



## Clinical Characteristics and in-Hospital Mortality in Patients with Acute Heart Failure at Dessie Referral Hospital, Northeast Ethiopia

Kassahun Bogale\* and Assasu Aderaw

Department of Pharmacy, College of Medicine and Health Science, Wollo University, Dessie, Ethiopia

### ABSTRACT

Cardiovascular diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Acute heart failure (AHF) is one of the most common diseases in emergency department and associated with a poor prognosis and high mortality rate. This study is aimed to assess the mortality rate of AHF patients at Dessie Referral Hospital. A retrospective cross-sectional study design was employed. All adult patients with a diagnosis of AHF who were admitted during the period January 1, 2019 to December 31, 2019 were included. Data was abstracted from the medical records by trained data collectors. Bivariate and multivariate analyses logistic regression analysis was carried out to assess the association between dependent and all the independent variables. In the study, a total of 96 acute heart failure patients participated. 49 (51 %) were females. The mean age was 52.5 (SD= ±20.28) years. Two third of patients (62, 64.6%) were newly diagnosed AHF patients. The mean length of hospital stay was 5.13 days (SD = ±3.92). Acute pulmonary congestion (86, 89.58%), orthopnea (78, 81.25%) and peripheral edema (64, 66.67%) were the most common clinical presentations. The most common prior medical conditions were Myocardial infarction (19, 19.8%) and valvular heart disease (8, 8.3%). Loop diuretics were the most commonly used drugs (87, 90.63%) during admission. In-hospital mortality was found to be 22.9%. We concluded that the in-hospital mortality was very high for acute heart failure patients at Dessie referral Hospital.

**Keywords:** Acute heart failure, In-hospital Mortality, Ethiopia

### INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke (WHO, 2020). Heart failure (HF) is a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood. The cardinal manifestations of HF are dyspnea and fatigue, which may limit exercise tolerance, and fluid retention (O’Gara et al., 2013).

Acute heart failure (AHF) is the term used to describe the rapid onset of, or change in, symptoms and signs of HF. It is a life-threatening condition that requires immediate medical attention and usually leads to urgent admission to hospital. AHF may be the first presentation of HF (‘de novo’ AHF) or it may be exacerbation of chronic heart failure. In chronic HF arrhythmia, discontinuation of medications, volume overload or severe hypertension are common precipitating factors (Members et al., 2012).

AHF is one of the most common diseases in emergency medicine and associated with a poor prognosis and high mortality rate. In-hospital mortality ranges from as low as 2.3% among patients enrolled in clinical trials to 19% in referral hospital series (Fonarow et al., 2005). Even though common and fatal, there is limited data on the epidemiology, treatment, and prognosis of AHF.

ADHF is an important clinical syndrome affecting a population at every age. It accounts for approximately 100,000 hospitalizations/year in Canada and 1 million hospitalizations/year in the United States. In-hospital mortality is high as are post-discharge readmission and mortality rates. Patients in the ADHERE (Acute Decompensated Heart Failure National Registry) had a 4% in-hospital mortality (Abraham et al., 2005).

Nearly 60% of adults with HF have five or more chronic comorbidities. Both cardiovascular and non-cardiovascular comorbidities observed among adults with HF contribute to condition development, progression and prognosis. Identification and characterization of common comorbidities and their association with treatment

\*Corresponding author: kasishcoool@gmail.com

outcomes in adult hospitalizations for HF is essential (C. S. Lee et al., 2014).

Despite high number of annual hospitalizations because of acute decompensated heart failure at Dessie referral hospital, its management remains largely empiric. Data are lacking regarding patient characteristics, usual comorbidities, commonly used treatment strategies, clinical outcomes, factors affecting treatment outcome and adherence to medications. This study was conducted to address all these gaps.

## MATERIALS AND METHODS

### Study area:

The study was conducted at Dessie referral hospital from January 1, 2019 to December 31, 2019. Dessie is a city in Amhara Region, South Wollo zone, which is found at a distance of 401km from the capital of the country, Addis Ababa. Dessie is the major city in the region with a population of 610,431 and is home to several public and privately owned hospitals of different levels. Dessie referral hospital is providing service in different units for the populations of Dessie town and the surrounding catchment population i.e. more than 10 million

### Study design and period:

A retrospective cross-sectional study design was employed during January 1, 2019 to December 31, 2019.

### Source and study population:

All adult patients admitted at the emergency department of DRH during the period January 1, 2019 to December 31, 2019 were the source population, whereas all adult patients diagnosed for AHF and were admitted from January 1, 2019 to December 31, 2019 were considered as the study population.

#### Inclusion criteria:

- New-onset or worsening of pre-existing HF as the primary cause of admission
- Age  $\geq 18$

#### Exclusion criteria:

- Patients transferred to another hospital
- Patients discharged against the medical advice

### Sample size determination:

Since all patients admitted to the emergency department of Dessie Referral Hospital with a diagnosis of acute heart failure were included to the study no sample size calculation was done. From the registration book found at the emergency department the chart numbers of acute heart failure patients admitted during the study period were

collected and the medical charts were retrieved from the record room.

### Study Variables:

#### Dependent variables

- In-hospital mortality

#### Independent variables

- Sociodemographic variables: (Sex, Age)
- Vital signs during admission (Blood pressure, heart rate)
- Comorbid conditions (MI, Valvular Disease, MI, DM, CKD, Angina, Pneumonia)
- Precipitating factors (Pneumonia, Adherence to treatment)
- Medications on admission such as diuretics, beta blockers, ACEIs, inotropes,

### Data collection:

Data was abstracted from the medical records by trained data collectors including nurses and interns working at the emergency department. Data was collected and filled directly into standardized forms and then entered into a computer database. Abstraction errors and variability were decreased by providing detailed data definitions, training sessions, and by performing re-abstraction of a random subsample for each data collector.

### Data management and analysis:

The data was entered, cleared, explored, standardized and summarized using SPSS version 20.0. Descriptive analysis was used to describe the pattern of independent variables and Logistic regression was used to determine crude and adjusted OR. Bivariate analyses was carried out to assess association between the dependent and all the independent variables and to identify candidates for multivariate analysis. Then, multivariable analysis was performed to determine the independent predictors of in-hospital mortality. Statistical significance was measured by p-values  $< 0.05$  and adjusted odds ratio (AOR) with 95% confidence interval (95% CI).

### Ethical consideration:

Ethical clearance was obtained from the Ethical Review committee of College of Medicine and Health sciences, Wollo University. Before the start of data collection, permission was obtained from the hospital management. The names of patients were replaced with codes to avoid individual identifiers. The data collectors were professionals working at DRH to maintain privacy.

## RESULTS

### Sociodemographic and patient characteristics during admission:

**Table 1: Socio-demographic and patient characteristics of acute heart failure patients admitted at Dessie Referral Hospital, Ethiopia, January 1- December 31, 2019**

Variables	Frequency (%)
<b>Sex</b>	
Male	47(49)
Female	49(51)
<b>Age (years)</b>	
<40	34(35.4)
40-60	27(28.1)
61-70	17(17.7)
71-80	11(11.5)
>80	7(7.3)
<b>Type of patient</b>	
Newly diagnosed AHF	62(64.6)
Acute decompensation of CHF	34(35.4)
<b>Hospital Stay (days)</b>	
1-5	69(71.9)
6-10	18(18.8)
11-15	7(7.3)
16-20	1(1)
>20	1(1)
<b>Sign and Symptoms</b>	
Dyspnea	36(37.5)
Orthopnea	78(81.25)
PND	59(61.46)
P. Edema	64(66.67)
<b>Edema Grade (N = 61)</b>	
+1	13(20.3)
+2	32(50)
+3	16(29.7)
<b>SBP (N = 95)</b>	
<90	9(9.5)
90-129	53(55.8)
130-139	11(11.6)
140-159	9(9.5)
≥ 160	13(13.7)
<b>DBP (N = 95)</b>	
<60	2(2.1)
60-79	52(54.7)
80-89	18(18.9)
90-99	10(10.5)
≥ 100	13(13.7)

From 96 acute heart failure patients incorporated in to the study, 49 (51 %) were females. The mean age of patients was 52.5 (SD=±20.28) years, ranging from 18– 88 years. The majority of patients (34, 35.4%) were in the age group less than 40. Two third of patients (62, 64.6%) were newly diagnosed acute heart failure patients and the rest (34, 35.4%) were admitted because of acute decompensation of chronic heart failure. The mean length of hospital stay was 5.13 days (SD=±3.92) ranging from 1-22 days. The majority of patients (69, 71.9%) had stayed at hospital for less than 5 days. The most common signs or

conditions documented during admission were acute pulmonary congestion (86, 89.58%), orthopnea (78, 81.25%) and peripheral edema (64, 66.67%). Nineteen patients (29.7%) have grade III edema during admission (Table 1).

#### **Prior Medical condition and adherence of patients:**

As shown in Table 2 the most common prior medical conditions were Myocardial infarction (19, 19.8%) and valvular heart disease (8, 8.3%). Pneumonia was the most common precipitating factor in 24 (25%) patients. According to the analysis made by physicians, from 51 patients 30(58.8%) patient had a recent history of high dietary salt intake or stopped taking a regularly prescribed medication (Table 2).

**Table 2: Prior Medical condition and adherence of acute heart failure patients admitted at Dessie Referral Hospital, Ethiopia, January 1- December 31, 2019**

Variables	Frequency (%)
<b>MI</b>	19(19.8)
<b>Valvular Disease</b>	8(8.3)
<b>DM</b>	4(4.2)
<b>CKD</b>	3(3.1)
<b>Angina</b>	2(2.1)
<b>Pneumonia</b>	24(25%)
<b>Adherence to diet or Medications (N = 51)</b>	21(41.2)

#### **Medications during admission:**

Loop diuretics were the most commonly used drugs (87, 90.63%) followed by spironolactone (19, 19.79%) and hydralazine (8, 8.33%) (Table 3).

**Table 3: Medications used during admission for acute heart failure patients admitted at Dessie Referral Hospital, Ethiopia, January 1- December 31, 2019**

Variables	Frequency (%)
<b>Furosemide</b>	87(90.63)
<b>Spironolactone</b>	19(19.79)
<b>Hydralazine</b>	8(8.33)
<b>Digoxin</b>	7(7.29)
<b>Beta Blockers</b>	4(4.17)
<b>ASA</b>	4(4.17)
<b>ACEIs</b>	3(3.13)
<b>Amlodipine</b>	3(3.13)
<b>Statins</b>	3(3.13)

#### **Treatment Outcome:**

From the total of 96 patients admitted at the emergency department 22(22.9%) were dead. The rest discharged alive 74 (77.1%).

**Medications on discharge:**

From those patients discharged alive (74, 77.1%), the most common discharge medications were a loop diuretic Furosemide (64, 86.5%) followed by spironolactone (41, 55.4%), beta blockers (24, 32.4%) and ACE inhibitors (21, 28.4%) (Table 4).

**Table 4: Discharge medications used for acute heart failure patients admitted at Dessie Referral Hospital, Ethiopia, January 1- December 31, 2019**

Variables (N=74)	Frequency (percent)
Fursemide	64(86.5)
Spironolactone	41(55.4)
Beta Blockers	24(32.4)
ACEIs	21(28.4)
Statins	14(18.9)
ASA	13(13.6)
Digoxin	8(10.8)
Warfarin	2(2.7)

**DISCUSSIONS**

The aim of this study is to assess the clinical characteristics and treatment outcome specially in-hospital mortality of AHF at DRH. Ninety-six acute heart failure patients were incorporated in the present study. More than 51 % were females which is similar with that of the study done at Black lion and St. Paul's Hospital, Addis Ababa, Ethiopia and in Sub-Saharan Africa Survey of Heart Failure, 54.4%, 57.8% and 50.8% respectively (Damasceno et al., 2012; Esubalew Woldeyes, 2020; Tirfe, Nedi, Mekonnen, & Berha, 2020).

The mean age of patients was 52.5 (SD= $\pm$ 20.28) years which is almost similar with that of the study done at St. Paul's Hospital Millennium Medical College in Addis Ababa, Ethiopia (47.1 ( $\pm$ 19.4) years) (Esubalew Woldeyes, 2020) but very less as compared to the data from Korean Acute Heart Failure Registry (68.5 $\pm$ 14.5 years) (S. E. Lee et al., 2017) and GREAT registry, an international, multicenter, prospective observational cohort of adult patients with AHF (72 (61.4 to 80) (Legrand et al., 2018).

From the total of 96 patients admitted because of AHF at DRH, 64.6% were newly diagnosed acute heart failure patients which is very high as compared to a study done at 14 university, central, and regional hospitals in Finland and 170 hospitals in France: 49% and 52% respectively (Logeart et al., 2013; Siirilä-Waris et al., 2006). In the present study the mean length of hospital stay was 5.13 days (SD= $\pm$ 3.92) which is very similar with the national study done at US on 2009 (5.2 days) (C. S. Lee et al., 2014) and in Black lion, Addis Ababa, a median of 4 days (Tirfe et al., 2020). Shortness of

breath secondary to pulmonary congestion (89.6%) was the most common manifestation of AHF in the present study. The same is true at a study done in Finland (63.5%) (Siirilä-Waris et al., 2006).

Myocardial infarction (19, 19.8%) and valvular heart disease (8, 8.3%) were the most common comorbidities of AHF patients at DRH. Similarly, the majority (58%) of AHF patients had coronary artery disease from the analysis of the Acute Decompensated Heart Failure National Registry (ADHERE) (Abraham et al., 2005). Rheumatic heart disease (30%) was the most frequent cause of heart failure at St. Paul's Hospital, Ethiopia (Esubalew Woldeyes, 2020). Data from the PROTECT and COACH Trials also indicated that Coronary Heart disease, hypertension and DM were the top three comorbidities (Tromp et al., 2017).

With regard to medications started on admission loop diuretics were the most commonly used drugs (87, 90.63%) followed by spironolactone (19, 19.79%) and hydralazine (8, 8.33%). Similarly 76% of patients were given intravenous furosemide infusions/bolus during the first 12 hours in a study done at Finland (Siirilä-Waris et al., 2006).

From the total of 96 patients admitted at the emergency department of DRH in-hospital mortality was 22.9% which is very high as compared to ADHERE registry and Tokyo Cardiac Care Unit Network Database 4.1% and 6% respectively (Abraham et al., 2005; Takahashi et al., 2011). This may be because of late presentation of patients to hospital and shortage of vasoactive medications in DRH. The same high death rate was documented in a similar study done at Blacklion and St. Paul's Hospitals, Ethiopia (17.2% and 24.4% respectively) (Esubalew Woldeyes, 2020; Tirfe et al., 2020).

The use of beta blockers and ACEIs at discharge were associated with a better outcome (Gayat et al., 2018). In the present study only 32.4% of patients were discharged with beta blockers and only 28.4% of patients were given ACE inhibitors at discharge.

**ACKNOWLEDGMENT**

We would like to acknowledge Dessie Referral Hospital and data collectors for their cooperation during the study. The authors would also like to acknowledge Wollo University for providing ethical clearance letter.

**ABBREVIATIONS**

ACCF/AHA-American College of cardiology and American Heart Association, ACEIs-angiotensin converting enzyme inhibitors, ADHERE-The Acute Decompensated Heart Failure National Registry, ADHF-acute decompensated heart

failure, AF-atrial fibrillation AHF-acute heart failure, Beta-beta blockers, CHF-congestive heart failure, DRH-Dessie Referral Hospital, EF-ejection fraction, ESC-European society of Cardiology, and HF-heart failure.

## REFERENCES

- Abraham, W. T., Adams, K. F., Fonarow, G. C., Costanzo, M. R., Berkowitz, R. L., LeJemtel, T. H., . . . Group, A. S. (2005). In-hospital mortality in patients with acute decompensated heart failure requiring intravenous vasoactive medications: an analysis from the Acute Decompensated Heart Failure National Registry (ADHERE). *Journal of the American College of Cardiology*, 46(1), 57-64.
- Damasceno, A., Mayosi, B. M., Sani, M., Ogah, O. S., Mondo, C., Ojji, D., . . . Schrueder, N. (2012). The causes, treatment, and outcome of acute heart failure in 1006 Africans from 9 countries: results of the sub-Saharan Africa survey of heart failure. *Archives of Internal Medicine*, 172(18), 1386-1394.
- Esubalew Woldeyes, H. Z., Hailu Abera, Tola Bayissa, Sisay Sirgu. (2020). Clinical characteristics and in hospital outcome of acute heart failure: a five-year experience at a tertiary care hospital in Ethiopia. *Ethiopian Medical Journal*, 58(1), 21-28.
- Fonarow, G. C., Adams, K. F., Abraham, W. T., Yancy, C. W., Boscardin, W. J., & Committee, A. S. A. (2005). Risk stratification for in-hospital mortality in acutely decompensated heart failure: classification and regression tree analysis. *Jama*, 293(5), 572-580.
- Gayat, E., Arrigo, M., Littnerova, S., Sato, N., Parenica, J., Ishihara, S., Lassus, J. (2018). Heart failure oral therapies at discharge are associated with better outcome in acute heart failure: a propensity-score matched study. *European Journal of Heart Failure*, 20(2), 345-354.
- Lee, C. S., Chien, C. V., Bidwell, J. T., Gelow, J. M., Denfeld, Q. E., Creber, R. M., . . . Mudd, J. O. (2014). Comorbidity profiles and inpatient outcomes during hospitalization for heart failure: an analysis of the US Nationwide inpatient sample. *BMC cardiovascular Disorders*, 14(1), 1-9.
- Lee, S. E., Lee, H.-Y., Cho, H.-J., Choe, W.-S., Kim, H., Choi, J. O., . . . Hwang, K.-K. (2017). Clinical characteristics and outcome of acute heart failure in Korea: results from the Korean Acute Heart Failure Registry (KorAHF). *Korean Circulation Journal*, 47(3), 341.
- Legrand, M., Ludes, P.-O., Massy, Z., Rossignol, P., Parenica, J., Park, J.-J., . . . Miro, O. (2018). Association between hypo-and hyperkalemia and outcome in acute heart failure patients: the role of medications. *Clinical Research in Cardiology*, 107(3), 214-221.
- Logeart, D., Isnard, R., Resche-Rigon, M., Seronde, M. F., De Groote, P., Jondeau, G., . . . Delahaye, F. (2013). Current aspects of the spectrum of acute heart failure syndromes in a real-life setting: the OFICA study. *European Journal of Heart Failure*, 15(4), 465-476.
- Members, A. T. F., McMurray, J. J., Adamopoulos, S., Anker, S. D., Auricchio, A., Böhm, M., Fonseca, C. (2012). ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. *European Heart Journal*, 33(14), 1787-1847.
- O'Gara, P., Kushner, F., Ascheim, D., Casey, D., Chung, M., de Lemos, J., Franklin, B. (2013). ACCF/AHA Guideline: 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*, 127, e362-e425.
- Siirilä-Waris, K., Lassus, J., Melin, J., Peuhkurinen, K., Nieminen, M. S., & Harjola, V.-P. (2006). Characteristics, outcomes, and predictors of 1-year mortality in patients hospitalized for acute heart failure. *European Heart Journal*, 27(24), 3011-3017.
- Takahashi, M., Kohsaka, S., Miyata, H., Yoshikawa, T., Takagi, A., Harada, K., . . . Sato, N. (2011). Association between prehospital time interval and short-term outcome in acute heart failure patients. *Journal of Cardiac Failure*, 17(9), 742-747.
- Tirfe, M., Nedi, T., Mekonnen, D., & Berha, A. B. (2020). Treatment outcome and its predictors among patients of acute heart failure at a tertiary care hospital in Ethiopia: a prospective observational study. *BMC Cardiovascular Disorders*, 20(1), 1-10.
- Tromp, J., Ter Maaten, J. M., Damman, K., O'Connor, C. M., Metra, M., Dittrich, H. C., . . . Davison, B. (2017). Serum potassium levels and outcome in acute heart failure (data from the PROTECT and COACH trials). *The American Journal of cardiology*, 119(2), 290-296.
- WHO Fact Sheet. [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)).