ACUTE HEART FAILURE AND ITS OUTCOME AMONG PATIENTS ADMITTED TO JIMMA UNIVERSITY MEDICAL CENTER, SOUTHWEST ETHIOPIA

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DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

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Abstract

Acute heart failure (AHF) is a life-threatening medical condition that necessitates immediate diagnosis and treatment, which often mandates admission to the hospital. AHF causes more deaths and disability and incurs greater economic costs than any other illnesses in the developed and developing countries. There were no studies reporting the incidence or prevalence of heart failure in the adult population in Ethiopia. In Ethiopia, Institution based studies showed the most common etiology and precipitating factor for acute heart failure were chronic rheumatic heart disease and pneumonia respectively. There is no published prospective study from JUMC on similar topic with key word of 'acute heart failure and outcomes'. So, this study is the first of its kind conducted at JUMC.

Objective: To determine etiology, precipitating factors and treatment outcome and predictors of outcome among patients with acute heart failure admitted to medical ward, Jimma university medical center, Southwest Ethiopia from July 12, 2021 to January 10, 2022

Method: A hospital based prospective cohort study was conducted on 184 patients admitted to JUMC from July 12, 2021 to January 10, 2022.

Data was collected using a structured questionnaire to determine etiologies, precipitating factors and, predictors of poor treatment outcome of AHF. Data was reported as mean ± SD for continuous variables with normal distributed and median (interquartile range) with non-normal distributed variables; and chi square test was used for categorical variables. Bivariate and multivariate logistic regression analysis was used to evaluate factors that predict poor treatment outcome; p-value $\leq$ 0.05 was considered statistically significant and reported as 95% CI. Statistical package for social science (SPSS version 26) was used to enter and analyze data

Result: Out of 184 patients**,** the mean age of participants was 48.33 ±18.855, 53.3% were males, 51.1% had ADHF syndrome. The mean (±SD) systolic and diastolic blood pressures were 116.17 ± 24.504 mmHg and 73.34 ± 16.159 mmHg at admission, respectively. The left ventricular ejection fraction was ≤40% in 52.7% of patients. Ischemic heart disease 67 (36.4%) and pneumonia 54 (29.3%) were the most common etiology and precipitating factors for acute heart failure respectively. Hypertension was the leading comorbidity identified. The median length of hospital stay was 9 days (IQR=7 to 13). In hospital mortality was 20.1%. Smoking [AOR= 4.31, (95%CI 1.37, 13.58), P value=0.013), Acute coronary syndrome [AOR= 4.55, (95%CI 1.31, 15.8), P value=0.017], Chronic kidney disease [AOR= 2.69, (95%CI 1.1, 6.54) P value=0.029] and elevated BUN [AOR =2.27 (95%CI 1.05, 4.9) P value=0.036] were independent predictors of mortality.

Conclusion & recommendation: Ischemic heart disease and pneumonia were the most common etiology and precipitating factors for acute heart failure, respectively. In hospital mortality was high 37(20.1%) among AHF patients admitted to Jimma University Medical Center. Patients with worsening of heart failure had a relatively higher mortality rate than those with denovo heart failure syndrome. Acute coronary syndrome, chronic kidney disease, smoking and BUN were all independent predictors of mortality. In order to improve patient outcomes, health facilities' diagnostic and treatment capabilities should be upgraded.

Key words: Acute heart failure, Outcome, Jimma, Ethiopia

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Acronyms

ACC/AHA: American College of Cardiology / American Heart Association;

ACS-acute coronary syndrome

ADCHF-acute decompensated heart failure

ADHERE: Acute decompensated heart failure National Registry

AF: Atrial fibrillation

AHF: Acute heart failure

ALARM-HF: Acute heart failure global registry of standard treatment

BNP: B-type natriuretic peptide

BUN: Blood urea nitrogen

CHD: Congenital heart disease

CKD-chronic kidney disease

CKD-EPI : chronic kidney disease epidemiology collaboration

CVD-cardiovascular disease

DM: Diabetes mellitus

ECG- electrocardiography

ED: Emergency department

EF: Ejection fraction

EHFS II: Euro Heart failure survey II

ESC: European society of cardiology

GFR: Glomerular filtration rate

HF: Heart failure;

HFmrEF- heart failure with mid-range ejection fraction

HFpEF- heart failure with preserved ejection fraction

HFrEF- heart failure with reduced

HIC-high income countries

IHD-Ischemic heart disease

JUMC-Jimma university medical center

KorAHF: Korean acute heart failure registry

MDRD: Modification of diet on renal disease;

MI: Myocardial infarction

NTproBNP: N-terminal pro-B-type natriuretic peptide

NYHA: New York heart association

OPTIMIZE-HF- Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure

SBP-systolic blood pressure

SSA-Sub Saharan Africa

TASH- Tikur Anbessa Specialized Hospital

THESUS–HF -The Sub-Saharan Africa Survey of Heart Failure

VHD: Valvular heart disease

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CHAPTER ONE

1. Introduction

1.1 Background

Acute heart failure (AHF) is a life-threatening medical condition that necessitates immediate diagnosis and treatment, which often mandates admission to the hospital. AHF can arise as a first-time occurrence (de novo) or, more commonly, as a result of chronic HF decompensation. It may be caused by primary cardiac dysfunction or precipitated by extrinsic factors, often in patients with chronic HF(1). AHF was the initial episode of cardiac decompensation in one-third of patients, and these de novo episodes of AHF were found to have a worse prognosis than subsequent episodes of AHF in the Euro Heart Failure Survey II (EHFS II) study (2) .

Similarly, concomitant life-threatening clinical problems and/or precipitants that require emergency treatment/correction must be recognized and addressed as soon as possible. The rule out of alternative reasons for the patient's symptoms and signs is usually the first step in the diagnostic workup for AHF (i.e., pulmonary infection, severe anemia, acute renal failure). Once AHF has been verified, a clinical evaluation is required to determine the best course of action. The importance of early therapy in Acute Coronary Syndrome (ACS) has long been proven, and it is now time to address it in the case of AHF (3).

The vast majority of AHF patients are well perfused but congested (warm-wet), while only a minority is hypo perfused (either cold-wet or cold-dry). Hypo perfusion defines cardiogenic shock, the most severe clinical presentation of AHF, which accounts for only about 10 % of AHF cases. The management of these individuals, however, is generally more complex, and they have a 5- to 10-fold greater in-hospital death rate than patients who are properly perfused. Systemic congestion, in contrast, is widespread and results from the combination of fluid accumulation and redistribution due to a change in vascular compliance, with variable proportions according to the clinical scenario. Fluid accretion is most common in chronic heart failure patients with reduced systolic function, whereas fluid redistribution is more common in new-onset AHF patients with retained systolic function and/or systemic inflammation. (4).

1.2 Statement of the problem

Heart failure (HF) is a worldwide pandemic that affects at least 26 million people and is becoming more common. The costs of HF health care are substantial, and they will only rise as the population ages. Despite major advancements in medicines and prevention, mortality and morbidity remain high, and quality of life remains poor (5).
Endomyocardial fibrosis, rheumatic heart disease, and congenital heart illnesses are among the many neglected endemic cardiovascular diseases (CVD) in Sub-Saharan Africa. Ischemic heart disease (IHD) is the major cause of heart failure in adults in high-income countries (HIC)(6).

The Sub-Saharan Africa Survey of Heart Failure (THESUS–HF) is a study that was conducted from July 1, 2007 to June 30, 2010. AHF is most commonly due to hypertension (n = 453 [45.4%], and rheumatic heart disease (n=1443[14.3%)(7). In industrialized countries, AHF is a disease of the elderly, with a mean age of 72 years. Acute HF strikes patients in the prime of their lives in sub-Saharan Africa. It has major economic implications because it affects the generation of bread winners and caregivers. (6). In Ethiopia, study done by Esubalew et al showed that the mean age of patients with AHF was 47.1(±19.42) years (8).

The EHFS II a survey on hospitalized AHF patients showed underlying cardiac disease are coronary heart disease and hypertension were the most frequent underlying diseases and often co-existent. Dilated cardiomyopathy was present in 25% cases of ADCHF patients (2).
Korean Acute Heart Failure Registry (KorAHF) enrolled 5625 AHF subjects from 10 tertiary university hospitals in Korea More than half of the patients had de novo HF (n=2936, 52.2%). IHD (37.6%) was the most frequent cause of HF, followed by idiopathic dilated cardiomyopathy (15.3%) and valvular heart disease (14.3%) (9).

Chronic rheumatic heart disease (RHD) 82 (48.5%), degenerative valvular heart disease (VHD) 37 (22.5%), and congenital heart disease (CHD) 33 were the three most frequent underlying cardiac diseases detected from prospective study conducted at TASH by Tirfe et al.(10).
Esubalew et al found rheumatic heart disease was the most frequent (30%) of the causes of heart failure. It was followed by right side heart failure (20.4%), idiopathic dilated cardiomyopathy (18.1%) and Ischemic heart disease (14.9%). (8) .

Acute heart failure global registry of standard treatment (ALARM-HF) survey showed the precipitating factor for AHF were Acute coronary syndromes in patients with de novo AHF, whereas arrhythmias, infections and non-compliance to chronic medications were the most frequent precipitating factors in patients with pre-existing episode(s) of AHF .Similarly study done EHFS II a survey showed the cause of hospitalization for HF differed in de novo AHF and Acute decompensated Heart Failure (ADCHF) groups. In individuals with de novo AHF, ACS was the most common precipitating event, occurring in 42% of cases, with myocardial infarction being the most common cause

(MI). Regardless of past history of HF, arrhythmia was found to be a common triggering cause in AHF patients. ADCHF patients had a higher rate of valvular diseases, infections, and medication non-adherence(2).

The most common identified precipitating cause of acute heart failure, according to Esubalew et al, was community-acquired pneumonia (28%) followed by infective endocarditis (10.9%), atrial fibrillation (8.7%), and medicine discontinuing (7.9%). Only 6.9% of the patients had ischemia, whereas 25.6 % of the patients had no definitive cause for the precipitating factors (8). Similarly, Tirfe et colleagues found that the top four precipitating causes for AHF were pneumonia 76(47.5%), atrial fibrillation 55(34.4%), anemia 39(24.4%), and drug discontinuation (36%) in a similar prospective analysis 36(22.5 %) (10).
In hospital mortality of patients admitted with AHF were different from one study to another as shown in Acute decompensated heart failure National Registry (ADHERE) study 4% and reaches 10.6% for those who were treated at Intensive Care Unit (ICU) (11), EHFS II was 6.7% (2), in THESUS-HF survey with an in-hospital mortality of 4.2% (7). In-hospital mortality was 24.4% in retrospective study done St. Paul's Hospital Millennium Medical College[10] and in one of prospective study done at TASH (17.2%) 29 out of 169 were patients died while they were at the hospital (8).

The predictors of high in hospital mortality in Korean Acute Heart Failure Registry (KorAHF) were presence of CKD, low SBP, advanced age , leukocytosis and conduction delay on Electrocardiography (ECG) (9) and EHFS II survey shown in-hospital mortality was extremely high in cardiogenic shock patients (39.6%), pulmonary edema and right HF (2).
The study done by Esubalew et al shown that CKD at admission, heart rate >100 beats per minute, female sex, and BP <90mmHg were independently associated with lower in-hospital survival[10] whereas study done by Tirfe et al shown, smoking, pulmonary hypertension, diabetes mellitus and presence of adverse drug events were independently associated with in-hospital mortality of AHF (8).
So this study helps to know the etiologies, precipitating factors and predictors of mortality in patients with AHF

1.3 Significance of the study

Acute heart failure is life threatening condition which can happen as de novo or de compensation of chronic heart failure.

Even though it is life threatening disease globally, in developed countries, it affects commonly aged group of population where as in middle and low income countries it affects the young and middle aged groups. In the latter countries, it affects the productive group of the society which has huge impact on the economy.

Despite high burden of heart failure in our country there are no published studies those asses' predictors of mortality.

So this study will help policy makers, program planning bodies and service providers to improve AHF treatment outcome and it also helps as a baseline for future studies.

CHAPTER TWO

2. Literature review

2.1 Prevalence of HF

Acute heart failure (AHF) is a major and constantly increasing disease that accounts for millions of hospitalizations each year around the world. Heart failure (HF) is associated with a high rate of morbidity and mortality, as well as a significant financial burden on health systems around the world. (2).

According to World Health Organization report, globally in 2015, death due to non-communicable disease accounted for 70% of all total deaths and death from cardiovascular diseases accounted for 45% of all non-communicable deaths. Approximately, 80% of these non-communicable deaths occurred in low and middle-income countries (12). In developed countries, the prevalence and incidence of heart failure (HF) are 2–3% and 0.5%, respectively, and increasing with age (13).

According to a systematic assessment of studies published between 1990 and 2015, the prevalence of heart failure in the Australian population ranged between 1.0 % and 2.0 %, with a considerable proportion of cases previously undiagnosed.(14). Among Chinese adults aged ≥35 years, the weighted prevalence of HF was 1.3 (15). The estimated prevalence rate of HF was 12.4 persons per 1,000 adults among aging society of South Korea (16).

CVD killed approximately one million people in SSA in 2013, accounting for 38.3% of non-communicable disease fatalities and 11.3 % of all deaths. SSA was responsible for 5.5 percent of all global CVD fatalities. (17). According to the World Health Organization (WHO), 34 % of Ethiopians died from NCDs in 2011, with a national CVD prevalence of 15%(18). In developing countries HHD, rheumatic heart disease, cardiomyopathy and myocarditis constitute larger contributions of HF (19). In Ethiopia, (Tsega TA et al) did a systematic review of PUBMED, EMBASE, and SCOPUS for papers published between January 1990 and July 2017; which contained nine articles. There were no researches in Ethiopia that looked at the incidence or prevalence of heart failure in adults. However, there were signs that heart failure could be a major problem in the country, affecting mostly middle-aged people. The most prevalent cause of heart failure in the studies considered is valvular heart disease, which is mostly associated to rheumatic heart disease(20).

2.2 Etiologies of heart failure

Hypertension (n=453 [45.4 %]) and rheumatic heart disease (n=143 [14.3 %]) were found to be the leading causes of AHF in the Sub-Saharan Africa Survey of Heart Failure (THESUS–HF) (7). OPTIMIZE-HF survey showed the most common cause for AHF was ischemic (IHD) in 46% of enrolled patients (21).

EuroHeart Failure Survey II (EHFS II) showed coronary/IHD (53.6%), AF (38.7%), valvular disease (34.4%) and dilated cardiomyopathy (DCM) (19.3%) were the most common underlying conditions reported (2). IHD 589 (59.6%), HHD 204 (20.6%), Cardiomyopathy 133 (13.5%), and Valvular heart disease 47(4.8%) were the most common etiologies for AHF, according to the Oman Acute Heart Failure Registry's findings(22). According to the Korean Acute Heart Failure Registry, IHD (37.6%), idiopathic dilated cardiomyopathy (15.3%), and valvular heart disease(14.3%) were the most common causes of AHF (9).
Study from Burkina Faso , data from a tertiary hospital-based registry showed etiologies for Heart failure were HHD(50.34%), Idiopathic cardiomyopathy (19.8%) ,IHD (14.36%) and Valvular HD(comprising both rheumatic and degenerative) was reported in (6.17%) (23).Similarly two studies from Nigeria Among 452 AHF patients in the Abeokuta Heart Failure Clinical Registry, HHD was the most common etiology that accounted for 78.5% of cases followed by less common etiologies like DCM (7.5%), cor pulmonale (4.4%), pericardial disease (3.3%), RHD (2.4%) (24) and IHD (0.4%) and the Abuja Heart Study cohort in Nigeria, a prospective registry of 1515 de novo cases showed hypertensive HF (61%) was the common form predominantly due to hypertension or HHD; followed by idiopathic DCM (12%) and RHD (8.6%) (25).

There is no community based studies on etiology of heart failure in Ethiopia. The institution based studies done, from Jimma University on pattern of cardiovascular disease at cardiac clinic showed Out of 781 cardiac patients 256 (32.8%) had RHD, 189(24.2%) HHD 158(20.2%) cardiomyopathy, 94(12.0%) IHD, 30(3.8%) Cor-pulmonale 27(13.5%) arrhythmia and 27(3.4%) had other sorts of heart diseases (26).
The other retrospective study conducted at St. Paul's Hospital Millennium Medical College indicated that rheumatic heart disease was the most frequent (30%) of the causes of HF, followed by right side heart failure (20.4%), idiopathic dilated cardiomyopathy (18.1%), and Ischemic heart disease (14.9%) (8).
In the study done at TASH, chronic rheumatic heart disease, degenerative valvular heart disease, congenital heart disease, hypertensive heart disease, ischemic heart disease, and cor-pulmonale were the underlying diseases found in AHF patients in order of decreasing frequency (10).

2.3 Precipitating factors and Comorbidity

Acute coronary syndromes were the main cause of AHF in patients with de novo AHF, whereas arrhythmias, infections and non-compliance to chronic medications were the most frequent precipitating factors in patients with pre-existing episode(s) of AHF in ALARM study (27)**.**The Korean Acute Heart Failure Registry (KorAHF) indicated most frequent causes of HF aggravation that led to admission were ischemia (26.3%), tachyarrhythmia (20.4%), and infection (19.6%), while a definitive cause of aggravation was not found in (13.4%) of patients and the associated co morbidities were Hypertension (62.2%), Ischemic heart disease (42.9%) ,Diabetes (40.0%), Atrial fibrillation (28.5%), Cerebrovascular disease (15.2%), Chronic renal failure (14.3%) and Chronic lung disease (11.3%) (9).

The Get With The Guidelines-HF (GWTG-HF) database found that pneumonia , arrhythmia ,drug discontinuation, worsening renal failure , and uncontrolled hypertension were the most common precipitating factors of HF(28). According to the Acute Decompensated Heart Failure National Registry (ADHERE), coronary artery disease (57%) and diabetes (44%) were the most common comorbidities among patients with acute heart failure, followed by atrial fibrillation (31%), and obstructive pulmonary disease or asthma (31%). Thirty percent of the cases had chronic renal insufficiency(11).

Study from Argentina Mar del Plata community hospital, sample on 102 elderly patients the common precipitating factors detected were Noncompliance with diet was identified in 52% of the patients, lack of adherence to the prescribed medications amounted to 30%, infections (29%), arrhythmias (25%), acute coronary ischemia (22%), and uncontrolled hypertension (15%), miscellaneous causes were detected in 18% of the cases (29).
Turkey Acute Heart Failure Diagnosis and Treatment Survey (TAKTIK) showed the most common precipitating factors for AHF were uncontrolled hypertension (10.7%), non-compliance to dietary (5.5%), and/or pharmaceutical recommendations (8.9%),pericardial tamponed, aortic dissection, arrhythmias (13.5%), ischemia and ACS (14.7%) (30).
Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure (OPTIMIZE-HF) a registry which involved 48612 patients from 259 USA Hospitals showed the most common precipitating factors were pneumonia (15.%), ACS(14.7%), Arrhythmia (13.5%),Uncontrolled hypertension (10.7%), Non-adherence to medication (8.9%) and Worsening renal function (6.8%) and Associated comorbidities were HTN(71%), DM(41.5%), Arrhythmia(36.2%),COPD(28%), Hyperlipidemia (32.1%) and chronic renal insufficiency (19.6%) (21).

China Heart Failure (China-HF) Registry from 132 participating hospitals from January 2012 to September 2015 enrolled 13,687 patients the most common precipitating factors were documented in 10,296 patients (75.2%). Infection (41.5%), ischemia (24.2%), and exertion (22.0%) and comorbidities were hypertension, coronary heart disease, atrial fibrillation, diabetes mellitus, were present in 50.9%,49.6%,24%,and 21% respectively (31).Euro Heart Failure Survey II (EHFS II) enrolled 3580 patients and showed the most common precipitating factors for AHF were Arrhythmia (32.4%),ACS(30.2%), Non-compliance with therapy (22.2 %) and infection (17.6%) and associated comorbidities were HTN(62.5%),DM(32.8%),COPD (!9.3%) ,Renal failure (16.8%),Anemia (14.7%) and stroke (13.3%) (2).

Retrospective patient chart review of 496 patients admitted with acute heart failure over five years at St. Paul's Hospital Millennium Medical College from September 2010 – September 2015 , showed most frequent identified precipitating cause for heart failure was community acquired pneumonia (28%), followed by infective endocarditis (10.9%), atrial fibrillation (8.7%) and drug discontinuation (7.9%). Ischemia accounted only for 6.9%, whereas a definitive cause of precipitating factors was not found in (25.6%) of the patients and associated comorbidity were Hypertension (22.4%) ,Chronic kidney disease (11.4%) ,Diabetes (9.6%) and Smoking (documented) (3.5 %) (8).

Hospital-based prospective observational study done at TASH conducted from May 15 to September 12, 2017,enrolled 169 patients who were diagnosed with AHF the most common precipitating factors were Pneumonia 76 (47.5%),Atrial fibrillation 55(34.4%),Anemia 39 (24.4),Drug discontinuation 36 (22.5%),Infective endocarditis 7 (4.4%),Acute coronary syndrome 6 (3.8%)Others (Pregnancy, uncontrolled hypertension) 6 (3.8%) and associated comorbidities were Chronic kidney disease 18 (10.7%),Pulmonary hypertension 17 (10.1%),Hypertension 14 (8.3%),Diabetes mellitus 8 (4.7%),Coronary artery disease 8 (4.7%),Asthma 8 (4.7%),Chronic obstructive pulmonary disease 7 (4.1%),Tuberculosis 6 (3.6%),HIV/AIDS 4 (2.4%) (10).

2.4 Predictors of mortality and outcome

The INTER-CHF study aimed to measure mortality at 1 year in patients with heart failure in Africa, China, India, the Middle East, Southeast Asia and South America. Overall mortality was 16.5%, highest in Africa (34%) and India (23%), intermediate in Southeast Asia (15%) and lowest in China (7%).Regional differences persisted after multivariable adjustment. Independent predictors of mortality included cardiac variables (New York Heart Association Functional Class III or IV, previous admission for heart failure, and valve disease) and non-cardiac variables (body-mass index, chronic kidney disease, and chronic obstructive pulmonary disease) (32).

The median length of hospital stay was 10 (range 7–15) days, and in-hospital mortality was 4.1±0.3%.Predictors of mortality included low systolic blood pressure, acute myocardial infarction, infection, right bundle branch block, and elevated total bilirubin and blood urea nitrogen level in China Heart Failure (China-HF) Registry report (31).
Trivandrum Heart Failure Registry from Kerala, India enrolled 1205 cases in to the registry. The median hospital stay was 6 days (interquartile range = 4-9 days) with an in-hospital mortality rate of 8.5% .Older age, lower education, poor ejection fraction, higher serum creatinine, New York Heart Association functional class IV, and suboptimal medical treatment were associated with higher risk of 90-day mortality (33).

OPTIMIZE-HF (Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients With Heart Failure) registry compared 20,118 patients with HFrEF and 21,149 patients with HFpEF length of hospital stay was the same in both groups, risk of in-hospital mortality was lower in patients with (EF > or =40%) (2.9% vs. 3.9%; p < 0.0001); predictors of mortality were Pneumonia/respiratory process and Worsening renal function. During 60- to 90-day post-discharge follow-up, patients with HFpEF (EF > or =40%) had a similar mortality risk (9.5% vs. 9.8%; p = 0.459) and re-hospitalization rates (29.2% vs. 29.9%; p = 0.591) compared with patients with HFrEF (21).

ADHERE registry Recursive partitioning of the derivation cohort for 39 variables indicated that the best single predictor for mortality was high admission levels of blood urea nitrogen (> or =43 mg/dL]) followed by low admission systolic blood pressure (<115 mm Hg) and then by high levels of serum creatinine (> or =2.75 mg/dL) and In-hospital mortality was similar in the derivation (4.2%) and validation (4.0%) cohorts (11).

Acute Heart Failure Database (AHEAD) registry from Czech Republic which enrolled 4,153 patients from September 2006 to October 2009 showed The median length of hospitalization was 7.1 days and 12.7% died during hospitalization. According to multivariate analyses, low systolic blood pressure, low cholesterol level, hyponatremia, hyperkalemia, the use of inotropic agents and norepinephrine were predictive parameters for in-hospital mortality in patients without cardiogenic shock. Severe left ventricular dysfunction and renal insufficiency were predictive parameters for mortality in patients with cardiogenic shock. Invasive ventilation and age over 70 years were the most important predictive factors for mortality in both genders with or without cardiogenic shock (34).

Prospective cohort study conducted in a single tertiary care in South Africa on 176 patients with per partum cardiomyopathy Forty-five (26%) patients had a poor(Poor outcome was defined as the combined end point of death, left ventricular (LV) ejection fraction (LVEF) < 35%, or remaining in New York Heart Association (NYHA) functional class III/IV at 6 months) outcome. NYHA functional class, LVEF and systolic blood pressure, increased left ventricular end systolic dimension (LVESD), lower body mass index (BMI) and lower total cholesterol at baseline were independent predictors of poor outcome (13).Tanzania Heart Failure (TaHeF) study which included 427 patients during follow-up, 66 patients died, resulting in a mortality rate of 22.4 per 100 person-years of observation and predictors of mortality were atrial fibrillation, , in-patient status ,anemia, pulmonary hypertension , creatinine clearance and lack of formal education (35).Data from the Abeokuta Heart Failure Clinical Registry which enrolled 452 patients presenting with AHF to the only tertiary hospital in Abeokuta; 17 subjects died during the course of admission. Causes of death were pump failure, sudden death possibly due to arrhythmia, pulmonary embolism and stroke.

The mean duration of hospital stay was 11.491 days, and intra hospital mortality was 3.8% (24).Retrospective study conducted at St. Paul's Hospital Millennium Medical College In-hospital mortality was 24.4%. The median duration of hospitalization was 6 days for non survivors. They had lower BP, higher heart , lower eGFR higher blood urea nitrogen (BUN), and stayed shorter in the hospital. CKD at admission, heart rate >100 beats per minute, female sex, and BP <90mmHg were independently associated with lower in-hospital survival (8). The in hospital mortality was found to be 17.2%. Smoking, diabetes mellitus, pulmonary hypertension and the presence of adverse drug events were predictors of in-hospital mortality from prospective observational study done on 169 patients at TASH (10). In conclusion, the etiologies of heart failure, precipitating factors, comorbidities, length of hospital stay, predictors of mortality, and in hospital mortality rate vary from setup to setup.

CHAPTER THREE

3. Objective

3.1 General objective

To determine etiology, precipitating factors and treatment outcome and predictors of outcome among patients with acute heart failure admitted to Emergency and Medical ward, Jimma university medical center, Southwest Ethiopia from July 12, 2021 to January 10, 2022.

3.2 Specific objectives

- To identify underlying etiologies of heart diseases in AHF patients
- To determine precipitating factors that lead to hospitalization in acute heart failure
- To evaluate the outcome of AHF patients after admission
- To determine factors that predict poor outcomes in acute heart failure patients
- To determine predictors of mortality in AHF patients
- To determine length of hospital stay in AHF patients
- To determine frequency of readmission in the prior 1 year among AHF patients

CHAPTER FOUR

4. Methods and Materials

4.1 Study setting and period

The study was conducted at Jimma University Medical Center (JUMC), located in Jimma town in southwest of Ethiopia, in Oromia region, 352 km southwest of capital city, Addis Ababa. Currently it is the only teaching and referral hospital in the southwestern part of the country. The hospital has Medical, Pediatrics, OB/GYN, Surgery, Dental, Radiology, Ophthalmology, Anesthesiology and Psychiatry departments with 800 bed capacities. The department of Internal medicine has a total of 100 beds with about 2781 annual admission.
Overall JUMC provides services for approximately 15,000 inpatient, 160,000 outpatient attendants, 11,000 emergency cases and 4500 deliveries in a year coming to the hospital from the catchment population of about 20 million people (38)

The study was carried out at the Emergency and Medical ward of Jimma university medical center for the period of six months.

4.2 Study design

A hospital based prospective cohort study was conducted to determine etiology, precipitating factors and treatment outcome and its predictors among patients of acute heart failure admitted to emergency and medical ward ,Jimma university medical center ,Southwest Ethiopia.

4.3 Population

4.3.1 Source population

All medical patients admitted to Jimma university emergency and medical ward

4.3.2 Study population

Study population were all AHF patients admitted to medical ward and emergency, Jimma university medical center with a diagnosis of AHF during study period

4.4 Sample size determination and sampling technique

Sample size determination

$$n=\frac{z^2 pq}{d^2}=\frac{(1.96)^2(.172*0.82)}{(0.05)^2}=21884\approx 219$$

P= 0.172 (5% margin of error)

P-value taken from research done at TASH (Tirfe et al. BMC Cardiovascular Disorders (2020) 20:16) https://doi.org/10.1186/s12872-019-01318-x

q= 1-p= 0.828

z= 1.96 for 95% confidence interval

d=0.05 (5% margin of error)

N= total patients expected to be admitted to ED and medical ward during 6 month period = 695 patients

But since the total population is less than 10,000 the required minimum sample could be obtained by making some adjustment

$$n_n=\frac{n}{1+n/N} \qquad \frac{219}{1+\frac{219}{695}}$$

n_n

$$n_n=1665\approx 167$$

Adding 10 % of non-response rate which will be 17

So final sample size will be 184 patients

4.5 Inclusion and exclusion criteria

Inclusion criteria: Any patient age ≥ 15 years admitted with AHF

Exclusion criteria: referral just after admission, patients who refuse to participate in the study.

4.6 Variables

4.6.1 Independent variables

- Socio-demographic characteristics (age, gender, address, occupation, marital status ,education status, Alcohol drinking, smoking, physical activity, salt intake behavior)
- Clinical characteristics(heart failure syndromes, hemodynamic profile, heart failure stage, NYHA functional class, Framingham criteria, Imaging studies, vital signs at admission, laboratory values)
- Precipitating factors (acute coronary syndrome, arrhythmia, anemia, Infection, uncontrolled hypertension, drug discontinuation, Drugs, pulmonary thrombo-embolism, excess salt intake and pregnancy)
- Underlying heart disease(Chronic rheumatic heart disease, Congenital heart disease, Cor pulmonale, Degenerative valvular heart disease, Dilated cardiomyopathy, Hypertensive heart disease, Ischemic heart disease)
- Comorbidity(Acute coronary syndrome, Hypertension, Diabetes mellitus, Atrial fibrillation, Asthma, Cardiomyopathy, Chronic kidney disease, Chronic obstructive pulmonary disease, Congenital heart disease, Dyslipidemia, HIV/AIDS, Hypothyroidism, Hyperthyroidism, Inflammatory heart disease, Surgery, Pericardial disease, Cancer, Tuberculosis
- Cardiometabolic markers (Troponin, NT ProBNP, Urea, Creatinine, Serum Sodium, Serum Potassium)
- ECG findings

4.6.2 Dependent variable

- Length of hospital stay
- Acute heart failure
- Treatment outcomes(Improved, Same, Deteriorated, Died, self-discharge against medical advice)

4.7 Data collection

Data was collected using a structured questionnaire developed according to Ethiopian national guideline on major non-communicable diseases (2016), European Society of Cardiology (ESC, 2016) and ACC/AHA guidelines and definitions (1,36,37). The primary data was collected twice, at admission and discharge. Socio-demographic, clinical characteristics, etiologies of heart failure, precipitating factors and co-morbidity was collected at admission. While imaging study findings (chest X-ray, electrocardiogram, and echocardiography), treatment given and hospital stay was abstracted from the patient's card. In addition data's collected on vital signs and laboratory values like serum sodium, potassium, hemoglobin, serum creatinine, BUN, troponin, and estimated glomerular filtration rate (GFR) based on CKD-EPI(chronic kidney disease epidemiology collaboration) derived formula was abstracted from the record using check list developed for this purpose. The treatment outcome was collected right after physician decided for discharge.

4.7.1 Data collection process

Individual patient's or his/her immediate attendant who knows the history of the patient was interviewed to fill the data collection format with relevant information about patient socio demographic characteristics, symptoms, comorbidity and medication history, cost of treatment during hospital stay.

4.7.2 Data collectors

Data collection was undertaken by first year Internal medicine residents, Medical interns after they were trained for one day about the objective of the study, variables on the questionnaire and its implication. Then, they were assigned to fill the data collection format. All data collection activities were supervised by principal investigator.

4.8 Data quality control

Data was collected using pretested format by trained data collector. Relevant clinical information and data was obtained from the patient/immediate attendant, patient charts and through observations.

Adequate training was provided for data collectors (Medical residents and Medical interns) to maintain clarity and easier understanding by those data collectors. Data was checked for completeness and internal consistencies right after collection by the principal investigator.

4.9 Data analysis

Data was cleared, edited, and entered to SPSS software for analysis based on the set of variable and objectives and descriptive statistics and chi square tests was used and significance of tests was decided at $P< 0.05$. The level of significance was chosen at 5% and p–value ≤ 0.05 was reported statistically significant and results was reported as 95% confidence intervals. For all statistical analysis Statistical Package for Social Sciences (SPSS version 26) was used. The result was presented using tables and figures as necessary.

4.10 Ethical clearance

Ethical approval was obtained from institutional ethical review board of College of Health Sciences at Jimma University and permission to conduct the study was obtained from department of Internal medicine. Informed consent was obtained from patients. Study participants was informed regarding the objectives of the study and they had the right either to decline or participate in this study. Identification numbers was used rather than names to identify patients. Confidentiality was maintained, that except principal investigator no other person was allowed to access the data abstraction tools.

4.11 Operational definitions

Acute heart failure: sign and symptoms of new onset of HF and/or de compensation or worsening of chronic stable HF.

Smoker: those who are current smokers and had a history of smoking.

Treatment outcome: the attainment of a specified end result measured using parameters such Improved, Same, Deteriorated, Died, self-discharge against medical advice.

Unemployed: no official duties with financial monthly income in either private, government and/or any non-governmental organization.

Excess salt intake: It is when the patients consume more than 5gm (one teaspoon) of salt/day

4.12 Dissemination plan

The study will be presented to the Jimma University, advisors and examiners, submitted to Department of Internal Medicine and copies will be given to the JUMC so that it will be used as a source of information for possible planning and implementation of health intervention and effort will be made for possible publication.

CHAPTER FIVE

Result

A total of 184 acute heart failure patients were admitted to emergency and medical ward from July, 2021 to January 2022. Majority of study participants were from rural area 117 (63.6%) and age group of 56-65 (21.2%).The mean age and standard deviation of age of the participants was 48.33(±18.855) .

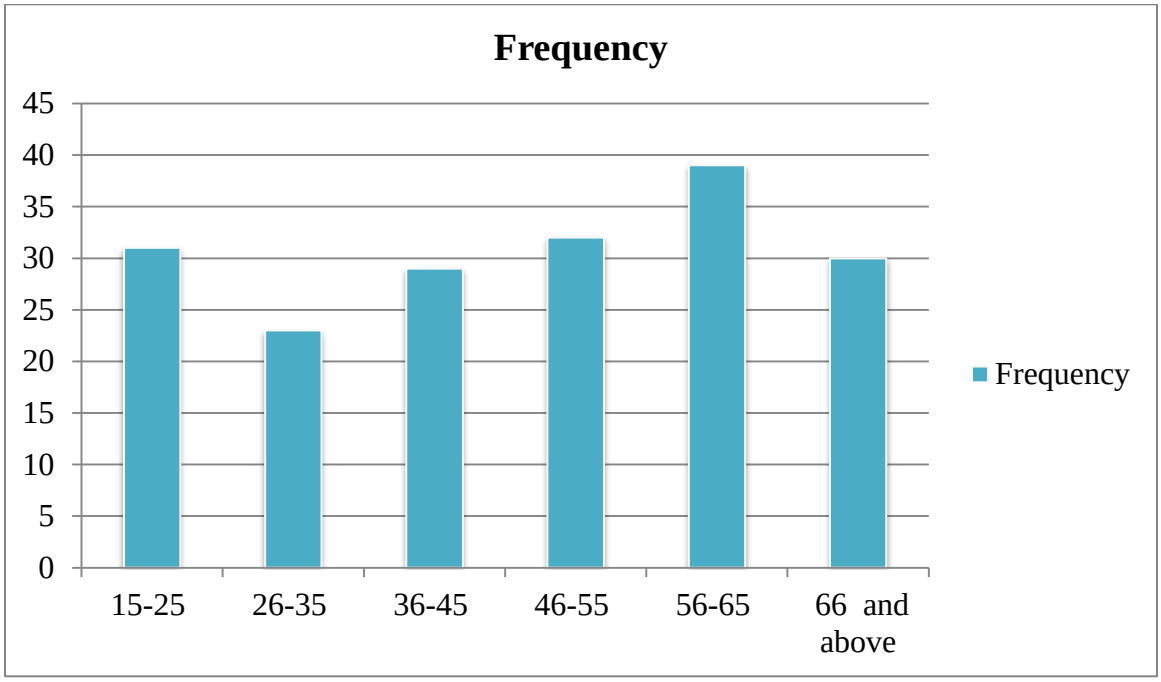

Figure 5.1 Age categories of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Of 184 patients enrolled in this study 98(53.3%) were males; 82 (44.6%) had attended primary school; 145 (78.8%) were married; 171 (92.9%) were unemployed.

Of the 184 patients, 37 (20.1%) have smoking history; 20 (11.4%) had smokes 5-10 pack year and 14 (7.6) have alcohol drinking behavior.

Table 5. 1: Socio-demographic characteristics of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables		Frequency (%)
Gender	Male	98 (53.3)
	Female	86 (46.7)
Marital status	Married	145 (78.8)
	Single	23 (12.5)
	Widowed	15 (8.2)
	Divorced	1 (0.5)
Educational status	Primary school	82 (44.6)
	No formal education	67 (36.4)
	Secondary school	26 (14.1)
	Higher education	9 (4.9)
Residence	Rural	117 (63.6)
	Urban	67 (36.4)
Employment status	Unemployed	171 (92.9)
	Employed	13 (7.1)
Alcohol drinking behavior	Yes	14 (7.6)
	No	170 (92.4)
Smoking	Yes	37 (20.1)
	No	147 (79.9)

Of 184 patients admitted to emergency and medical ward 90 (48.9%) had *denovo* heart failure, ninety four (51.1%) had acute decompensated heart failure (ADHF) and 66 (70.2%) of those with ADHF had readmission history of more than two times in the past 1 year.

At admission 141 (76.6%) presented with NYHA functional class IV; and 164 (89.1) of the patients were presented with hemodynamic profile B ('warm and wet').

At admission mean ± (SD) value of SBP was 116.17 ± 24.504 mmHg and IQR (100-135), among these 106 (57.6%) patients had blood pressure < 120mmHg. According to the ESC/ESH guidelines for the management of arterial hypertension, of the 184 patients, 29 (15.8%) presented with grade 1 systolic hypertension at admission measurement; mean ± (SD) value of DBP was 73.34 ± 16.159 mmHg and IQR (60-82) , among these 113 (61.4 %) patients had admission diastolic blood pressure measurement of less than 80 mmHg. Of the 184 patients 92 (50%) had higher admission pulse rate (> 100 beats per minute) and 3(1.6%) had heart rate less than 60 bpm.

As shown in table 5.2, from the Framingham major criteria majority of acute heart failure patients had PND 183 (99.5%), rales 139(75.5%), cardiomegaly 168 (91.3%) acute pulmonary edema 47 (25.5%) and S3 gallop 34 (12.5%) was reported.
From the minor criteria majority of acute heart failure patients 183 (99.5%) experienced dyspnea on exertion, 179 (97.3%) presented with complaint of nocturnal cough.

Table 5. 2: Framingham criteria of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

	Variables	Frequency (%)
Framingham Major Criteria	PND	183 (99.5)
	Cardiomegaly	168 (91.3)
	JVD	162(88)
	Rales	139 (75.5)
	Acute pulmonary edema	47 (25.5)
	S3 gallop	23 (12.5)
Framingham Minor Criteria	Dyspnea on exertion	183(99.5)
	Nocturnal cough	179 (97.3)
	Ankle edema	175 (95.1)
	Hepatomegaly	118 (64.1)
	Pleural effusion	59 (32.1)
	Tachycardia ≥ 120 bpm	35 (19)

As shown in table 5.3, all of 184 patients enrolled had Chest X-ray, Electrocardiography and Echocardiography results. The most common chest X-ray findings were cardiomegaly 168(91.3%); pneumonia 54(29.3%); pleural effusion 59 (32.1%) and pulmonary edema 47 (25.5%). The most common ECG finding was sinus tachycardia 61(33.2%) followed by atrial fibrillation 44 (23.9%) and 15(8.2%) had ACS evidences. 97(52.7%) of patients have depressed left ventricular ejection fraction and the most common echocardiographic finding of heart disease was ischemic heart disease 67 (36.4%) followed by chronic rheumatic heart disease 49 (26.6%).

Table 5. 3: Imaging findings of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Type of Imaging	Findings	Frequency (%)
Chest X-ray	Cardiomegaly	168(91.3)
	Pneumonia	54 (29.3)
	Pleural effusion	59 (32.1)
	Pulmonary edema	47 (25.5)
	COPD features	9 (4.9)
	Normal	2 (1.06)
Electrocardiography	Sinus tachycardia	61 (33.2)
	Atrial fibrillation	44 (23.9)
	Left ventricular hypertrophy	25 (13.6)
	ACS (ST elevation or depression)	15 (8.2)
	Left bundle branch block	11(6)
	Bradycardia	3 (1.6)
	Ventricular tachycardia	2 (1.1)
	Normal ECG	32 (17.4)
Echocardiography	Ischemic heart disease	67 (36.4)
	Chronic rheumatic heart disease	49 (26.6)
	Pulmonary hypertension	46 (25)
	Dilated cardiomyopathy	32 (17.4)
	Hypertensive heart disease	24 (13)
	Pericardial effusion	22 (12)
	Degenerative valvular heart disease	14 (7.6)
	Left ventricular thrombus	9 (4.9)
	Corpulmonale	5 (2.7)
	Constrictive pericarditis	4 (2.2)
	Aortic aneurysm	1 (.5)
	Depressed EF (<40 %)	97 (52.7)
	Preserved EF (>40%)	87 (47.3)

Among the chronic RHD patients , multi-valvular involvement (both mitral and aortic valve) was most common finding 35 (71.4%) whereas isolated mitral regurgitation and isolated mitral stenosis was 11(22.4%),3(6.1%) respectively. Calcific valve disease (Degenerative valve disease) was documented in 14 (7.6%) patients and calcific aortic valve disease was the most common finding.

The underlying cardiac diseases found in AHF patients in order of decreasing frequency were Ischemic heart disease 67(36.4%), chronic RHD 49 (26.6%) ,dilated cardiomyopathy 32 (17.4%), Hypertensive heart disease 24 (13%) calcific/degenerative valve disease 10 (5.4%) , Corpulmonale 5 (2.7%) .

The most common identified precipitating causes for acute heart failure were Infections (pneumonia 54(29.3%), Infective endocarditis 9(4.9%) and Pyelonephritis 3(1.6%), Arrhythmias (Atrial fibrillation 44(23.9%), ventricular tachycardia 2(1.1%) and bradyarrhythymia 2 (1.1%), drug discontinuation 37(20.1%), anemia 34 (18.5%), Uncontrolled hypertension 22 (12%), Acute coronary syndrome 15 (8.2%), whereas definitive cause for precipitating factors was not identified for 19 (10.3%) cases.

Hypertension 52 (28.3%) most common comorbidity identified followed by pulmonary hypertension 46 (25%), chronic kidney disease 31(16.8%), chronic obstructive pulmonary disease 12 (6.5%) and tuberculosis 9 (4.9 %).

Table 5. 4: Etiologies, Precipitating factors and comorbidities of AHF identified at admission among patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Identified diseases	Frequency %
Etiologies of AHF (n=184)	
Ischemic heart disease	67 (36.4)
Chronic RHD	49 (26.6)
Dilated cardiomyopathy	32 (17.4)
Hypertensive heart disease	21 (11.4)
Calcific/degenerative VHD	10 (5.4)
Corpulmonale	5 (2.7)
Constrictive pericarditis	4 (2.2)
Severe pericardial effusion	3 (1.6)
Congenital heart disease	2 (1.1)
Precipitating factors (n=184)	
Pneumonia	54 (29.3)
Atrial fibrillation	44 (23.9)
Drug discontinuation	37 (20.1)
Anemia	34 (18.5)
Hypertension	22 (12)
Acute coronary syndrome	15(8.2)
Infective Endocarditis	9 (4.9)
Pyelonephritis	3 (1.6)
Ventricular tachycardia	2 (1.1)
Bradyarrhythymia	2 (1.1)
Unidentified	19 (10.3)
Comorbidities (n=184)	
Hypertension	52 (28.3)
Pulmonary hypertension	46 (25)
Chronic kidney disease	31 (16.8)
Chronic obstructive pulmonary disease	12 (6.5)
Diabetes mellitus	10 (5.4)
Tuberculosis	9 (4.9)
Hyperthyroidism	6 (3.3)
Asthma	3 (1.6)
HIV-AIDS	2 (1.1)
Cancer (Pancreatic)	1 (.5)
Not identified	15 (8.2)

Admission laboratory result for serum sodium, potassium, hemoglobin, BUN, serum creatinine was determined for all of 184 patients.

The mean ± (SD) value of serum sodium at admission was 134.48 mEq/L ± 6.59 and IQR (131-139); of these 96 (52.2%) had value less than 135 mEq/L and the mean ± (SD) of potassium was 4.0585 ± 0.6830 and IQR (3.56-4.42); of these, 42 (22.8%) had serum potassium concentration less than 3.5 mEq/L and 4 (2.2%) had serum potassium concentration greater than 5.5 mEq/L.

The mean ± (SD) value of Hemoglobin was 12.13± 2.74 g/dl; based on WHO classification 50 (51%) of all male patients have Hgb level less than 13 g/dl whereas 49 (57%) of all female patients have Hgb less than 12 g/dl. Clinically significant anemia in cardiac patients is (Hgb <10 g/dl); when this value is used as cut point 40 (20.1%) of patients were categorized under this group.

The value for serum troponin at admission was found for 120 patients with median of 22.67 (IQR=10.59, 52.79); of these 52 (28.3%) were with value greater than 29 ng/ml (the laboratory's upper limit).

The median BUN level was 46 mg/dL (IQR = 30.12, 79.8), with 102 (55.4%) having elevated BUN level (≥43 mg/dL). The mean± (SD) of creatinine was 2.8±1.75 and IQR (0.76, 1.29). At admission 57(31%) patients had elevated blood creatinine levels (≥1.2 mg/dL).

Table 5. 5: Laboratory results of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables	**N**	Frequency (%)
Serum sodium	**184**	
Serum sodium <135 mEq/L		96 (52.2)
Serum sodium 135 to 145 mEq/L		82 (44.6)
Serum sodium ≥ 145 mEq/L		6 (3.3)
Serum potassium	**184**	
Serum potassium 3.5-5.5 mEq/L		138 (75)
Hyperkalemia ≥ 5.5 mEq/L		4 (2.2)
Hypokalemia < 3.5 mEq/L		42 (22.8)
Serum creatinine	**184**	
Serum creatinine <1.2 mg/dl		127 (69)
Serum creatinine ≥ 1.2 mg/dl		57 (31)
Blood urea nitrogen	**184**	
BUN < 43 mg/dl		82 (44.6)
BUN ≥ 43 mg/dl		102 (55.4)
Hemoglobin level(Hgb)	**184**	
Hgb level for male patients	**98**	
Hgb< 8 g/dl		6 (6.1)
Hgb 8-10.9 g/dl		20 (20.4)
Hgb 11-12.9 g/dl		24 (24.5)
Hgb ≥13 g/dl		48 (49)
Hemoglobin level for female patients	**86**	
Hgb< 8 g/dl		11 (12.8)
Hgb 8-10.9 g/dl		20 (23.3)
Hgb 11-11.9 g/dl		18 (20.9)
Hgb ≥12 g/dl		37 (43)
Hgb < 10 g/dl (both male and female)		40 (21.7)

As shown in figure 5.2, the mean ± (SD of estimated GFR was 89.29 ± 42.65 mL/min/1.73m2 and IQR (61.25, 118) and 43 (23.4%) had eGFR less than 60 mL/min/1.73m2.

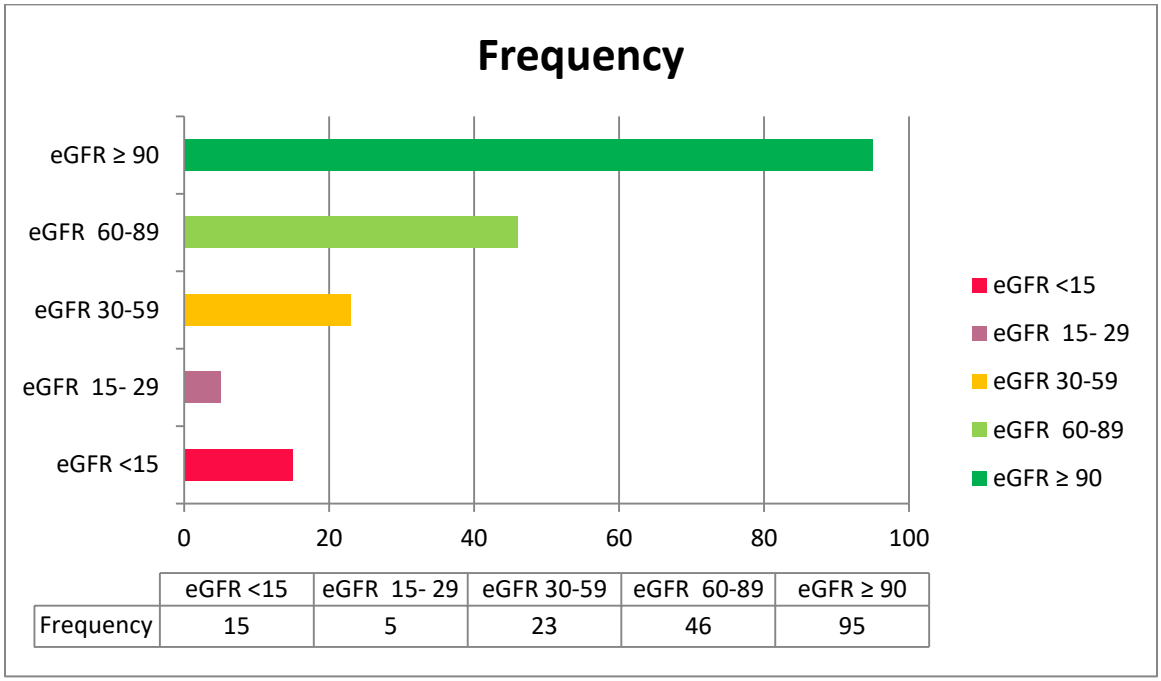

Figure 5.2: Estimated glomerular filtration rate of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

From 94 patients who had ADHF syndrome on admission, sixty-six had been hospitalized for worsening of heart failure in the prior one year. Of these 50 (75.8%), 15(22.7%) and 1(1.5%) had readmission history of two times, three times and four time in the prior one year respectively.

Of the 184 patients enrolled in this study, 132 had a good treatment outcome (improved and discharged), while 52 had a poor treatment outcome, with 37 (20.1%) of them succumbing in hospital. Mortality rate was relatively higher in those with ADHF 19 (51.4%) than in those with *denovo* HF 18(48.6%). The median hospital stay of patients was 9 days (IQR = 7 to 13).

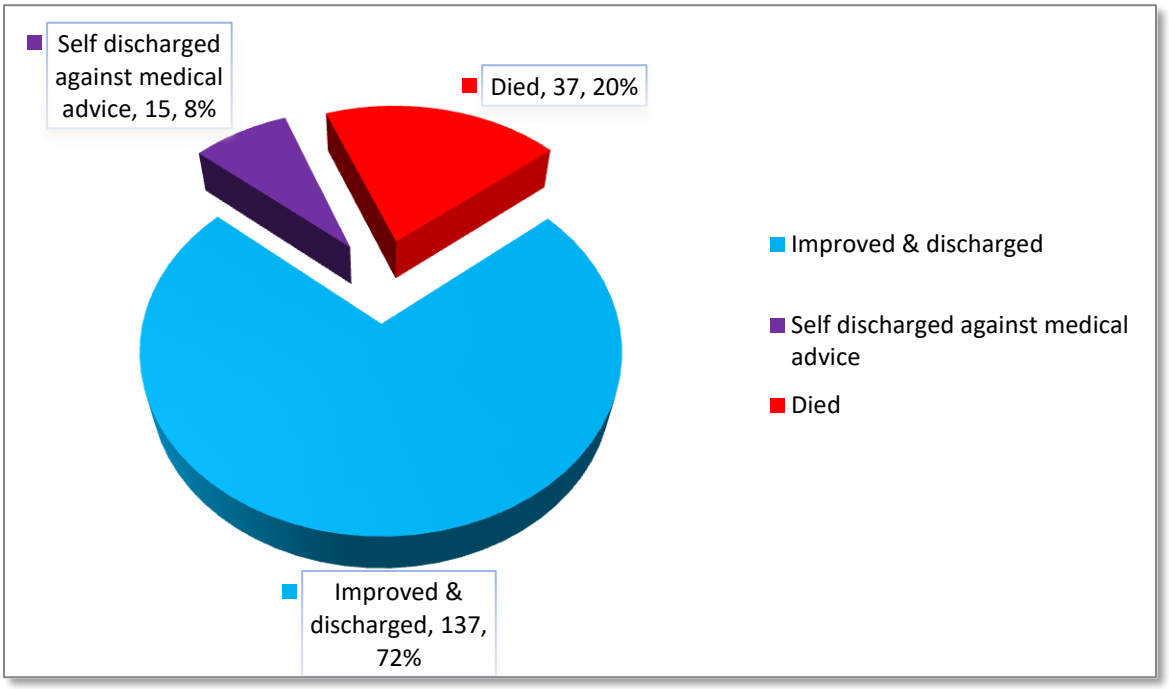

Figure 5.3: Outcomes of AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184).

Of the 184 patients, 5 of the 37 patients who had a smoking history had a poor treatment outcome (13.5%), and 47 of the 147 patients who had no smoking history had a poor treatment outcome (32%). The Chi-square test indicated that there was a significant association between smoking and poor treatment outcome ($p = 0.026$).

Of the 184 patients, 14 of the 32 patients who had low systolic blood pressure measurement (<90 mmHg) on admission had poor treatment outcome (43.8%) and 38 of the 152 who had systolic blood pressure measurement (≥ 90 mmHg) had poor treatment outcome (25%). Chi-square test indicated that there was significant association between low admission systolic blood pressure measurement (<90 mmHg) and poor treatment outcome ($p = 0.032$)

Of the 184 patients, 37 of the 102 patients who had elevated blood urea nitrogen (BUN ≥43 mg/dl) on admission had poor treatment outcome (36.3%) and 15 of the 82 who had no elevated blood urea nitrogen had poor outcome (18.3%). Chi-square test indicated that there was significant association between elevated blood urea nitrogen (BUN ≥43 mg/dl) and poor treatment outcome ($p = 0.007$)

Of the 184 patients, 23 of the 57 patients who had elevated serum creatinine (Cr≥1.2 mg/dl) on admission had poor treatment outcome (40.4%) and 29 of the 127 whose serum creatinine was not elevated had poor outcome (18.3%). Chi-square test indicated that there was significant association between elevated serum creatinine (Cr≥1.2 mg/dl) on admission and poor treatment outcome ($p = 0.015$).

Of the 184 patients, 8 of the 15 patients who had ACS as precipitating factor of AHF on admission had poor treatment outcome (53.3%) and 44 of the 169 who had no ACS as precipitating factor of AHF had poor treatment outcome (26%). Chi-square test indicated that there was significant association between CKD as comorbidity and poor treatment outcome ($p = 0.024$)

Of the 184 patients, 16 of the 31 patients who had CKD as comorbidity on admission had poor treatment outcome (51.6%) and 36 of the 153 who had no CKD comorbidity had poor treatment outcome (23.5%). Chi-square test indicated that there was significant association between CKD as comorbidity and poor treatment outcome ($p = 0.002$)

Of the 120 patients whose serum cardiac troponin determined, 22 of the 52 patients who had elevated troponin above normal laboratory range (≥29 ng/ml) on admission had poor treatment outcome (42.3%) and 14 of the 68 who had no had elevated troponin above normal laboratory range (<29 ng/ml) had poor outcome (20.6%). Chi-square test indicated that there was significant association between troponin and poor treatment outcome ($p = 0.010$)

Table 5.6: Chi-square test of variables associated with poor treatment outcome ADHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables	Frequency	Percent poor treatment outcome (95% CI)	P value
Smoking Yes Smoking No	37 147	13.5% [0.039,0.047]	**0.026**
Systolic blood pressure(<90 mmHg) Systolic blood pressure(≥90 mmHg)	32 152	43.8% [-0.359, -0.16] 25%	**0.032**
ACS present ACS not present	15 169	53.3% [0.032,0.039] 26%	
BUN elevated(≥ 43 mg/dl) BUN elevated(< 43 mg/dl)	102 82	36.3% [0.031, 0.05] 18.3%	**0.007**
Creatinine elevated (≥ 1.2 mg/dl) Creatinine elevated (< 1.2 mg/dl)	127 57	40.4%[0.035, 0.315] 22.8%	**0.015**
CKD as comorbidity present CKD as comorbidity absent	31 153	51.6%[-0.452,-0.11] 23.5%	**0.001**
Troponin above laboratory's range (≥ 29 ng/ml Troponin above range (<29 ng/ml	120 52 68	42.3%[0.037,0.052] 20.6%	**0.010**

Smoking history, admission systolic blood pressure measurement, presence of acute coronary syndrome as precipitating fact, presence of CKD as a comorbidity, BUN, and troponin were all predictors of poor treatment outcomes in univariate logistic regression analysis.

Multivariate logistic regression was used to evaluate variables with a p-value of less than 0.25. Factors having a high percentage of missing values and variables with multi-collinearity problem were not included as covariates in multivariate analysis. Explanatory variables were created using the normal 'enter' method. With a chi square of = 1.952 df = 6, N = 184, and a p value of 0.924, the goodness of fit test confirmed that the model was not zero.

Table 5.7: Univariate and multivariate logistic regression analysis AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables	Univariate			Multivariate		
	OR	95% CI	P-value	AOR	95%CI	P-value
Socio-demographic						
Smoking†	0.332	[0.122,0.908]	0.032	4.31	[1.37,13.58]	0.013
Vital signs						
Systolic blood pressure Ω	2.33	[1.06,5.14]	0.035			
Precipitating factors &comorbidity						
Acute coronary syndrome†	**3.25**	**[1.12,9.48]**	**0.031**	**4.55**	**[1.31,15.8]**	**0.017**
CKD †	**3.47**	**[1.56,7.7]**	**0.002**	**2.69**	**[1.1,6.54]**	**0.029**
Laboratory results						
Troponin level Ω	2.83	[1.26,6.33]	0.011			
BUN Ω	**2.54**	**[1.28,5.07]**	**0.008**	**2.21**	**[1.05,4.9]**	**0.036**
Creatinine Ω	2.29	[1.167,4.48]	0.016			

NB: Ω coded for one unit increase; systolic blood pressure coded 0 for ≥ 90mmHg, 1for < 90 mmHg, serum BUN coded 1 for ≥ 43mg/dl, coded 0 for < 43mg/dl, troponin coded 1 for ≥ 29ng/ml, 0 for < 29 ng/ml, creatinine coded 1 for ≥ 1.2 mg/dl, creatinine coded 0 for < 1.2 mg/dl, † coded 1 for YES coded 0 for NO

Table 5.8: Multivariate logistic regression analysis of predictors of poor treatment outcome among AHF patients admitted to emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables	P value	AOR	95% C.I for Odds ratio	
			Lower	Upper
Systolic blood pressure Ω	0.097	2.07	0.878	4.9
Smoking†	**0.013**	4.31	1.37	13.58
Acute Coronary syndrome †	**0.017**	4.55	1.31	15.8
BUN Ω	**0.036**	2.27	1.05	4.9
CKD †	**0.029**	2.69	1.1	6.54

NB: Ω coded for one unit increase; systolic blood pressure coded 0 for ≥ 90mmHg, 1for < 90 mmHg, serum BUN coded 1 for ≥ 43mg/dl, coded 0 for < 43mg/dl , † coded 1 for YES coded 0 for NO

Smoking history, admission systolic blood pressure measurement, presence of acute coronary syndrome as precipitating factor, presence of CKD as a comorbidity, BUN, and troponin were all predictors in hospital mortality in univariate logistic regression analysis.

Multivariate logistic regression was used to evaluate variables with a p-value of less than 0.25. Factors having a high percentage of missing values and variables with multi-collinearity problem were not included as covariates in multivariate analysis. Explanatory variables were created using the normal 'enter' method. With a chi square of = 5.67 df = 6, N = 184, and a p value of 0.461, the goodness of fit test confirmed that the model was not zero.

Smoking multiplies the odds of in hospital mortality by 14.58 (95% CI 2.22, 95.69), presence of acute coronary syndrome as precipitating factor multiplies the odds of in hospital mortality by 13.02 (95%CI 2.93, 57.91), presence of CKD as comorbidity multiplies the odds by 3.00 (95%CI1.135, 7.94) and for each1 mg/dL increment in BUN above 43 mg/dl the odds of in hospital mortality multiplied 2.98 (95%CI1.16, 7.69) in mulvariate logistic regression shown below in table 5.9

Table 5.9: Univariate and multivariate logistic regression analysis for in hospital mortality predictors in AHF patients admitted to the emergency and medical ward, Jimma University Medical Center, Ethiopia from July 12, 2021 to January 10, 2022 (n=184)

Variables	Univariate			Multivariate		
	OR	**95% CI**	**P-value**	**AOR**	**95%CI**	**P-value**
Socio-demographic						
Smoking†	**5.47**	**[1.25,23.9]**	**0.024**	**14.58**	**[2.22,95.69]**	**0.005**
Vital signs						
Systolic blood pressure Ω	2.54	[1.1, 5.9]	0.030			
Precipitating factors &comorbidity						
Acute coronary syndrome†	**5.51**	**[1.85,16.41]**	**0.002**	**13.02**	**[2.93,57.91]**	**0.001**
CKD †	**3.9**	**[1.68,8.96]**	**0.001**	**3.002**	**[1.135,7.94]**	**0.027**
Laboratory results						
Troponin level Ω	3.34	[1.39,8.02]	0.007			
BUN Ω	**3.07**	**[1.36,6.95]**	**0.007**	**2.98**	**[1.16,7.69]**	**0.024**
Creatinine Ω	3.03	[1.44,6.36]	0.003			

NB: Ω coded for one unit increase; systolic blood pressure coded 0 for ≥ 90mmHg, 1for < 90 mmHg, serum BUN coded 1 for ≥ 43mg/dl, coded 0 for < 43mg/dl , † coded 1 for YES coded 0 for NO

CHAPTER SIX

Discussion

Males accounted for more than half of the patients admitted with AHF in our study, which is similar to Esubalew and colleagues' study, THESUS-HF, ADHERE, OPTIMIZE-HF, and KorAHF studies, but lower than the European registries EHFS II (2,9–11,13,23).
The mean age of patients enrolled in this study was 48.33 ±18.9, which was comparable to the retrospective studies done by Esubalew and his colleagues (47.1 (± 19.4) and THESUS-HF 52.3 (± 18.3). In contrast, registries in ADHERE 72.4 (14.0), OPTIMIZE-HF 73.1 (14.2), and KorAHF 67.6 (14.3) had a higher mean age (2,7–9,11,21).

This study found that 51.1 % of patients enrolled had ADHF syndrome and 70.2 % had been admitted for this diagnosis within the previous year, which differs from the findings of EHFS II and ADHERE, which found that 63 % of patients had ADHF and 37 % had denovo HF, and 75 %of patients had ADHF and 25 % had denovo HF, respectively. This may be due to the prevalence of poor drug adherence and literally high illiteracy in which 81 % of study participants attended primary school and less ;which could contribute for recurrent admission among patients with ADHF (2,11).

In this study, on admission to hospital patients with NYHA IV, III, and II, were 76%, 20.1%, and 3.3%, respectively. Of the patients, respectively, it is almost comparable to the study done at TASH by Tirfe and his colleagues, among AHF patients presenting with NYHA IV, III, and II functional classes, which showed 69.2%, 24.3%, and 6.5%, respectively, and the ADHERE registry, 32%, 44%, and 20%, respectively. When compared to patients in the ADHERE registry, there was a larger proportion of patients with NYHA IV functional class who came to JUMC. This could indicate that, as compared to the participants in these investigations, more patients were admitted with significant decompensation (10,11).

According to the Framingham major criteria, the most common signs and symptoms in this study were paroxysmal nocturnal dyspnea (99.5%), cardiomegaly (91.5%), and neck vein distension (88%). In addition, Unlike the ALARM-HF registry, which found that the most prevalent presenting symptoms were rales (61%), orthopnea (73%), and elevated jugular venous pressure (40%). This could mean that more patients with substantial functional impairment were admitted to JUMC compared to the patients in the ALARM-HF registry (27).

In this study the mean (±SD) systolic blood pressure and pulse rate was 116.17(±24.5) mmHg and 104.15 (±21.5) bpm , contrasts to findings of CHINA-HF registry 128 (± 26) mmHg and 82 (± 25) bpm, THESUS survey 130.4(±33.5) mmHg and 103.7 (±21.6) bpm and OPTIMIZE-HF 142.6 (± 33.2) mmHg and 86.6 (±21.5) bpm .This may be due to a difference in genetic background, racial differences, and diet, as well as a difference in study sample size, which could have an effect on the mean blood pressure measurement. (7,8,21,31).

In this study, the most common ECG finding was sinus tachycardia (33.2%), followed by atrial fibrillation (23.9%), in contrast to Tirfe et al's findings, which showed atrial fibrillation was the most common (54.1%), followed by sinus tachycardia (33.9%), and the most common finding in the KorAHF registry was atrial fibrillation (34.9%), followed by pathologic Q wave (23.9%). (13.2%) (9,10).

The retrospective study done at JUMC previously on the pattern of cardiac disease at the cardiac clinic revealed chronic RHD was leading cause of heart failure (26). But, in present study ischemic heart disease was leading cause of heart failure. Current finding is similar to the findings of EuroHeart Failure Survey II (EHFS II) and KorAHF registry, in which primary underlying causes of heart failure was ischemic heart disease (2,9). Our finding contrasts to the findings of THESUS survey, TaHeF study and two studies from Nigeria (Abuja Heart Study on urban Nigerians and Contemporary profile AHF in southern Nigerians) in which hypertension was commonest cause of acute heart failure (7,24,25,35). Despite the fact that this study had a limited sample size and was conducted in a single center, it could nevertheless show that diseases are evolving from communicable to non-communicable (NCD).

In this study, 52.7% of patients had a depressed left ventricular ejection fraction (≤40%). In the Oman Acute Heart Failure Registry, KorAHF registry, and ADHERE registry, patients with an ejection fraction of less than forty percent were 56%, 60.5%, and 63%, respectively (9,11,22). This could be because HFrEF is commonly associated with ischemic heart disease, as discovered in this study, which found a link between IHD and low ejection fraction (p value = 0.000, 95% CI [3.13, 12.62], OR =6.280).

Pneumonia, atrial fibrillation, medication discontinuation, and uncontrolled hypertension, as well as acute coronary syndrome, were the most common precipitating causes of acute heart failure in this study, which makes this study comparable to the Get With The Guidelines-HF (GWTG-HF) database. Pneumonia/respiratory processes, arrhythmia, medication noncompliance, increasing renal failure, and uncontrolled hypertension were the most common precipitating causes of heart failure between January 2005 and September 2013 (28). OPTIMIZE-HF, a registry which involved 48612 patients from 259 US hospitals, showed the most common precipitating factors were pneumonia, acute coronary syndrome, arrhythmia, uncontrolled hypertension, non-adherence to medication, and worsening renal function (21). This suggests that early detection of pneumonia and educating and counseling patients on cardiac drug compliance need due attention to decrease the acute heart failure associated with hospital admission.

In this study, hypertension, pulmonary hypertension, chronic renal disease, chronic obstructive pulmonary disease, diabetes mellitus, TB, hyperthyroidism, asthma, and HIV/AIDS were all recognized as comorbidities. Hypertension, coronary artery disease, and diabetes were the most common comorbid conditions in the ADHERE registry (11). The KorAHF registry revealed that hypertension, ischemic heart disease, diabetes, atrial fibrillation, cerebrovascular illness, chronic renal failure, and chronic lung disease are all common comorbidities. According to the China HF registry, hypertension, coronary heart disease, atrial fibrillation, and diabetes mellitus were the most common comorbidities (31).

The median hospital stay in this study was 9 days, which is comparable to the findings of the EHFS II, KorAHF registry, and CHINA-HF registry, but higher than the findings of the ADHERE (4.3 days), OPTIMIZE-HF (4 days), and THESUS-HF (7) days (2,7,9,11,21,31)**.**

In this study, poor treatment outcomes occurred in 52 patients, of whom 37 (20.1%) had in hospital mortality. Mortality was higher in patients with ADHF (51.35%) than in *denovo* HF (48.6%). Over all, in hospital mortality in this study is almost comparable to the prospective study done at TASH in which in hospital mortality was 17.20%, the data from a retrospective study done by Esubalew and his colleagues showed in hospital mortality of 24.4%, and the data from the prospective Tanzanian acute heart failure (TaHeF) study in which mortality was 22.4 per 100-year observation. In contrast, hospital mortality rates for patients evaluated in OPTIMIZE-HF, KorAHF, ADHERE registry, and EHFS II ranged from 4% to 6.7%. A prospective cohort study of international congestive heart failure (INTER-CHF) patients revealed regional variability in mortality among AHF patients, with mortality being highest in African patients, intermediate in South East Asia, and lowest in China, South America, and the Middle East (2,8–11,21,32,35).So, the difference in mortality rate may be related to health care infrastructure and variability in patients' characteristics at admission.

In this study, independent predictors of in hospital mortality identified were the presence of acute coronary syndrome as a precipitating factor, smoking, chronic kidney disease as comorbidity, and elevated BUN (≥ 43 mg/dl). In the CHINA-HF registry, acute coronary syndrome, BUN, infection, left bundle branch block on ECG, low systolic blood pressure, and elevated bilirubin level were all independent predictors of in-hospital mortality (31), while BUN, high serum creatinine, and low systolic blood pressure were all independent predictors in the ADHERE registry (11). In the absence of any other prognostic indicators , OPTIMIZE-HF found that risk-adjusted post-discharge mortality was considerably higher in patients whose hospitalization was prompted by ischemia/ACSs or worsening renal function (21). The majority of these studies show that acute renal function detriment or the presence of Chronic kidney disease and acute coronary syndrome were major predictors of mortality as in this this study.

Limitation of the study

The laboratory test for serum uric acid level, NT pro-BNP, BNP, and CRP cardiac troponin determination was not consistently available for all of the enrolled patients (troponin was only checked for 120 patients), making it impossible to draw a link between poor outcome and these variables.

It was difficult to estimate the amount of salt consumption behavior among patients and the cost of therapy since they are subjectively influenced.

Strength of the study

In contrast to retrospective research, the strength of this study lies in its prospective study design, which yielded more or less useful information.

CHAPTER SEVEN

7.1 Conclusion

Poor treatment outcome was seen in 52 (28.3%) and in hospital mortality occurred in 37 (20.1%) patients. Ischemic heart disease was the most common cause of heart failure among AHF patients admitted to JUMC, showing that the epidemiology of heart failure etiology has shifted from rheumatic heart disorders to ischemic heart diseases, remarkably similar to that of western developed countries. Pneumonia and hypertension were the most common identified precipitating factors and comorbidities, respectively, in AHF patients admitted to JUMC. Patients with acute decompensated heart failure had a greater mortality rate than those with denovo heart failure syndrome. Acute coronary syndrome, chronic kidney disease, smoking, and BUN were all found to be independent predictors of mortality in hospitalized AHF patients.

7.2 Recommendation

To intervene and improve the outcome of patients with acute heart failure syndrome, physicians should actively diagnose and treat precipitating events and comorbidities, and laboratory measures such as BUN should be followed.

To reduce drug discontinuation-related hospital admissions as well as smoking related mortality and complications, health education and counseling should be strictly enforced.

In order to improve patient outcomes, health facilities' diagnostic and treatment capabiliti es should be upgraded.

To reduce heart failure and the implications of ischemic heart disease and hypertension, a community-wide awareness of risk factors for IHD and preventative treatments should be undertaken.

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DECLARATION

I, the undersigned, declare that this thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been fully acknowledged.

Name: Gemechis Mekonnen (MD)

Signature and Date: _____

Name of the institution: **Jimma University**

Date of submission: _____

This thesis has been submitted with my approval as university advisor

Name of the first advisor: Dr. Elsah Tegene (MD, Associate professor Medicine & Interventional Cardiologist)

Signature and Date: _____

Name of the second advisor: Dr. Tadesse Dukessa (MD, Internist & Cardiologist, Assistant Professor of Internal Medicine)

Signature and Date: _____

Name of third advisor: Mr. Lamessa Dube (Bsc, MPHE, Assistant Professor of Epidemiology)

Signature and Date: _____

Appendix

Information sheet and Consent Form

Consent form (Afaan Oromoo)

Unka itti eyyemamoo tahuu gaafataman- Afaan Oromootiin

Nagaa keessanii Akkam bultan/Akkam Ooltan

Maqaan koo_____Jedhama. Dursaa qorannoo kanaa kan tahan Dr.Gammachiis Makonniniifan odeeffanno/ragaalee funaanuutti jira.Innis Yunivarsiitii Jimmaatti barataa dhibee keessaa(Internal Medicine Resident) waggaa sadaffaati .Qorannoo kanas xumura waggaa sadaffaatiif/ Ebbifamuuf hojjechuutti jira.Mata dureen qorannoo kanaas "Etiology, Precipitating Factors and Treatment Outcome and Its predictors Among Patients of Acute Heart Failure Admitted to Emergency and Medical Ward, Jimma University Medical Center, Southwest Ethiopia" jedhama.

Kaayyoon qorannoo kanaas Hospitaala Yaalaa Fayyaa Jimmaatti (JUMC) namoota sababa dhibee onneetiin ciisanii yaalamuuf dhufan sababoota dhukkubbii dhibee onnee,Hammeessitoota dhibee onnee, Bu'aa yaalaan booda namoota dhibee onneen qabaman irratti mul'atuu fi Wantoota du'atii namoota dhibee onneen qabamaniif sababa tahan qorachuudha.

Qorannoo kana keessatti guutumman guutuutti hirmaachuun fedha irratti kan hundaa'edha.

Qorannoo kana keessatti hirmaachuu dhisuun tajaajiloota isin argattan kamuu irratti dhiibbaa fidu tokkolleee hin qabu. Odeeffannooleen isinirraa funaaname kamuu iccitiidhaan kan qabamuufi nama kamittiyyuu dabarfamee kan hin kennamne yoo tahu; dursaa qorannoo kanaa qofaatu itti fayyadama.

Isin galateeffachaa hirmaachuuf fedha qabduu?

Eeyyee_____ Lakki_____

Guyyaa itti funaaname___/__/_____ Nama funaane_____ Dursaa Qorannichaa_____

Information sheet and consent form

Consent form (Amharic)

የ ፈ ቃ ደ ኝ ነ ት ማ ስ ቦ የ ቅ ያ ቅ ፅ - ኣ ማ ር ኛ

ሰ ላ ም ጤ ፍ ይ ስ ጥ ልኝ እ ን ደ ምን ኣ ደ ሩ / ዋ ሉ ፤

ስ ሜ_____ ይ ባ ላ ል ፤ ለ ዶ/ረ ገ ሞ ቺ ስ ማ ካ ን ን የ ዚ ህ ጥ ና ት ዋ ና ኣ ጥ ኚ እ የ ስ ራ ሁ እ ገ ኛ ለ ው።

እ ሱ ም በ ጂ ማ ዩ ኒ ቭ ረ ስ ቲ የ ሶ ስ ተ ኛ ሀ ሞ ት ዉ ስ ጥ ዳ ወ ተ ሚ ሪ ነ ዉ ፡ ስ ለ ሆ ነ ም ለ መ ሚ ቅ ያ ፁ ሁ ፍ ማ ሟ ያ ጥ ና ት እ የ ሰ ራ ይ ገ ኛ ል። የ ጥ ና ቱ ር ዕ ስ " (Acute heart failure and its outcome among patients admitted to Jimma University Medical Center, Southwest Ethiopia.) ይ ሰ ኛ ል።

የ ጥ ና ቱ ዓ ላ ማ በ JUMC በ ል ብ ድ ካ ም ህ ማ ም ተ ኛ ተ ው ለ ሚ ታ ከ ሙ የ ማ ከ ም ው ጤ ት (Treatment outcome) ሚ ፈ ተ ሽ ፣ ለ ል ብ ሞ ድ ከ ም ጠ ን ቅ የ ሆ ኑ ማ ላ የ ት ፣ ሆ ስ ፒ ታ ል እ ን ዲ ተ ኙ

(hospitalization) የ ሚ ያ ደ ር ጉ ሁ ኔ ታ ዎ ች ማ ላ የ ት እ ና ለ ሞ ት የ ሚ ያ በ ቁ መ ነ ሰ ዔ ዎ ች ማ ላ የ ት ነ ው።

ስ ለ ዚ ህ እ ዚ ህ ጥ ና ት ው ስ ጥ ማ ሉ ፈ ቃ ደ ኛ ሆ ነ ው እ ን ዲ ሳ ተ ፉ እ ን ጠ ይ ቃ ለ ን። እ ዚ ህ ጥ ና ት ው ስ ጥ ኣ ል ሳ ተ ፍ ም የ ማ ለ ት

ማ ሉ ጭ ብ ት ኣ ለ ዎ ት። ባ ለ ማ ካ ተ ፍ ዎ ም ክ ን ያ ት ደ ግ ሞ በ ም ን ም ዓ ይ ነ ት ከ ሆ ስ ፒ ታ ሉ የ ሚ ያ ገ ኙ ት ኣ ገ ል ግ ሎ ት እ ና ህ ክ ም ና

በ ም ን ም ሁ ኔ ታ ኣ ይ ጓ ደ ል ብ ዎ ት ም ወ ይ ም ኣ ይ ቋ ረ ጥ ም።

ከ እ ር ስ ዎ የ ም ሰ በ ስ በ ው ም ን ኛ ው ም የ ህ ክ ም ና ሚ ጃ ሚ ስ ጥ ር የ ተ ጠ በ ቀ ነ ው። ከ ዋ ና ኣ ጥ ኚ በ ስ ተ ቀ ር ማ ን ም ሰ ው

ሚ ጃ ው ን ማ ቋ ት በ ፍ ፁ ም ኣ ይ ቻ ለ ው ም። ስ ለ ሆ ነ ም የ እ ር ስ ዎ ት ብ ብ ር እ ና ተ ሳ ት ፎ እ ን ጠ ይ ቃ ለ ን ፤ ፈ ቃ ደ ኛ ስ ለ ሆ ኑ

በ ቅ ድ ሚ ያ እ ና ማ ሰ ግ ና ለ ን።

ፈ ቃ ደ ኛ ነ ዎ ት ፣ ኣ ዎ ኣ ይ ደ ለ ሁ ም

ቀ ን ___/___/_____ ሚ ጃ ሰ ብ ሳ ቢ _____ ተ ቆ ጣ ጣ ሪ _____

Dear sir / madam

Good Morning / after noon;

My name is _____. I am working for Dr.Gemechis Mekonnen the principal investigator of this research. He is third year Internal Medicine Resident at Jimma University Medical Center (JUMC). Currently he is doing his thesis work entitled "Acute heart failure and its outcome among patients admitted to Jimma University Medical Center, Southwest Ethiopia." Thus I am going to ask you some questions that are not difficult to answer. The time required for this is about 15 to 20 minutes.

So your cooperation and contribution towards this research will be very much appreciated. Your participation in this study is completely voluntarily. Your decision to decline will not in any way affect the service that you gain from this hospital. All information given will be kept confidential. And no other person except the principal investigator will be allowed to access the questionnaire.

Are you willing to participate?

Yes_____ No_____

Date of interview ___/___/_____ Name of supervisor _____Name of data collector_____

Appendix

Data collection tool of AHF patients admitted to JUMC Emergency Department or Medical Ward, Jimma University Medical Center

Socio-demographic Characteristics

Data collection date ___/ ___/ _____ Card No _____

Client ID: _____

1 Age _____ (years)

2 Address _____ (region)

1. Urban
2. Rural

3 Gender

1. Male
2. Female

4 Occupation

1. Employed
2. Unemployed

5 Marital status

1. Single
2. Married
3. Divorced
4. Widowed

6 Educational status

1. No formal education
2. Primary school
3. Secondary school
4. Higher education

7 Family history of heart failure

1. Yes
2. No

8 If yes what was the diagnosis

1. IHD
2. DCM
3. CHD
4. HCM
5. Unknown/Don't know the diagnosis

9 Smoking

1. Yes
2. No

10 If yes, how much pack year he/she smoked

I. < 5 pack year
II. 5-10 pack year
III. 10-15 pack year
IV. 15-20 pack year
V. >20 pack year

11 Are you physically active or do vigorous –intensity activity

like(carrying heavy loads, digging ,farming construction work etc)

I. Yes
II. No

12 If yes for the above question for how long do you undertake such activity?

1. >30 minutes/day
2. <30 minutes /day

13 Are you used to eating a lot of salt?

1. Yes
2. No

14 If yes , to above question estimate amount of daily intake as

1. >1 tea spoon
2. < 1 teaspoon

Clinical Characteristics at Admission

15 What was Heart failure syndrome at admission?

1. New '*de novo*'
2. Acute decompensated chronic heart failure (ADCHF)

16 If Acute decompensation of HF (ADCHF) what was duration chronic heart failure?

I. < 6 month
II. 6 month to 1 year
III. 1 to 5 year
IV. > 5 year

17 What was stage heart failure at admission?

1. Stage A
2. Stage B
3. Stage C
4. Stage D

18 What was functional class of HF?

I. NYHA I
II. NYHA II
III. NYHA III
IV. NYHA IV

19 What Is Hemodynamic profile

I. Profile A (warm and dry)
II. Profile B (warm and wet)
III. Profile C (cold and wet)
IV. Profile L (cold and dry)

20 Vital signs at admission

I. Systolic blood pressure _____(mmHg)
II. Diastolic blood pressure _____ (mmHg)
III. Pulse rate _____(bpm)
IV. Respiration rate_____(bpm)
V. Body temperature_____ (°C)
VI. Oxygen saturation (without supplemental oxygen)_____ (%)

21 Urine output balance __(mL/24 hr)

1. <100ml
2. 100-400 ml
3. 500-1000 ml
4. > 1000 ml

22 What is/are Framingham major criteria the patients have?

I. Acute pulmonary edema
II. Cardiomegally
III. Neck vein distension

IV. Paroxysmal nocturnal dyspnea or orthopnea
V. Rales
VI. S3 gallop

23 What is/are Framingham minor criteria the patient have

I. ankle edema
II. dyspnea on exertion
III. hepatomegaly
IV. night cough
V. pleural effusion
VI. tachycardia (range of ≥ 120 / min)

Imaging studies

24 What was Chest X-ray finding of the patient at admission?

I. Normal
II. Cor pulmonale
III. Cardiomegally
IV. COPD feutures
V. Pleural effusion
VI. Pneumonia
I. Pulmonary edema

25 What is the ECG finding of the patient?

I. Normal
II. Acute coronary syndrome(ST segment depression or elevation)
III. Atrial fibrillation
IV. Bradycardia
V. Sinus tachycardia
VI. Ventricular fibrillation
VII. Ventricular tachycardia
VIII. LVH
IX. LBBB
X. Others specify _____

26 What is the ECHO finding?

1. Normal
2. Chronic rheumatic heart disease

I. Yes
II. NO

I. If yes, which valve/valves is/are involved?

I. MS
II. MR
III. AR
IV. AS
V. Multivulvular involvement

3. Degenerative heart disease/Calcific valve diseases if yes what which valve or valves involved

I. Aortic
II. Mitral
III. multivulvular

4. Hypertensive heart disease/ Left Ventricular Hypertrophy
5. If there is diastolic dysfunction what is its grade?

I. G1DD
II. G2DD
III. G3DD

IV. G4DD

6. Ischemic heart disease(IHD)
7. Dilated cardiomyopathy(DCM)
8. Pericardial effusion
   I. Yes
   II. No
9. If yes, what was it severity?
   I. Mild Pericardial effusion
   II. Moderate pericardial effusion
   III. Severe pericardial effusion
10. Pulmonary hypertension
11. Cor pulmonale
12. Constrictive pericarditis
13. LV aneurysm
14. Aortic aneurysm
15. LV thrombus
16. What was Left ventricular ejection fraction reported?
    a. <40%
    b. >40%

Laboratory values

27 Serum Na+ _____ (mEq/L)

28 Serum K+ _____ (mEq/L)

29 Hemoglobin _____(g/dL)

30 Serum creatinine _____(mg/dL)

31 Blood urea nitrogen _____(mg/dL)

32 eGFR _____ (mL/min/1.73m2)

33 Troponin I _____(ng/mL)

34 Creatine kinase–MB _____ (units/L)

35 Others _____ (specify)

Precipitating Factors at Admission

36 Acute coronary syndrome

37 Anemia

38 Arrhythmia
   I. Atrial fibrillation
   II. Atrial flutter
   III. Ventricular tachycardia/fibrillation
   IV. Bradycardia

39 Drugs
   I. Beta blockers
   II. Calcium channel blockers
   III. Behavior of salt intake

40 Drug discontinuation

41 Infection
   I. Pneumonia
   II. Infective endocarditis
   III. UTI(upper UTI)

42 Pregnancy

43 Pulmonary thromboembolism

44 Uncontrolled hypertension

45 Unknown /Unidentified

46 **Underlying Clinical Diseases at Admission**

47 Chronic rheumatic heart disease
48 Dilated cardiomyopathy
49 Hypertensive heart disease
50 Ischemic heart disease
51 Congenital heart disease
52 Cor pulmonale
53 Degenerative valvular heart disease
54 Pericardial effusion
55 Others _____ (specify)

Etiology / Co-morbidity

56 Acute coronary syndrome
- I. STEMI
- II. NSTEMI
- III. Unstable angina

57 Diabetes mellitus
58 Atrial fibrillation
59 Chronic kidney disease
60 Asthma
61 Cardiomyopathy
62 Cancer
63 Chronic obstructive pulmonary disease
64 Congenital heart disease
65 Coronary artery disease
66 Dyslipidemia
67 HIV/AIDS
68 Hypothyroidism
69 Hyperthyroidism
70 Hypertension
71 Hypertensive heart disease
72 Pericardial disease
73 Pericardial effusion
74 Pulmonary hypertension
75 Rheumatic heart disease
76 Stroke
77 Tuberculosis
78 Valvular heart disease

Treatment and Outcome

79 Outcomes
- I. Improved
- II. Same
- III. Deteriorated
- IV. Died
- V. Self-discharge against medical advice

80 Readmission(for patients with decompensated HF)
1. Yes
2. No

81 If yes how frequent was he / she admitted in past 1 year
- I. 2
- II. 3
- III. 4
- IV. ≥5

82 Length of hospital stay _____ (days)