpatient to outpatient care can be an especially vulnerable period because of the age of the patients, complex medical regimens, the large number of comorbid conditions, and the multiple clinicians who may be involved (39).Early evaluation after discharge is critical. This evaluation should include a review of therapeutic changes and a thorough assessment of the patient’s clinical status outside of the highly structured hospital setting. Barriers to coordination of care include overextended primary care, lack of interoperable computerized records, lack of financial , and lack of integrated systems of care(39).

### 1.3 FIGURE 1: CONCEPTUAL FRAME WORK

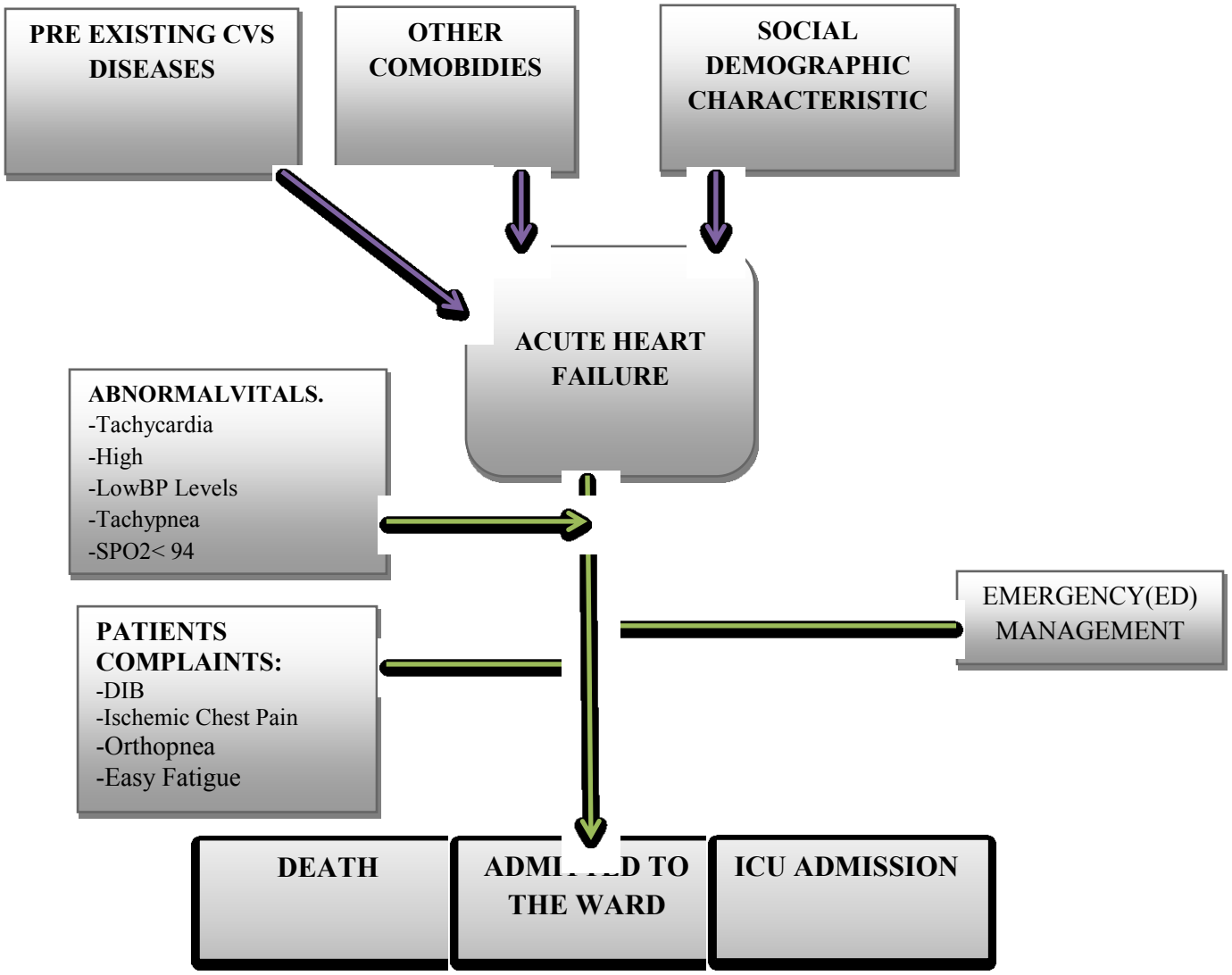



**Figure 1: Conceptual Frame Work**

Shows that the presence of pre-existing cardiovascular diseases example; hypertension and other comorbidities, will result into AHF also due to ominous vitals(high/low BP ,tachycardia, tachypnea , SPO2 < 94)will result in to AHF, and also if there is delay in life saving interventions (good emergency care), late recognition of ominous signs like difficulty in breathing (DIB),ischemic chest pain, orthopnea, easy fatigue will result into poor outcomes death, need of ICU admission (40)(12)(41)**.**

## 1.4 PROBLEM STATEMENT

Heart failure is a major public health problem in SSA associated with high morbidity and mortality. Hypertension is an emerging risk factor for most of the patient presenting with HF in SSA, including Tanzania(12). However appropriate treatment and disposition can affect outcome.

In Tanzania, there are no studies especially in Emergency Department documenting the management and outcome. Due to scarcity of data in our setting, we cannot identify demographic, clinical characteristics, causes and outcomes of acute heart failure patients. Without this knowledge, we cannot be sure we are identifying the patients that need aggressive treatment, whether our treatment is appropriate and whether it affects outcomes. Also with lack of local data hence denies us the options of customizing or adopting the HF guidelines.

Heart failure is preventable disease and understanding the etiology in our setting will help to focus efforts of our health care system to address the most common causes of this disease, lowering the burden in our country.

## 1.5 RATIONALE FOR THE STUDY

This is baseline study to look at the Adult patient presenting with AHF triaged to resuscitation room. In this study, we will determine Demographics, clinical characteristics, managements and disposition and outcome which will help to determine what leads to higher mortality in our setting. This study will allow us to assess the severity of presentations and compare them with that seen in other studies, including studies conducted in high income settings.

Through this study we will identify the role of emergency care provided at the ED in management of patient presenting with AHF at ED. This study also will identify diagnostic and treatment modalities, clinical considerations, risk stratification, and disposition options in patients presenting to the ED with AHF. Also it will help in identifying the possible gaps in patient care, which may assist ongoing efforts to decrease hospitalizations for heart failure and improve AHF outcome.

## 1.6 RESEARCH QUESTION

What is the clinical profile and outcomes of patients presenting with acute heart failure in Emergency Medicine Department at Muhimbili National Hospital, Dar es salaam Tanzania?

## 1.7 OBJECTIVES

### 1.7. 1Broad objective

To describe the profile and outcome of patients presenting with acute heart failure in Emergency Medicine Department at Muhimbili National Hospital, Dar es salaam Tanzania.

### 1.7.2 Specific Objectives

1. To determine the proportion of adult patients presenting to the emergency medicine department of Muhimbili National Hospital with acute heart failure.
2. To describe the clinical characteristics of adult patients with acute heart failure presenting to the emergency medicine department of Muhimbili National Hospital.
3. To describe the management strategies of adult patients with acute heart failure presenting to the emergency medicine department of Muhimbili National Hospital
4. To describe the disposition and outcomes of adult patients with acute heart failure presenting to the emergency medicine department of Muhimbili National Hospital

# CHAPTER 2:

## 2.0 METHODOLOGY

### 2. 1 Study design

This was the prospective cohort study of Adult patients with AHF presenting to the Emergency Medicine Department (EMD) of Muhimbili National Hospital (MNH) from September 2019 to February 2020.

### 2.2 Study setting

This observational cohort study was conducted at Muhimbili National Hospital, a tertiary hospital located in Dar es Salaam, Tanzania. Muhimbili National Hospital is a tertiary hospital located in Dar es Salaam, Tanzania. It has bed capacity of 1,500 with around 1,000 to 1,200 inpatient admissions per week. The EMD is part of the MNH and it is the point of entry to the hospital for most patients. MNH is staffed with specialists and super specialists including pulmonologists, endocrinologist, surgeons and neurologists who may be consulted when needed in management of patient with AHF. MNH has central Pathology Laboratory (CPL), electrocardiogram machines, echocardiogram machines, and bronchoscope services which may be needed in patient care.

The EMD at MNH is staffed with emergency physicians, postgraduate students in emergency medicine program, medical officers (registrars), critical care nurses and nursing officers. The EMD at MNH is equipped with diagnostic facilities including arterial blood gases machines, bedside ultrasound machines, portable x-rays, cardiac monitors, ventilator machines and other point of care tests. Acutely ill patients including adult patients with acute heart failure at MNH are received in emergency department's resuscitation rooms where they are stabilized and undergo diagnostic workups before being disposed to appropriate ward.

Disposition for heart failure patients may be to ICU and Jakaya Kikwete Cardiac Institute(JKCI), although occasionally to the medical or renal ward. The ED is the first full capacity public emergency department in Tanzania and the training site for the only Emergency Medicine (EM) residency program in the country. The department is staffed 24hours, seven days a week by locally trained specialist emergency physicians, who oversee the care of patients and training of interns, registrars and EM residents. The ED sees an average of 45000 patients annually, with an admission rate of 65%.

### 2.3 Target Population

Adult patients aged 18 years and above with acute heart failure (AHF).

**2.4 Accessible population**

Adult patients with AHF presenting to the MNH EMD.

**2.5 Study population**

Adult patients with AHF presenting to the MNH EMD during the months of the study, meeting the inclusion criteria at the time when the research assistant is available to enroll them.

**2.6 Sampling design**

Consecutive enrollment of adult patients presenting to the EMD with AHF and who met inclusion criteria at times when research assistant/researcher was available for enrolment.

**2.7 Study subjects**

**2.7.1 Inclusion criteria**

Age ≥18 years with dyspnea as a main complaint, diagnosed with AHF at EMD by the treating emergency physician, and consenting to the study. Framingham criteria for diagnosing Heart Failure(42) was used for the definition of AHF. Patients were included if they had at least two of the following signs and symptoms:

- Paroxysmal nocturnal dyspnea
- Neck vein distention
- Rales
- Radiographic cardiomegaly (increasing heart size on chest radiography)
- Acute pulmonary oedema
- S3 gallop
- Hepatojugular reflux

**2.7.2 Exclusion criteria**

1. Arrived in ED while in cardiac arrest or CPR is going on
2. No informed consent
3. Known with renal failure, patients undergoing dialysis, known with nephrotic syndrome, and those known with hepatic failure.

### 2.8 Variables of interest

**2.8.1 Dependent variable:** Mortality

**Predictor Variables:**

1. Demographic data: age, sex,
2. Referral pattern: self-referred/hospital referred.
3. Comorbidities: prior medical history
4. Present illness
5. Presenting complain in the ED
6. Vitals including the HR, RR, Temp, RBG, on arrival, while in ED and before cardiac arrest.
7. Length of stay in the Hospital.
8. Management strategies at ED: including the investigations done and treatment given

### 2.9 Outcomes

The primary outcome of this study was In-Hospital mortality. Secondary outcome were ICU admission, Length of Stay and ED interventions

### 2.10 Sample size estimation

The sample size estimate was based on a study on AHF done in India on "Epidemiology of acute decompensated heart failure" by *Sandeep Seth et al* where, In Hospital mortality 30.8% was noted(36).

The sample size for this study was calculated using the following formula:

Sample size: $N = 4Z\alpha^2P(1-P)/(W^2)$

Whereby:

N= Minimum required sample size

Zα= Standard normal deviation for α. A level of confidence of 90% will be chosen for this study.

P= Expected proportion with the characteristic of interest. A value of 30.8% is chosen basing on previous study done in India, In Hospital mortality being their primary outcome.

W= Total Width of confidence interval. A width of 15% is chosen for this study.

Therefore minimum sample size calculated was:

$N = 4X1.645^2 X\ 0.308(1-0.308)/(0.15^2)$

N= 103.

Following adjustment for 10% non-response rate a minimum sample size of 113 participants was estimated.

## 2.11 DATA MANAGEMENT

### 2.11.1 Data collection:

The Research assistant was thoroughly trained prior to the commencement of data collection to which patients they should recruit, how to perform the interviews and collect data, how to communicate with the patients of family members in order to obtain consent and all the relevant information needed. A consecutive patient enrollment scheme was applied. The principle researcher and her assistant(s) were collecting data of consenting study participants that met inclusion criteria over 12 h, either during the day 0800-2000 h or night 2000-0800 h, eligible patients were captured during the period of study.

Treating Doctors who attended the patients at the beginning of the shift were informed to notify either the researcher or her assistant in case they received any adult patient ≥ 18 years with non-traumatic difficulty in breathing. Chief complaints related to AHF (for example DIB with Orthopnea, Paroxysmal, Nocturnal Dyspnea, Chest pain) were additionally monitored by Research assistant or Principle researcher on the electronic tracking board and patients with triage complaint of DIB were approached for eligibility. Then Framingham criteria for diagnosing Heart Failure were used for the definition of AHF. Patients were included if they had at least two of the following signs and symptoms: Paroxysmal nocturnal dyspnea, Neck vein distention, Rales, Radiographic cardiomegaly (increasing heart size on chest radiography), Acute pulmonary oedema, S3 gallop, Hepatojugular reflux. A standardized data collection checklist was used to assess the eligibility of patients to enroll in the study. An opportunity to participate in the study was offered to all eligible patients/patient relative by providing them an informed consent and providing them all the relevant information concerning the study. The principal researcher oversaw the data collection process and data were verified for quality and accuracy on a daily basis.

**Standardized data collection form/checklist**

Data was collected prospectively during the patient's visit using a pre-defined checklist/case-report form, which recorded information obtained from the treating physician, the patient and/or relative(s) and the electronic medical record (EMR).

The standardized data collection checklist/form had the following component:

a) Patient baseline information:

The researcher or her assistant(s) prospectively documented the patient's baseline information including the demographic status, referral status, hospital visited prior, admission status(if new or readmitted, mode of arrival.

b) Patient Clinical profile

Patient's presenting symptoms, comorbidities, vital signs and The ED management provided, including the procedures done were documented. All diagnostics, treatment and disposition were recorded.

c) Follow-up

The recruited patients were followed up, during the time of their hospitalization, from the ED to the time of discharge or death to record their hospital outcomes. The Principle researcher traced all patients enrolled (through their clinical files and records in the hospital system)in different units and wards in which patients were admitted, throughout the duration of the study and observed and recorded the duration of ED and in- hospital stay, the outcome of the patient (discharged or died) and length of stay were all recorded.

### 2.11.2 Validity and reliability.

Data collection was done using purpose designed Case report Form (CRF). To ascertain validity of research instrument, a designed CRF was pretested prior to initiation of the study to check for appropriateness and feasibility. Also data validation was achieved through Source Data Verification that is information reported on the CRF by the investigator will be compared with the original medical records to ensure it is complete and accurate.

## 2.12 Data analysis:

Data were coded and imported into Research Electronic Data Capture (REDCap). Statistical Package for Social Science (IBM SPSS version 25, IBM, LTD, Carolina, USA) was used for analysis. Relevant frequencies and tables where generated for all variables. Means/proportions

and medians/interquartile ranges were calculated for appropriate variables. In determining the proportion of adult patient with Acute Heart Failure the proportion of patients were used with heart failure amongst all patients seen in the study time.

### 2.13 Ethical considerations

Ethical approval was obtained from the Muhimbili University of Health and Allied Sciences Research Committee. Permission to collect data will be obtained from the responsible institution, MNH. Consent to participate in the study was obtained from patients themselves or their next of kin. The data obtained during the study remained confidential.

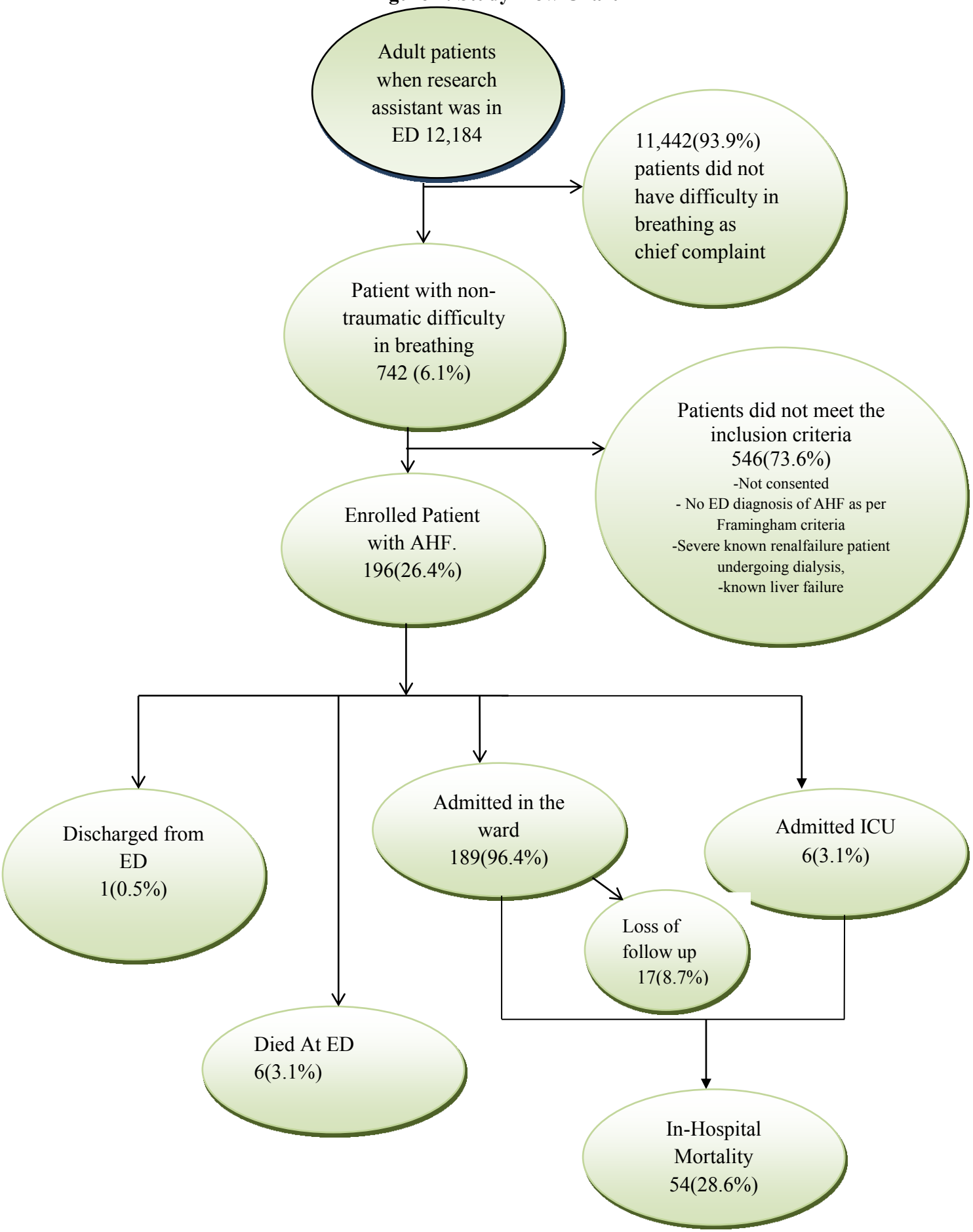
The recruited patients were allocated numbers that were used as their identification instead of names. Those who refused to consent were excluded from the study**.**

# CHAPTER 3:

## 3.0 RESULTS:

A total number of 12,184(100%) adult patients presented to the ED during study period and742 (6.1%) patients presented with difficulty in breathing, in whom we enrolled 196 (26.4%) patients with AHF who were eligible and consented to be in the study. Of the patients who had AHF, 183(96.4%) were admitted in the wards and 6(3.1%) admitted in the ICU), 6(3.1%) died in Emergency Department, 1(0.5%) was discharged home from ED, 17(8.7%) of patient were loss of follow up. The in-hospital mortality was 54(28.6%) (figure 2).

**Figure 2: Study Flow Chart**



## 2.2 Demographic Characteristics of Patients Presenting With AHF

Among the 196 patients with AHF, 105 (53.6%) were male, and the overall median age was 59 years (with interquartile range of 45-67years). Majority of patients 136 (69.2%) were self-referred and majority had primary level of education 138(70.4). Most of the patients 110(56.1%) were newly admitted (Table 1).

**Table 1: Demographic Characteristics of Patients Presenting With AHF**

| **VARIABLE** | **N=196** |
|---|---|
| **Age (yrs.)** | **n/N (%)** |
| Median age | 59 years **(IQR 45-67)** |
| 18-64 years | 129 (65.8%) |
| 65 and above | 67(34.2%) |
| **Sex** | |
| Male | 105 (53.6%) |
| Female | 91(46.4) |
| **Level of education** | |
| No education | 21 (10.7%) |
| Primary school | 138 (70.4%) |
| Secondary school | 26(13.3%) |
| University/college | 11 (5.6%) |
| **Referral Status** | |
| Self-referral | 136 (69.2%) |
| Hospital referred | 60(30.6%) |
| **Admission Status** | |
| New admission | 110(56.1%) |
| Readmission | 85(43.4%) |

### 3.2 Clinical Characteristics of Patients Presenting With AHF

All of our patients had DIB 196(100%) and most of them had Chest pain 84 (42.9%). Tachypnea was the most frequently reported abnormal vital sign 181(92.3%), half of the patient 98(50%) presented with tachycardia. Hypertension was the most common comorbidity 92(46.9%) (Table 2).

**Table 2: Clinical Characteristics of Patients Presenting With AHF**

| | **N=196** | **n/N (%)** | %(95%CI) |
|---|---|---|---|
| **Abnormal Vital signs** | | | |
| Tachypnea (RR>20BRPM) | 181 | 92.3 | 92.3(87.6-95.6) |
| Tachycardia(HR>100BPM) | 98 | 50 | 50 (42.8-57.2) |
| Hypertension(SBP≥140) | 75 | 38.3 | 38.3(31.5-45.5) |
| SpO2 < 94% | 50 | 25.5 | 25.5(19.6-32.2) |
| Altered mental status | 18 | 9.2 | 9.2(5.6-14.1) |
| Hypotension(SBP<90) | 9 | 4.6 | 4.6(2.1-8.6) |
| Febrile (T > 37.5°C) | 8 | 4.1 | 4.1(1.8-7.9) |
| Bradycardia(<60bpm) | 7 | 3.6 | 3.6(1.5-7.3) |
| **Presenting complaints** | | | |
| DIB | 196 | 100 | 99.9(97.9-100.0) |
| Chest pain | 84 | 42.9 | 42.9(35.9-50.2) |
| Peripheral oedema | 75 | 38.3 | 38.3(31.5-45.5) |
| Cough | 62 | 31.6 | 31.6(25.2-38.6) |
| Orthopnea | 59 | 30.1 | 30.1(23.8-37.0) |
| PND | 48 | 24.5 | 24.5(18.7-31.1) |
| **Comobidities/Medical History** | | | |
| Hypertension | 92 | 46.9 | 46.9 (39.8-54.1) |
| History of heart failure | 59 | 30.1 | 30.1(23.8-37.0) |
| Other cardiovascular conditions | 12 | 6.1 | 6.1(3.2-10.4) |
| Cardiomyopathies | 11 | 5.6 | 5.6(2.8-9.8) |
| Malignancy | 7 | 3.6 | 3.6(1.5-7.3) |
| Diabetes | 6 | 3.1 | 3.1(1.2-6.6) |
| Acute Coronary Syndrome | 5 | 2.4 | 2.4(0.8-5.6) |
| Hematological diseases | 2 | 1 | 1.0(0.1-3.6) |

### 3.3 Management strategies at the Emergency Department.

Of all patients only 21 (10.7%) had troponin investigation and among them only 38.1% had high troponin level. ECG and radiological investigation like Chest X-ray and Bed Side ultrasound were also done whereby of all patients 123(62.8%) did ECG, 174(88.8%) did Bedside USS, 119(60.7%) did Chest X-ray. A 76.4%, 94.8%, had abnormal ECG and abnormal Bed side USS respectively. Among those who did Chest X-ray 34.5% had Cardiomegaly. Not all patients did all investigation. Sometimes the investigations were not functioning or present in ED during study period also investigations were ordered at the discretion of the physician, thus not all patients received all tests, hence overestimation of results.

Majority of the patients 124 (63.3%) received oxygen therapy; 9 (4.6%) where intubated, and others remained on NIV- CPAP 9 (4.6%). The most common HF drug used was Diuretics(35.2%), followed by nitroglycerine was given to 18.4%. %).Small proportion of patients 18(9.2%) and 12(6.1%) received Inotropes/Vasopressor support and antiarrhythmic respectively, with clear indications of persistent hypotension/poor cardiac contractility and arrhythmias respectively (Table 3).

**Table 3: ED Management Strategies**

| **VARIABLES** | **N=196** |
|---|---|
| **ED Managements** | **n /N(%)** |
| **ED Investigations** | |
| Abnormal ECG | 94/123(76.4) |
| Abnormal Bed side USS | 165/174(94.8) |
| High Troponin | 8/21(38.1) |
| Chest X-ray(cardiomegaly) | 41/119(34.5) |
| **ED Treatments** | |
| Oxygen therapy | 124 (63.3) |
| antibiotics | 71 (36.2) |
| Blood Transfusion (BT) | 2 (1.0) |
| Intravenous fluid | 72 (36.7) |
| Diuretic | 69 (35.2) |
| Vasodilators/Nitroglycerin | 36 (18.4) |
| Inotropes/Vasopressor support | 18 (9.2) |
| Antiarrhythmics | 12(6.1) |
| CPAP | 9(4.6) |
| Intubated | 9 (4.6) |
| Cardioversion | 3(1.5) |
| Transcutaneous pacing | 0(0) |
| CPR. | 7(3.6) |

### 3.4 Disposition and Outcome of Patients Presenting with AHF

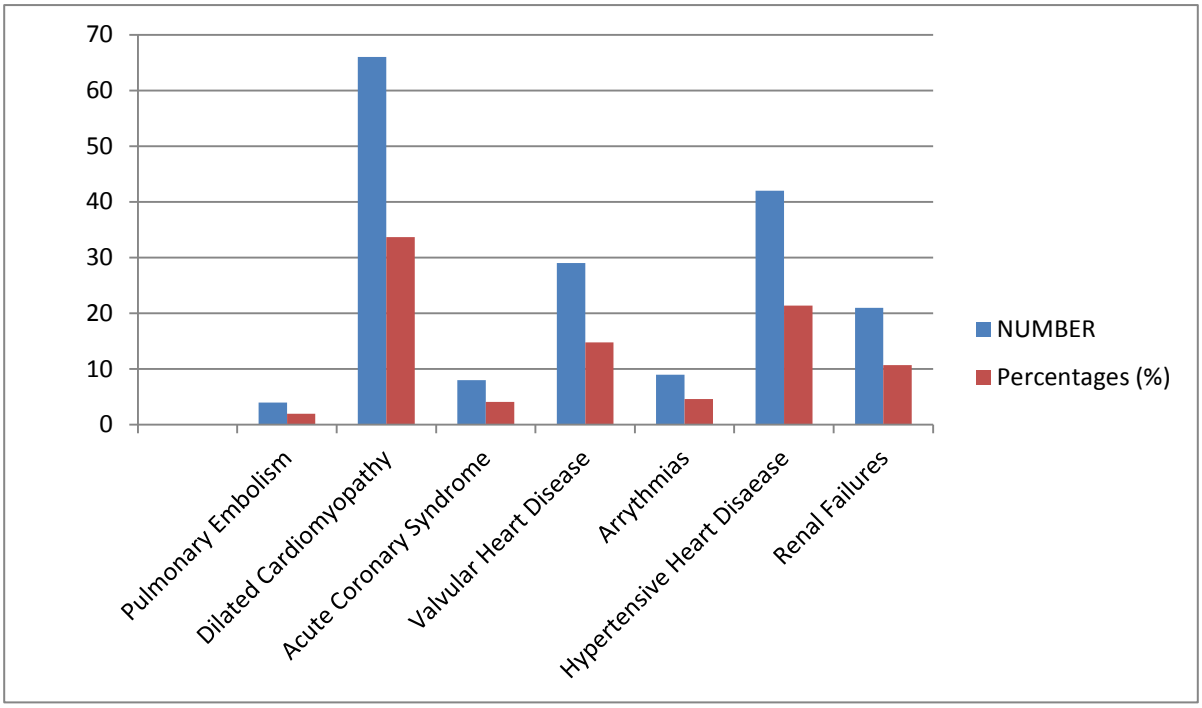
Most of the patients were admitted to the Cardiac ward 70% and 23.5% were admitted in other(non-cardiac) wards, However many of these patients who went to the wards because they had other underlying, and life-limiting illnesses such as renal failure. Only 3.1% were admitted to the ICU, also 1 (0.5%) patient was discharged from ED. Among of the patient admitted most of them showed to have DCM (33.7%) as the final/discharging diagnosis (Figure 2). There was 3.1% of the patients Died in the ED. We lost follow up of 17(8.7%) who were admitted. In-Hospital mortality of 28.6% of whom 7.1% died within 24 hours. Median length of stay was 7days (IQR3-11days)(Table 4).

**Table 4: Disposition and Outcome of Patients presenting with AHF**

| **Disposition/outcome** | **N= 196** | %(95%CI) |
|---|---|---|
| **Total Admitted** | 189 | 96.4(92.7-98.5) |
| Cardiac Ward | 137 | 70(63.1-76.3) |
| Other wards | 46 | 23.5(17.8-30.1) |
| ICU | 6 | 3.1(1.2-6.6) |
| Discharged from ED | 1 | 0.5(0.0-2.8) |
| Died in ED | 6 | 3.1(1.2-6.6) |
| Inpatient mortality* | 54/189 | 28.6(22.3-35.6) |
| 24-hour mortality** | 14 | 7.1(3.9-11.6) |
| **Median LOS** | | **7days(IQR3-11)** |

*Includes only inpatients' death (denominator: N=189)those who were admitted **Includes EMD, Inpatient

**Figure 3: A bar chart showing common final/discharging diagnosis that caused AHF**



### 3.5: Risks of AHF Mortality

Overall 60 (30.6%) patients died during the study. Risks of Mortality analysis are listed where by ,receipt of endotracheal intubation, receipt of inotropes and disposition were all significantly predictors of mortality($p<0.05$) (Table 5).

**Table 5: Risks of AHF Mortality**

| | **DIED** | **SURVIVE** | **Relative Risk** | |
|---|---|---|---|---|
| **Variables** | **n=60** | **n=119** | **RR (CI)** | **p- value** |
| | **n(%)** | **n(%)** | | |
| **Age Group** | | | | |
| 18-64 | 36(30) | 83 (69.7) | 0.76(0.5-1.1) | 0.185 |
| **Male Sex** | 37(38) | 60 (61.9) | 1.35(0.9-2.1) | 0.16 |
| **Abnormal Vital Signs** | | | | |
| Spo2<94% | 15(33) | 30 (66.7) | 0.99(0.6-1.6) | 0.98 |
| Tachycardia (HR>100bpm) | 34(38) | 55(61.8) | 1.32(0.9-2.0) | 0.19 |
| Tachypnea (RR>20 BPM) | 56(34) | 109(66.1) | 1.19(0.5-2.8) | 0.69 |
| SBP≥ 140 | 7(29) | 51(70.8) | 0.80(0.5-1.2) | 0.32 |
| SBP< 90 | 7(32) | 15(68.2) | 0.92(0.39-2.14) | 0.85 |
| Bradycardia(<60bpm) | 4(57) | 3(42.9) | 1.76(0.9-3.5) | 0.1 |
| **Cormobidities** | | | | |
| Hypertension | 30(36) | 54(64.3) | 1.13(0.7-1.7) | 0.55 |
| Previous history of HF | 17(□6) | 30(63.8) | 1.11(0.7-1.7) | 0.65 |
| **ED Management** | | | | |
| Intubated | 8(89) | 1(11.1) | 2.90(2.1-4.0) | <0.001 |
| CPAP | 4(44) | 5(55.6) | 1.35(0.6-2.8) | 0.44 |
| Diuretics | 19(28) | 49(72.1) | 0.75(0.5-1.2) | 0.23 |
| Nitroglycerine | 13(36) | 23(63.9) | 1.1(0.7-1.8) | 0.7 |
| Ionotropes | 12(71) | 5(29.4) | 2.38(1.6-3.5) | <0.0001 |
| Antiarrthmias | 4(33) | 8(67) | 0.99(0.4-2.3) | 0.99 |
| **Disposition** | | | | |
| ICU | 6(100) | 0(0.0%) | 4.31(3.4-5.5) | <0.0001 |
| Non cardiac ward | 17(37) | 29(63) | 1.66(1.04-2.6) | 0.03 |

** Total N= 179 reduced from 196, as it excluded number of loss of follow-ups(17 patients)*

# CHAPTER 4:

## 4.0 DISCUSSSION:

This study aimed at describing the profile of patients presenting with acute heart failure to an emergency department in a low income country. We found that the patients were middle aged adults of median age 59 years, which is similar to other AHF studies other African countries (37), but in contrast with high income countries like United States where by AHF is a disease of the adult >65yrs with median age of 66-70 years(28).

Most of our patients had tachypnea and half of them had tachycardia. Hypertension was the dominant comorbidity in these patients which is also similar to other studies done in Africa. The Sub-Saharan Africa Survey of Heart Failure (THESUS–HF )study which was a prospective, multicenter, observational survey of patients with AHF admitted to12 university hospitals in 9 countries found that a history of hypertension was present in 45.4% of patients with heart failure (37). These shows there are limited antihypertensive strategies aimed at preventing the progression to heart failure and failure to address the growing burden of disease associated with hypertension. Findings from different trials have demonstrated an association between long-standing HTN and heart failure (HF). A meta-analysis of 23 BP-lowering trials showed that 28.9% of the patients developed HF, which amounted to 8.5 events per 1000 patients Of the individuals(43)(44),in the Framingham Heart Study cohort, 91% of the participants with HF had a previous diagnosis of HTN, and compared with the normotensive individuals(24).

Diagnosis of AHF should be based on a thorough history assessing symptoms, prior cardiovascular history and potential cardiac and non-cardiac precipitants, as well as on the assessment of signs and symptoms of congestion and/or hypo perfusion by physical examination. In our study we used Framingham criteria for diagnosing Heart Failure was used for the definition of AHF. The criteria included at least two of the following signs and symptoms: Paroxysmal nocturnal dyspnea, Neck vein distention, rales,
Radiographic cardiomegaly (increasing heart size on chest radiography), Acute pulmonary oedema, S3 gallop, Hepatojugular reflux (45).

Interestingly in most of investigations done in our patients were ECG and radiological investigations like chest X-ray and Bed side ultrasound(POCUS) and most of them showed to have abnormal findings which helps to confirm AHF diagnosis or causes of AHF.

Laboratory assessment (with specific biomarkers) like troponin was also done in less than quarter of our patients. Barrier to this is sometimes troponin analyzer was not present in our department. Troponin helps to rule out ACS which also causes HF. Other specific biomarkers like natriuretic peptides were not done. This is due to unavailability of natriuretic peptides analyzer in our ED. European Society of cardiology recommended plasma level of a plasma NP level to be measured in all patients with acute dyspnea and suspected AHF when presenting to the ED. This help in the differentiation of AHF from non-cardiac causes of acute dyspnea. NPs have high sensitivity, and normal levels in patients with suspected AHF makes the diagnosis unlikely (42)(46).Not all patients did all investigation. Sometimes the investigations were not functioning or present in ED during study period also investigations were ordered at the discretion of the physician, thus not all patients received all tests, hence overestimation of results.

Oxygen therapy was provided to a large number of participants either through non re-breather mask, Invasive and non-invasive ventilation support, This appears to adhere with the recommendation of European Society of Cardiology(ESC),which recommends oxygen therapy and ventilatory support as initial therapy for the patient presenting with AHF for hypoxemic patients(42).

Surprisingly diuretics was the most given anti-failure followed by vasodilators/nitroglycerine in our patients, though was given in less than half of our patients which may be due to physicians discretion but giving these medications appears to adhere with European Society of Cardiology(ESC)recommendations which showed diuretics is a corner stones of AHF management in patients with good perfusion followed by vasodilators as the second most used ant failures(42).

Median length of stay was 7 days(IQR3.-11days)this shows early death in these patients with AHF, this showed the very sick nature of these patients, and indicates how severe AHF is. Among the patients admitted the most frequent diagnosis was dilated cardiomyopathy (33.7%). This can be compared to the data from the sub-Saharan African Survey of Heart Failure

(THESUS-HF) which found that among the cause of AHF, dilated cardiomyopathy is a predominant cause(37). In contrast to high income countries where by ACS accounts for most of the cases(35). Important observation is that proportion of ischemic heart disease including acute coronary syndrome(ACS) may have been underestimated in our setting because of limited diagnostic tools as seen in our study less than quarter of AHF patients had troponin levels investigated in our study and among those investigated less than a half had high troponin.
Interestingly, Most of the patients in our study were admitted to the Cardiac ward were admitted in other (non-cardiac) wards, However many of these patients who went to others wards because they had other underlying, and life-limiting illnesses such as renal failure.

Our study also showed high in-hospital mortality (28.6%), High mortality rate has also been found in other SSA countries, study done in 12 African countries had in hospital mortality of 17.8%(37). The AFAR study in India which is a LMIC, used an Acute heart failure registry study, found in-hospital mortality for patients admitted from the ED was 30.8%.In contrast in HICs Like data from Euro Heart Failure Survey II (EHFS II) on hospitalized acute heart failure patients showed a low in hospital mortality on this survey of 6.7% (35). Also data from Acute Decompensated Heart Failure National Registry (ADHERE) of 2004 in USA on "Characteristics and outcomes of patients hospitalized for heart failure in the United States" also showed very low in hospital mortality of 4.0%(28).

This reflects the very sick nature of the patients who ultimately get admitted at this tertiary hospital and also suggests that there are more advanced and better management strategies of Heart failure in high income countries.

Risk factors influencing mortality among AHF patients that we found were, receiving inotropes, being Intubated and disposition. Patient who received Inotropes had high risk of mortality(RR) 2.4 ($p<0.0001$), mortality has been implicated for those who received inotropes in the previous studies; mortality was 70.6% among patients receiving inotropes in our patient cohort, and 44.4% in AFAR(Acute failure registry study) study done in India reflecting the severity of disease in this subgroup(36).not only that use of inotropes had also showed concerned of increased as documented in some studies in European heart journal(42).

Intubation showed to have greater risk of mortality (RR) 2.9 ($p<0.0001$) in these patient with AHF as seen in our study. The European Society Of Cardiology guideline for Invasive mechanical ventilation(Intubation) recommends this modality should only be used if acute respiratory failure does not respond to vasodilators, oxygen therapy, and/or CPAP, or NIPPV Studies have demonstrated that hyperoxia which can occur in intubated patients can be associated with reduced coronary blood flow, reduced cardiac output, increased blood pressure, increased systemic vascular resistance, and a trend to higher mortality(47). It is known that intubated patients are the most critically ill patients, so intubation may be a marker of patients likely to have a higher mortality.

Mortality was high among these patient who were admitted in ICU 100%(RR) 4.3 ($p<0.0001$). Survival chances of critically ill patient with AHF are very low or almost negligible, possibly because patients admitted in ICU are very sick. This is similar to the study done by Lee et al on, "Outcomes of Heart Failure (HF) Patients Admitted to the Intensive Care Unit (ICU)" which conclude that HF patients who are admitted to the ICU are sicker and experience increased risk of 30-day readmissions and death(48). Patients high risk of death when admitted in non-cardiac wards (RR) 1.7 =0.03) compared to those who were admitted in other wards which may mean that the patients benefited from definitive and expert managements of cardiac disease.

This study provided the profile and outcome of AHF related Death presenting to Urban Tertiary hospital in Tanzania as well as enlightening on risk factors related to increased mortality among AHF patients.

**4.1 STRENGTHS:**

This was a prospective study done in the only tertiary hospital in Tanzania. Patients are referred from all over the country. The availability of cardiologists and a cardiac institute allows for more accurate investigations and diagnosis. Patients were able to be followed from ED to admission or discharge

## 4.2 LIMITATIONS:

This was a single centered study, thus will affect the generalizability. Acute heart failure is a clinical syndrome which may resemble other syndrome presenting with dyspnea , diagnosis patient with acute heart failure may vary from one physician to another. Investigations were ordered at the discretion of the physician, thus not all patients received all tests.

# CHAPTER 5:

## 5.0 CONCLUSION:

In this ED of a LMICs Acute HF affects patients at middle aged adults. Hypertension was the most common comorbidity among these patients. We found high mortality among patient presenting with AHF. Future studies should focus on evaluating and improving risks for AHF so as to improve outcome.

## 5.1 RECOMMENDATION

1. Future studies should focus on assessing knowledge of providers on managing patients with AHF with adaptation of international recommendations.

2. A larger study can be conducted to look at some of the potential predictors of mortality and causative factors contributing to AHF morbidity and Mortality that were shown to be statistically insignificant in this study for the interest of public health.

3. Standardized Guidelines should be developed in collaboration with the CARDIAC unit basing on the current international recommendations for the management of AHF. This guideline should be applicable in all Hospitals in Tanzania.

4. Having the program which aims to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure as seen in other developed countries. This will ensure coordination and continuity in care as patients transfer between locations where by there will be communication between sending and receiving clinicians, preparation of the patient and caregiver for what to expect at the next site of care, reconciliation of medications, follow-up plans for outstanding tests, and discussions about monitoring signs and symptoms of worsening conditions. For patients with heart failure, the transition from inpatient to outpatient care can be an especially vulnerable period because of the age of the patients, complex medical regimens, the large number of comorbid conditions, and the multiple clinicians who may be involved.

5. Closely Follow-up of patients as well as creating awareness of all patient on risk of getting Heart Failure e.g. Hypertensive patients should be greatly emphasized as well as Preventive strategies directed toward earlier and more aggressive blood pressure control are likely to help reducing the incidence of CHF and its associated mortality.

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# APPENDIXES

## Appendix 1.DATA COLLECTION FORM

**APPENDIXES**

**Appendix 1. DATA COLLECTION FORM**

**ADULT PATIENTS AGED> 18 YEARS TRIAGES AS LEVEL ONE** ☐

**PATIENT INITIALS:** ☐☐☐ **MRN:** ☐☐☐☐☐☐☐☐ **DATE:** ☐☐ ☐☐ ☐☐

Day Month Year

**A: DEMOGRAPHICS**

**Birthdate:** ☐☐ ☐☐ ☐☐☐☐ **Age:** ☐ **Years**

**Gender: Male** ☐ **Female** ☐

**Patient address:** ☐

**Mode of Arrival to EMD:** ☐ **Self-referral** Text

☐ **Referred Facility:** ☐ **Days spent on facility** ☐

**B: INITIAL VITALS**

**BP:** ☐ PULSE: ☐ RR: ☐ **$SPO_2$:** ☐ TEMP: ☐ GCS ☐

## C: CLINICAL CHARACTERISTICS

CHIEF COMPLAINT: 1. _____
2. _____
3. _____

EMD DIAGNOSIS: 1. _____
2. _____
3. _____

## D: DISEASE STATUS

☐ Known Patient with any CVS DISEASE
☐ HYPERTENSIVE
☐ DIABETIC
☐ OTHER COMMOBIDIES, mention_____
_____

## E: PHYSICAL EXAMINATION

**PRIMARY SURVEY**

| | Normal | Abnormal | Not Done | Comment (*If any) |
|---|---|---|---|---|
| Airway (A) | | | | |
| Breathing (B) | | | | |
| Circulation (C) | | | | |
| Disability (D) | | | | |
| Exposure (E) | | | | |

SECONDARY SURVEY

| | Normal | Abnormal | Not Done | Comment (*If any) |
|---|---|---|---|---|
| HEENT | | | | |
| Respiratory | | | | |
| Cardiovascular | | | | |
| Gastrointestinal | | | | |
| Genitourinary | | | | |
| Musculoskeletal | | | | |
| Neurological | | | | |
| Skin/dermatological | | | | |
| Haem/lymphatic | | | | |
| Endocrinological | | | | |
| Others (specify) | | | | |

**F: LABORATORY INVESTIGATIONS**

☐ FBP
Hemoglobin:_____
Reticulocyte count:_____
Hematocrit:_____
WBC:_____
Platelet Count:_____

☐ SERUM ELECTROLYTES
Potassium:_____
Sodium:_____
Calcium:_____
Magnesium:_____
Chloride:_____

☐ RENAL FUNCTION TEST
Creatinine:_____
BUN:_____

PH:_____PCO2:____PO2:_____
HCO3:_____An Gap:_____Hct:____

☐ BLOOD GAS

☐Troponin levels_____

**G: IMAGING INVESTIGATIONS**

| | RESULTS: NORMAL | ABNORMAL | NOT KNOWN |
|---|---|---|---|
| ☐ Ultrasound of: _____ | ☐ | ☐ | ☐ |
| ☐ ECG | ☐ | ☐ | ☐ |
| ☐ CHEST XRAY | ☐ | ☐ | ☐ |

**H: EMD TREATMENT**

| ☐ MEDICATION | *DOSE* | *ROUTE* |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

☐ **IVF (INTRAVENOUS FLUIDS)** — ***AMOUNT (In mls)***

☐ **BLOOD PRODUCTS** — **AMOUNT (In mls)**

☐ **OTHER EMD INTERVENTIONS (Intubation, procedures etc)**

---

**EMD supportive treatment received**

☐ Positioning
☐ Suctioning
☐ Oxygen therapy by CPAP
☐ Oxygen therapy by NRBM
☐ Oxygen therapy by nasal prong
☐ Oxygen therapy by BVM
☐ Oxygen therapy by ETT - Intubation
☐ NO oxygen therapy given
☐ NGT
☐ Airway adjunct

---

**Specific non invasive treatments received at EMD**

☐ Diuretics
☐ anthypertensives
☐ VASODILATORS
☐ NITROGLCERIDES
☐ Antibiotics
☐ IV fluids
☐ Ionotropes
☐ Antiarrhythmic drugs
☐ Electrolyte replacement - K, Na, Mg, Ca
☐ Blood transfusion
☐ CPR
☐ Other antifailure drugs
(Mention others) _____

---

**EMD invasive treatments received**

☐ Intubation
☐ Pleural tapping
☐ Ascetic tapping
☐ Synchronized Cardioversion
☐ Defibrillation

☐ Pericardiocentesis
☐ Others
(Mention others) _____

**I: DISPOSITION**

☐ ALIVE ON
☐ DISPOSITION
ADMITTED TO:
☐ WARD_____
☐ ICU
☐ OTHERS:_____

☐ DISCHARGED HOME FROM EMD

☐ DIED WHILE IN EMD
DATE OF DEATH

Day ☐☐ Month ☐☐ Year ☐☐

**PROGRES DURING HOSPITAL STAY**

☐ SURVIVED TO DISCHAGE

DATE OF DISCHARGE

Day ☐☐ Month ☐☐ Year ☐☐

☐ DIED IN THE WARD/ICU

DATE OF DEATH

Day ☐☐ Month ☐☐ Year ☐☐

FINAL HOSPITAL DIAGNOSIS

| |
|---|
| |
| |
| |

**Appendix 2. Informed Consent form (English version)**

**ID NO……..**

**Introduction:**

Greetings, my name is Dr Shamila Sadiki Rwegoshora, a second year resident in the Department of Emergency Medicine at Muhimbili University of Health and Allied Sciences (MUHAS). I am conducting a study with the above title as part of my study program. I hereby request your participation and cooperation in my study once I or my research assistant approaches you. Your decision to or not to participate will have no effect on the care and management or harm to your patient or beloved one. Please ask questions if there is anything about this study you do not understand.

**Study Title:**

Profile and outcome of patients presenting with acute heart failure in emergency medicine department at Muhimbili national hospital, Dar essalaam Tanzania.

**Researcher:**

Dr. Shamila Sadiki Rwegoshora, MD, Department of Emergency Medicine Muhimbili University of Health and Allied Sciences.

**Purpose of this study:**

Acute Heart Failure is the major burden in our population and needs to be prevented so as to improve the mortality. The purpose of this study is to describe profile and outcome of patients presenting with acute heart failure in Emergency Medicine Department at Muhimbili National Hospital, Dar es salaam Tanzania.

**Benefits:**

There will be overall benefit after knowing the results and its implication to the hospital. There will be no payment for participation in the study.

**Risks**:

There is no risk in participating in this study. Patient will not be given any experimental medication, nor will any additional test be done on you as part of the research.

**Costs or fees for entering this study:**

There will be no additional costs to the patient for being in this study. You will only pay for all the things that you would have paid for if the patient was not in the study.

**Who can take part in this study?**

This study is for all Adult patients above 18years of age who are seen in the Emergency Department of Muhimbili National Hospital. Participation in this study is entirely voluntary. The patient will not lose any benefits, nor will the patient be given improper treatment if you decides not to take part in this study.

**What will happen in this study?**

When you consent to be involved in the study, you will be asked a few questions about the demographic characteristics. We will also look at blood investigation results and the management provided to the patient.. Your will also receive the standard of care that is appropriate for him/her, as per the hospital policies.

**What are the options if you do not want to take part in this study?**

Your participation in this study is completely voluntary. You will continue to receive regular care regardless of whether you participate in the study.

**What are the risks involved with taking part in this study?**

Since no intervention of any kind will be done we anticipate no risks to your health.

**Leaving the study:**

You may choose to stop taking part in this study at any time for any reason. If you decide to stop taking part, it will have no effect on your medical care.

**New Information**

New information related to this study and specifically new information about you will be made known to you when it becomes available.

**How will your privacy be protected?**

Information about you as well as the test results will be kept strictly confidential.

The study information will be stored in protected computer files and in paper records stored in locked filing cabinets. Only study staff will have access to the information.

The information will be maintained indefinitely.

Your signature below means you have read the above information, understood it well and are voluntarily ready to participate in this study.

I, _____ have read/been told the contents of this form. My questions have been answered. I agree to participate in this study.

**Signature of Participant** **Date** _____

_____

Thank you for agreeing to participate in the study. Please do not hesitate to contact me for any clarification should need arise.

**Contact Information:**

**Dr. SHAMILA S RWEGOSHORA**

Principal investigator

Phone number: (0713-14-38-15)

**Dr. Bruno Sunguya**

Director of Research and Publications,

Research and Publication Committee,

Muhimbili University of Health and Allied Sciences,

P.O. Box 65001, Dar es Salaam.

Telephone Number: 2150302-6

**APPENDIX 3: Informed consent (swahili version):**

Jina langu ni Dkt.Shamila Sadiki Rwegoshora, mwanafunzi wa udaktari bingwa wa magonjwa ya dharura. Ninafanya utafiti wa Ugonjwa wa kushindwa utendaji kazi wa moyo kwa dharura, jinsi ya kutibu na matokeo ya wagonjwa wanaoshuhudia kushindwa kwa moyo kwa dharura katika idara ya dharura katika hospitali ya kitaifa ya muhimbili, Dar es Salaam Tanzania. Tafadhali chukua muda wa kupitia taarifa hii kwa makini. Kama una maswali yoyote, tafadhali usisite kuwasiliana na mimi.

**Mada:**

Wasifu na matokeo wa wagonjwa wenye ugonjwa wakushindwa utendaji kazi wa moyo kwa dharura, katika idara ya dharura katika hospitali ya kitaifa ya muhimbili, Dar es Salaam Tanzania

**Mtafiti:**

Dk.Shamila Sadiki Rwegoshora, MD, Idara ya Tiba ya dharura, Chuo Kikuu cha Afya na Sayansi Muhimbili.

**Lengo la utafitihuu:**

Kushindwa kwa dharura kwa moyo kufanya kazi ni jambo linalotakiwa kuepushwa ili kupunguza vifo vya watoto. Utafiti huu unadhamiri ya kuangalia Wasifu wa wagonjwa wenye ugonjwa wa kushindwa utendaji kazi wa moyo kwa dharura, katika idara ya dharura katika hospitali ya kitaifa ya muhimbili, Dar es Salaam Tanzania

**Hatari:**

Hatutaraji ikuwepo na athari/hatari yeyote itokanayo na ushiriki katika utafiti huu. Mgonjwa hatopewa dawa yoyote yamajaribio, wala vipimo vyovyote vya ziada havitafanyika kwa sababu ya kushiriki katika utafiti.

**Faida za utafiti:**

Kwa kutoa ridhaa yako ya kushirikishwa katika utafiti huu, tutaweza jua ni sababu zipi na hatari zipi zinaweza kupelekea mgonjwa moyo kusimama/kufa, tiba zinazoweza kuokoa mgonjwa, na hatma za wagonjwa hawa baada ya tiba ya dharura. Hutapata faida yoyote ya kibinafsi kutoka kuwa katika utafiti huu.

**Gharama au ada kwa ajili ya kushiriki katika utafiti huu**

Hakutakuwa na gharama za ziada kwa wewe au familia yako kwa kuwa katika utafiti huu. Wewe utalipa kwa ajili yahuduma zote ambazo ungepewa usinge kuwa katika utafiti.

**Nanianawezakushirikikatikautafitihuu?**

Utafiti huu ni kwa watu wazima wenye umri wa ya miaka 18 na juu yake ambao wataonwa ndani ya idara ya magonjwa ya dharura. Una haki ya kushiriki au kutoshiriki katika huu utafiti. Mgonjwa hatonyimwa huduma yoyote endapo mlezi atakataa kushiriki katika utafiti huu.

**Nini kitatokea katika utafiti huu?**

Utaulizwa maswali kadhaa kuhusu tabia yako binafsi. Pia tutakuwa tunaangalia matokeo ya mgonjwa ya damu na matibabu atakayopewa. Wewe utapewa taarifa zote kuhusu matokeo ya ugonjwa wako wakati wa utafiti huu na mgonjwa atapata huduma sahihi kulingana na hali yake, kwa mujibu wa sera hospitali.

**Je, kuna usiri katika utafiti huu?** Taarifa zitakazopatikana katika utafiti huu zitabaki na wewe na mtafiti. Hakuna mtu mwingine atapewa uwezo wa kujua taarifa hizo. Kama taarifa za mgonjwa zitahitajika katika siku zijazo na daktarin ni mwingine kwa ajili ya matibabu yake, zitatole wa kwake. Matokeo ya utafiti huu yanaweza kuchapishwa katika Makala kwaajili ya watafiti wengine kusoma lakini taarifa itakuwa bila ya taarifa yoyote ambayo ingeweza kuruhusu wengine kujua mgonjwa ni nani.

Saini yako chini inamaana umesoma habari hapo juu, umeelewa vizuri na uko tayari kushiriki katika utafiti huu kwa hiari.

Mimi, _____, nimesoma /nimesomewa maelezo yote yaliyomo kwenye fomu hii na nimeelewa. Maswali yangu yamejibiwa vizuri na niko tayari kushiriki.

**Saini ya mshiriki** **Tarehe**

_____ _____

Asante kwa kukubali kushiriki katika utafiti.. Tafadhali usisite kuwasiliana na mimi kwa maswali yoyote.

**Mawasiliano:**

**Dkt. Shamila Sadiki Rwegoshora,**
Mtafiti Mkuu.
Namba ya Simu: 0713 143815.

**Dr. Bruno Sunguya**
Mkurungenzi wa Utafiti na Machapisho,
Kamati ya Utafiti na Machapsiho,
Chuo Kikuu Cha **Afya na Sayansi Shirikishi Muhimbili**
S.L.P. 65001, Dar es Salaam.
Namba ya Simu: 2150302-6

## APPENDIX 4: PERMISSION TO COLLECT DATA AT MNH


# MUHIMBILI NATIONAL HOSPITAL

Cables: "MUHIMBILI"
Telephones: +255-22-2151367-9
FAX: +255-22-2150534
Web: www.mnh.or.tz

Postal Address:
P.O. Box 65000
DAR ES SALAAM
Tanzania


**In reply please quote:**

**MNH/TRCU/IRB/Permission/ 2019/153** **26th August, 2019**

Head of Department,
Emergency Medicine
**Muhimbili National Hospital**

**RE: PERMISSION TO COLLECT DATA AT MNH.**

| | |
|---|---|
| **Name of Student** | **Dr.Shamiala S. Rwegashora** |
| **Title** | **"PROFILE OF PATIENTS PRESENTING WITH ACUTE HEART FAILURE IN EMERGENCY MEDICINE DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL DAR ES SALAAM, TANZANIA".** |
| **Institution** | Muhimbili University of Health and Allied Sciences |
| **Supervisors** | **DrHendry R. Sawe**<br>**Dr. Juma Mfinanga** |
| **Period** | 26th August 2019 to 26th February , 2020 |

Approval has been granted to the above mentioned student to collect data at MNH.

Named MNH based supervisor must ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

**Dr. Faraja Chiwanga**

**Head of Teaching, Research and Consultancy Unit**

c. c DMS
c. c **Dr. Juma Mfinanaga**
c. c **Dr.Shamiala S. Rwegashora**

TEACHING, RESEARCH & CONSULTANCY UNIT
P. O. Box 65000
DAR-ES-SALAAM
MUHIMBILI NATIONAL HOSPITAL

***All Correspondence to Addressed to the Executive Director***

## APPENDIX 5: ETHICAL CLEARANCE

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**
**OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES**

P.O. Box 65001
DAR ES SALAAM
TANZANIA
Web: www.muhas.ac.tz

Tel G/Line: +255-22-2150302/6 Ext. 1015
Direct Line: +255-22-2151378
Telefax: +255-22-2150465
E-mail: dpgs@muhas.ac.tz

Ref. No. DA.287/298/01A/

13th August, 2019

Dr. Shamila S. Rwegoshora
MMed. Emergency Medicine,
School of Medicine,
**MUHAS**.

**RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: " PROFILE OF PATIENTS PRESENTING WITH ACUTE HEART FAILURE IN EMERGENCY MEDICINE DEPARTMENT OF MUHIMBILI NATIONAL HOSPITAL, 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 Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from **09th August, 2019 to 08th August, 2020.** In case you do not complete data analysis and dissertation report writing by **08th August, 2020,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Bruno Sunguya
**Ag: DIRECTOR OF POSTGRADUATE STUDIES**

cc: Director of Research and Publications
cc: Dean, School of Medicine, **MUHAS**