

*Full Length Research Paper*

# **Assessment of major causes of heart failure and its pharmacologic management among patients at Felege Hiwot referral hospital in Bahir Dar, Ethiopia**

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Heart failure is a complex, clinical syndrome of signs and symptoms that are caused by defects in cardiac structure, function, or both, resulting in impairment of peripheral circulation and organ oxygenation. It is a staggering clinical and public health problem and the study of the epidemiology on heart failure demonstrated that heart failure is associated with significant mortality, morbidity, and health care expenditures. It is a disorder in which the heart pumps blood inadequately which lead to reduced blood flow, congestion of blood in the veins and lungs, and other changes that may further weaken the heart. The aim of this study is to assess the relative contribution of the various causes of heart failure and its prevalence over time which helps policy makers as a tool for decision making in allocating resources and to analysis the association of heart failure with related factors. To a chive this objective of the study a retrospective cohort study based on data from the heart failure patients at Felege Hiwot referral hospital from 2013 to 2017. The analysis revealed that the prevalence of heart failure was decreased over time when we compared patient who had taken treatment with patients who does not take any treatment. Hypertension, diabetes mellitus, anemia, and infection were highly correlated with heart failure and had significant effect on heart failure ( $p < 0.05$ ) and treatments are the basic way to manage heart failure and to recover from this disease. About 71% of patients who died from heart failure were died within four years of diagnosis.

**Key words:** Assessment, heart failure, management and pharmacologic.

## **INTRODUCTION**

Heart failure (HF) is a complex, clinical syndrome of signs and symptoms that are caused by defects in cardiac structure, function, or both, resulting in impairment of peripheral circulation and organ oxygenation in which

more than 6 million people in the United States older than 20 years have heart failure, approximately 800,000 new cases are diagnosed each year (Katz, 2013). Heart failure is a major public health problem associated with

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high morbidity and mortality among individuals 65 years and older (Sochalski et al., 2009). It is the most common principal discharge diagnosis among medicare beneficiaries and the third highest for hospital reimbursements (Home Health Agency center, 2017). This disease is the leading causes of death in all developing regions of the world with the exception of sub-Saharan Africa, where the first phase of the epidemiologic transition is still dominant, although with a shifting trend towards a double burden of infectious and non-communicable diseases (Boutayeb, 2006). Epidemiological studies and data from clinical trials have shown that the early time period after a hospitalization for HF is a particularly vulnerable interval. Although survival rates for all patients with HF have improved during the past several decades, the greatest gains have been made in the treatment of patients with heart failure with reduced heart failure (Gurwitz et al., 2013).

Evidence from clinical trials supports the use of digoxin to improve symptoms and reduce hospitalization in patients with HF with reduced left ventricular ejection fraction particularly in patients with more advanced symptoms that contributes to digoxin's as well as neurohumoral and it acts by inhibiting the Na-K-ATPase pump, thus reducing the transport of sodium from the intracellular space in myocytes (Ambrosy et al., 2014). An observational study, including propensity analysis (Cleland, 2013), report that aspirin 75 mg/d, given to 828 outpatients with chronic heart failure, was associated with a 30% reduction in hospitalizations for heart failure and a 42% reduction in mortality compared either with 503 patients not taking aspirin or 64 patients taking higher doses of aspirin.

Based on a research done on the prevalence and etiology of heart failure in patients seen at a teaching hospital in Ghana, the result shows that among the 524 patients involved in the study, 398 of the patients had heart failure according to the modified framingham criteria for the diagnosis of heart failure; giving rise to a prevalence of 76%. Duration of heart failure symptoms is an important factor affecting survival in patients who receive mechanical circulatory support. Patients with heart failure who received mechanical circulatory support have an overall better survival and higher frequency of transplantation and myocardial recovery, despite being sicker at the time of implantation.

In developing countries including Ethiopia, there are many unsettled issues and even controversies among physicians regarding the pharmacologic preferences, indications and contra indications to start a drug and when to hold. In the study done by Belete and Fessahaye (2010) in Jimma University specialized hospital during a five year period, they found that among 781 cardiac cases, Rheumatic heart disease was more common 256 (32.8%) followed by hypertensive heart disease and cardiomyopathy accounting for 189 (24.2%)

and 158 (20.2%) of cases, respectively. There were no study done on incidence or prevalence of heart failure in the adult population in Ethiopia. However, there are indicators that heart failure will be a significant burden in the country, and typically affects middle-aged adults. The aim of this study is to assess the relative contribution of the various causes of heart failure and its prevalence over time which help policy makers as a tool for decision making in allocating resources. Additionally it can be used as a baseline data for community based epidemiological studies to see burden of heart failure diseases in the public setting and to identify the significant factors which causes heart failure.

## MATERIALS AND METHODS

### Study design and eligibility for the study

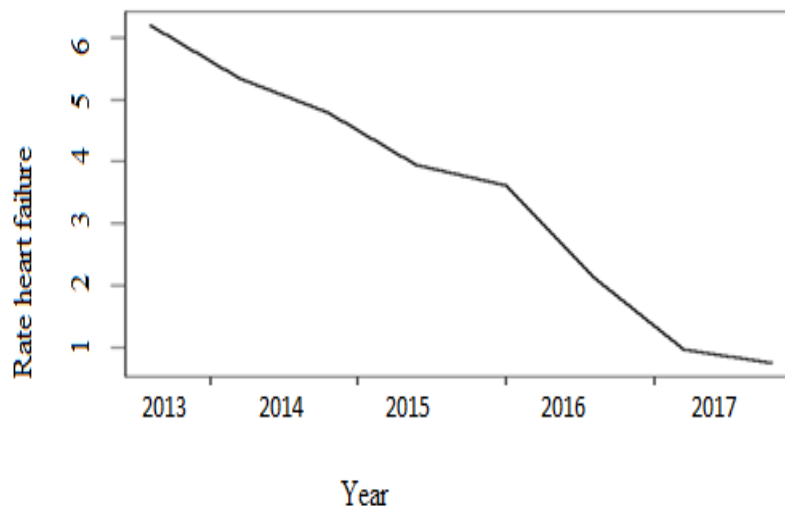
A retrospective record review was conducted to collect data registered from September, 2013 to August, 2017. The target populations of this study are all heart failure patients who attend Felege Hiwot referral hospital and have been active in follow-up for their Heart failure. During the 4 year period from September 2013 to August 2017, a total of 1681 cardiac patients were admitted, 936 patients to the medical ward and 745 patients to intensive care units (ICU). Among these 384 cases that had follow up and newly diagnose patients who were enrolled to the follow up and had complete card record were taken as study subjects. And hence, 384 patients were considered to collect the data of heart failure which was evaluated at fixed time points. During the data collection time each incomplete chart of the patient was excluded to overcome the problem of data missing, even though there were missing handling mechanisms.

One aim is to ensure horizontal equity in the analyses and comparison on the effect of factor affecting heart failure. The relevant inpatient data were extracted with the study variables on sex, age, precipitating factor, duration of illness, method of diagnosis, associated factors, drug combination, cause of congestive heart failure, frequency of emergency visit, frequency of hospitalization, Spironolactone, digoxin, aspirin, final assessment, New York heart classification and Simva or atrovastatin. Previous studies have reported a proportion among patients with heart failure widely varying from 13 to 74% (Vasan et al., 1995). The different study populations and differences in study design and diagnostic criteria used for heart failure in general are probably responsible for these discordant epidemiological data (McAlister et al., 1999). A recent retrospective community study conducted in patients hospitalized for heart failure over a period of 15 years showed an decrease over time in the average prevalence of heart failure after they starts the treatment as compared with heart failure who had not start their drugs which could be one explanation for the variable proportion of patients with heart failure in various studies. Studies including younger patients show a lower frequency of heart failure (Cohn and Johnson , 1990). Multivariable analysis identified older age, stroke, diabetes, cancer, hyponatraemia, and low glomerular filtration rate as predictors of 5 year mortality in heart failure. In a recent study including hospitalized patients with newonset heart failure, 1 year predictors of mortality in patients with preserved heart failure were age, systolic blood pressure, hyponatraemia, anemia, renal dysfunction, and co-morbidities (Owan et al., 2006). An exploratory analysis was conducted to obtain descriptive statistics of the study variables to obtain percentages and to analyses the

**Table 1.** Covariates used in the assessment of heart failure data.

Variable	Categories (Descriptions)
Sex	Female, Male
Age	Year
Education status	Literate, Illiterate
Precipitant factors	Infection, Arrhythmia, Anemia, MI and Drug discontinuation
Duration of illness	newly diagnosed, less than 1, 1-5 and more than 5 years
Method of diagnosis	Clinical + CXR, ECG, ECHO
NYHA classification	NYHA class ii, NYHA class iii and NYHA class iv
Cause of CHF	CRVHA, Cardiomyopathy, IHD, HHD, Corpulmonale, Anemia
Time of emergency visit	None, Once, Twice, 3 times and more than 4 times per year
Time of hospitalization	None, Once, twice, 3 times and more than 4 times per year
Aspirin	Yes and No
Simva/Atorvastatin	Yes and No
Spironolactone	Yes and No
Digoxin	Yes and No
Associated factors	Hypertension, CKD, DM, RVI and thyroid disorders

NYHA = New York Heart Association, ECG = Electrocardiogram, DM=Diabetes mellitus, CKD = Chronic Kidney disease, HHD= Hypertensive heart disease, IHD = Ischemic heart disease, MI = myocardial infarction, CXR = Chest x-ray, CRVHD = Chronic rheumatic valvular Heart disease, CHF= congestive heart failure, RVI = Respiratory viral infections ECHO = Echocardiogram.

**Figure 1.** Progression of heart rate over time.

relationship between the degree of heart failure and the health failure related factors, a univariate analysis was performed using the chi-square test. Continuous variables were expressed as mean  $\pm$  standard deviation while the categorical variables were summarized by per cents and analyzed with Chi-square test. Associations of heart failure with age, sex and others factors were sought using chi-square. P value  $\leq 0.05$  was considered statistically significant. In this study several potential explanatory variables were considered in this study (Table 1).

## RESULTS AND DISCUSSION

In this study 384 patients were considered to collect the heart failure which was evaluated at fixed time points. Based on graph of Figure 1, this study had shown that after the patient starts their medication, the rate of heart failure was changed over time. The notion is that because heart rates may increase or decrease over time

**Table 2.** Univariate analysis of predictors in patients with heart failure.

<b>Variable</b>	<b>% (n)</b>	<b>P-Value</b>
Age	48.36±19.043	0.0001
Sex (Female)	53.6(206)	0.002
Education (Illiterate)	271(70.6%)	0.0021
<b>NYHA Class</b>		<b>0.008</b>
NYHA class ij	6(23)	
NYHA class iij	11.5(44)	
NYHA class iv	27.3(105)	
<b>Percipient factors</b>		<b>0.004</b>
Infection	27.3(105)	
Arrhythmia	18.8(72)	
Anemia	15.9(61)	
MI	10.4(40)	
Drug discontinuation	9.1(35)	
<b>Method of diagnosis</b>		<b>0.031</b>
Clinical + CXR	26.8(103)	
ECG	7(27)	
ECHO	66.1(254)	
<b>Cause CHF</b>		<b>0.0001</b>
HHD	9.6(37)	
Corpulmonale	7.3(28)	
Anemia	9.6(37)	
Other	2.3(9)	
<b>Duration of illness</b>		<b>0.006</b>
Newly diagnosed	22.8(88)	
< 1 year	38.3(147)	
1– 5 years	32.6(125)	
>5 years	6.3 (24)	
<b>Drugs</b>		<b>0.0041</b>
Aspirin (yes)	6.2 (24)	
Digoxin (yes)	33.9 (130)	
Spironolactone	68 (261)	
Simva/Atorvastatin	59.4 (228)	
<b>Associated factors</b>		<b>0.0071</b>
Hypertension	38.8 (149)	
CKD	6.8 (26)	
DM	20.3 (78)	
RVI	2.1 (8)	
Thyroid disorders	2.1 (8)	
Other	7.03 (27)	

in response to changes in a person's condition or response to a treatment. From the graph we understand that, when the patients start their follow up like taking of treatments (aspirin, digoxin, Spironolactone) the prevalence of heart failure was decreased over time as

compared to the patient who does not take any treatment.

Based on the result of Table 2, the demographic characteristics result, states that the mean age was 48.36 years with a standard deviation of ±19. 043 which shows

that heart failure was affect the middle age group as well as the older age group and age had a significant effect on heart failure ( $p = 0.0001$ ). This result also has similarity with the study of Hunt (2005) who conclude that the overall prevalence of heart failure in the adult population in developed countries is 2% and its prevalence increases with age. Among the total study subjects 53.6% (206 cases) were females that indicates females were more exposed for heart failure than males, sex was also one significant factor for the cases of heart failure ( $p=0.002$ ) which is in line with the study result of Isaac and Yaw (2013) and the study by Scantlebury and Borlaug (2011), which states the etiology of heart failure has been shown to have significant differences by sex.

Similarly, on the result of education status most of the patients were, 271(70.6%) were illiterate ( $p=0.0021$ ). This result is an indicator about the inverse relationship between education and management of heart failure disease for an individual which is similar to the study of Harper et al. (2011) were conclude developed nations, education has been shown to be inversely associated with coronary heart disease. This relation has great importance to many health professionals and policy makers (Commision on Social Determinants of Health, 2008).

Different associated factors had a significant effect on heart failure ( $p = 0.0071$ ). Among those factors hypertension was a cause in 149 (38.8%) of the patients, 26 (6.8%) patients had chronic kidney disease, 78(20.3%) patients had diabetes mellitus (DM), 8 (2.1%) patients had retroviral infection and another 8 (2.1%) had thyroid disorder as a comorbidity. 27 (7.03%) patients had other associated factors like smoking, family history and obesity while the remaining 88 (22.9%) of patients had no documented associated factor which share similar findings with the study of Owan et al. (2006). From this result, hypertension and diabetes mellitus were contributing the highest percentage for cause of the heart disease. When we consider the variable of NYHA class had its own effect on heart failure ( $p=0.008$ ). Based on the NYHA class, 317 (82.6%) of patients had NYHA class *iv*, 44 (11.5%) had NYHA class *iii* and 23 (6%) of the cases had NYHA class *ii*, this reflects NYHA class *iv* takes the highest portion for the cause of heart failure as compared to the other NYHA class. This result is different from Ahmed et al. (2006), however, because the NYHA classification involves doctors' subjective judgment of symptoms and clinical data, wide interobserver variability has been reported. Once the patients went to medication they had diagnosed in different mechanisms, since method of diagnosis had an effect on the type of treatment they had taken ( $p = 0.031$ ). According to this study result about 254(66.1%) of the study subjects were diagnoses in Echocardiogram (ECHO) method and 103(28.6%), 27(7%) were diagnoses by Clinical + CXR and ECG respectively.

After identifying patients that has heart failure, appropriate drug were given for each patients which were the more significant factor in the management of heart failure ( $p= 0.0041$ ). Among those patients, 261(68%) used spironolactone, 228 (59.4%) used simva/atorvastatin and 130(33.9%), 24(6.2%) used digoxin and aspirin respectively. From our observe spironolactone takes the highest percentage for controlling heart failure disease. This is because spironolactone used to treat heart failure by reduces blood pressure, also prevent body from absorbing too much salt which had effect on heart failure. Similarity, simva/atorvastatin helps to control associated factors like DM, hypertension even if aspirin contribute the smallest portion, it is used to lower risk of heart failure in patients with coronary artery disease such as patients with history of heart attack. Drugs reduced heart failure hospitalizations and the combined events of heart failure death or heart failure hospitalization in patients.

In the same case 105 (27.3%) of cases with CHF were precipitated by infection and pneumonia which was the commonest infection accounting for 45 cases (42%) of all infections, arrhythmia was found to be the precipitant in 72 (18.8%) of cases, 61 (15.9%) had anemia as a precipitating factor and 40 (10.4%) had myocardial infarction which was highly related with heart failure and 35(9.1%) of patients had drug discontinuation as a precipitant. And based on duration of illness about 88 (22.9%) of cases were newly diagnosed patient, 147 (38.3%) were diagnosed on follow up for less than 1 year, 125 (32.6%) of cases had follow up between 1- 5 years and 24 (6.3%) were on follow up for > 5 years.

## Conclusion

Heart failure (HF) is an increasingly common problem and is associated with high morbidity and mortality. The associated factors were the most and common causes for heart failure ( $p<0.05$ ). Anemia is concomitant factor and a significant cause of heart failure which shows that risk factors of anemia especially infection like malaria and hookworm infestations are very common in this catchment areas of the study and this is a readily preventable cause by taking preventive measures. Treatments (drugs) are the basic way to manage heart failure and to recover from this disease ( $p= 0.0041$ ). About 71% of patients who died from heart failure were dead within four years of diagnosis, and all the patients who died from heart failure were New York heart association class IV patients which shows the functional status is an important predictor of outcome.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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