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A Study of Clinical Profile and Outcome of Acute Heart Failure in Elderly Patients

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Abstract
Heart failure (HF) is a common cardiovascular condition whose prevalence and incidence are increasing in the recent past. Heart Failure (HF) is predominantly a disorder of the elderly with rates increasing exponentially with time.

Keywords: Acute Heart Failure, Clinical Profile, Outcome

Material and methods
The Observational and prospective study was conducted in a tertiary care teaching hospital. The study included all patients >60 years of age diagnosed as acute heart failure as per Boston Criteria. Patients with chronic obstructive pulmonary disease and chronic heart failure were excluded. Patients were followed till either discharge or death.

Results
The study included total 72 patients. Male and female formed 51.40% and 48.60% of study population respectively. Based on ejection fraction on 2D ECHO, acute heart failure with reduced left ventricular ejection fraction HFrEF was seen in 87.50% subjects; HFpEF (6.90%) and HFmrEF (5.50%) respectively. Major comorbidities included both DM and HTN in 58.3% patients, DM and IHD in 20.8%, DM, HTN and IHD in 18.1% patients. As per Boston score, maximum patients 75.00% fell into range of 8-12, 20.8% (5-7) and 4.2% into score range of 1-4. Out of 66 patients 91.7% were discharged.

Introduction

Acute heart failure (AHF) represents a broad spectrum of disease states, with heterogeneous clinical presentations, but commonly characterized by either a rapid onset or a progressive worsening of signs and symptoms, requiring immediate treatment and leading to urgent hospitalization[1]. The initial clinical presentation is more heterogeneous than the simple description “de novo or worsening heart failure (HF)”, and includes several distinct phenotypes such as acutely decompensated HF, cardiogenic shock, pulmonary oedema, right HF, hypertensive HF and HF in the setting of acute coronary syndromes[2]. Despite increased prevalence and improved management very less statistics exist on heart failure in India. Amid that elderly were underrepresented in most studies. The clinical profile of heart failure in elderly patients will not only help in diagnosis but also management of the condition. Our study was aimed at studying the clinical profile, etiology and outcome of heart failure in such group at tertiary care center.

Materials and Methods

Study design

The Observational and prospective study was conducted at tertiary care teaching hospital. Ethical approval was obtained from Institutional Ethics Committee. After obtaining written and informed consent, patients satisfying inclusion and exclusion criteria were recruited in study over a period of 12 months. All elderly patients admitted in emergency, medicine wards and ICU having symptoms of heart failure were screened. A detailed history was recorded in addition to a thorough clinical examination, and routine and specific laboratory investigations were done. The study included all patients >60 years of age diagnosed as acute heart failure as per Boston Criteria (Table 1). Patients were followed till either discharge or death. Patients with chronic obstructive pulmonary disease and chronic heart failure were excluded.

Data Collection

All elderly patients admitted in emergency, medicine wards and ICU having symptoms of heart failure were screened. A detailed history was recorded in addition to a thorough clinical examination, and routine and specific laboratory investigations were done.

Table 1. Boston Criteria for Diagnosing Heart Failure

CRITERION	POINT VALUE*
Category I: history	
Rest dyspnea	4
Orthopnea	4
Paroxysmal nocturnal dyspnea	3
Dyspnea while walking on level area	2
Dyspnea while climbing	1
Category II: physical examination	
Heart rate abnormality (1 point if 91 to 110 beats per minute; 2 points if more than 110 beats per minute)	
Jugular venous elevation (2 points if greater than 6 cm H_2O; 3 points if greater than 6 cm H_2O plus hepatomegaly or edema)	2 or 3
Lung crackles (1 point if basilar; 2 points if more than basilar)	1 or 2

CRITERION	POINT VALUE*
Wheezing	3
Third heart sound	3
Category III: chest radiography	
Alveolar pulmonary edema	4
Interstitial pulmonary edema	3
Bilateral pleural effusion	3
Cardiothoracic ratio greater than 0.50	3
Upper zone flow redistribution	2

*— No more than 4 points are allowed from each of three categories; hence the composite score (the sum of the subtotal from each category) has a possible maximum of 12 points. The diagnosis of heart failure is classified as "definite" at a score of 8 to 12 points, "possible" at a score of 5 to 7 points, and "unlikely" at a score of 4 points or less.

RESULTS

Total 72 patients were enrolled for the study. Male and female formed 51.4% and 48.60% of study population respectively. In our study group,79.2% patients were in the age group of 60-70 years, 13.9% were in the age group of 71-80 years and 6.9% were in the age group of >80 years. Most common risk factor for heart failure is both hypertension and diabetes (seen in 58.3%), Diabetes mellitus and ischemic heart disease (seen in 20.8%) and DM & HTN & IHD (seen in 18.1% patients). 30.6% patients had history of alcohol intake while 58.3 % patients had history of smoking.

In our study population the most common symptom was dyspnea seen in 94.4%, pedal oedema seen in 59.7% patients followed by chest pain 45.8% followed by fatigue and cough respectively.

In our study population the most common sign was crackles seen in 83.3% patients followed by pedal oedema, Hepatojugular reflex, Pallor, hypertension, tachycardia and hypotension seen in 70.8%, 44.4 %, 41.7%, 26.4%, 25% and 23.6% respectively.

Most common presentation of HF was Dyspnea in which 44.4% presented with NYHA functional class 4, 36.1% presented with orthopnea while 27% having PND. In our study population 58.3% patients are obese having BMI >25 and 30.6 % are normal. 59.7% patients have collapsible IVC while 34.7% have non collapsible.

In our study population T wave inversion seen in 39% while 6% have tall T wave. 32 % patient have normal Q wave while 24 % have pathologic Q waves. In our study population 22% patients ECG showing

ST segment elevation while 13 % patient having ST segment depression. Most common 2d ECHO finding was mild to moderate MR (followed by mild to moderate TR.

Most common etiology found was hypertension (61.1% patients), followed by ischemic heart disease (52.8% patients). Etiologies of heart failure shown in table 2.

Table 2. Etiologies of heart failure

	Frequency	Percent
Hypertension	44	61.1%
IHD [ischemic heart disease]	38	52.8%
Fluid overload	20	27.8%
DCMP [Dilated Cardiomyopathy]	15	20.8%
Valvular Heart Disease	2	2.8%
High output states (Anemia)	1	1.4%
Others (atrial fibrillation)	1	1.4%

In our study population 84.7% patients received diuretics, 50% received vasodilators and only 2.8% patient received ARNI. According to EF 87.5 % patients have HFrEF i.e., EF <40%, 5.5% and 6.9% patients having HFmrEF and HFpEF respectively i.e., 87.7% patients having systolic heart failure and 12.3% patients having diastolic heart failure shown in table 3.

Table 3. Classification of heart Failure based on left ventricular ejection fraction (n=72)

	Frequency	Percentage
HFrEF	63	87.50%
HFmrEF	4	5.50%
HFpEF	5	6.90%

In our study population majority of acute heart failure patients (75.0%) has Boston score of 8-12 i.e., definite heart failure.

Table 4. Boston score distribution(n=72)

	Frequency	Percent
Unlikely<4	3	4.2%
Possible 5-7	15	20.8%
Definite 8-12	54	75.0%
Total	72	100.0%

Out of 72 patients 66 (92%) patients got discharged while 6 (8.3%) patients were died.

In our population low mean BP was associated with high mortality in acute HF, which is statistically significant.

Table 5. Outcome of heart failure in relationship with blood pressure (n=72)

	Discharge (n=66)		Death (N=6)		P value
	Mean	SD	Mean	SD	
Pulse(beats/mins)	93.4	18.8	83.0	14.0	0.191
MBP	87.3	19.5	66.2	30.4	0.018

In our study population raised CRP (mean 32.9) was associated with high mortality but statistically not significant. Most of patients who died had hyperuricemia (mean serum uric acid value is 9.3 mg%) as compared to patients who got discharged (mean serum uric acid value is 7.9mg %) but statistically not significant. Also, there is significant association between creatinine clearance and mortality (p value is 0.048). Mean Ejection fraction among patients who died was lower as compared to those who got discharged, which was found to be statistically significant. (P value calculated by independent t test is 0.026). Patient who died had higher value of LA size as well as LVIDs as compared to those who are discharged.

DISCUSSION

Worldwide Heart Failure is a major public health issue. The prevalence of heart failure is known to increase with age and is much higher in elderly patients. Our aim of this study was to assess the baseline characteristics of acute heart failure seen in elderly patients (>60 years) presenting to the emergency medical service of a tertiary care hospital with a diagnosis of acute heart failure based on the Boston Heart Failure criteria. Our analysis revealed a similar gender-based distribution in this study group as 51.4% males and 48.6% females met the inclusion criteria. Categorically, 79.2% patients were aged between 60-70years, 13.9% of patients were aged between 71-80years and 6.9% were more than 80 years old.

Table 6. Mean Age of presentation of HF in elderly patients

	Our Study	Sri Harsha Onteddu et al[3].	Ashiq Shukkoor et al[4]	AFAR study[5]
Mean age	66 yrs.	61 yrs.	60 yrs.	54
Gender distribution	Men>women	Men>women	Men>women	Men>women

The mean age at presentation in our study was 66.5 ± 6.9 years. This is similar to data from analysis of Ashiq Shukkoor et al where mean age of the total population included was 59.9 ± 13.3 years[4]. Similarly, another study conducted to assess the clinical profile of hospitalized patients with heart failure in North India by Sri Harsha Onteddu et al showed the mean age on admission to be 61± 14 years. Also, an increase in male distribution was noted among heart failure patients. Similar to Sri Harsha Onteddu et al Study has shown that the incidence of HF progressively increased across all age group and was greater in men than in women[3]. The differences in these findings across all studies could be attributed to regional differences or selection bias.

Table 7. Signs of heart failure

Signs	Our Study	Ashiq Shukkoor et al[4]
PND	27.8%	65.1%

The above table 7 showing paroxysmal nocturnal dyspnea in 27.8% in our study as compared to 74% and 65.1% respectively by Stella et al.

In our study more than 50% of the patients complained of typical symptoms, which included dyspnea (94.4%), oedema (59.7%), and fatigue (38.9%). Approximately 10%-50% patients presented with orthopnea, paroxysmal nocturnal dyspnea, cough, chest pain, weight gain and abdominal pain. Therefore, our analysis has identified dyspnea and pedal oedema as the key clinical features occurring with high frequency at presentation in elderly patients with acute HF. Ashiq Shukkoor et al[4] reported that breathlessness, tiredness and weight gain were the most presenting symptoms. Kuo dc et al has reported that dyspnea has a sensitivity of 84% and specificity of 34%, fatigue has a sensitivity of 31% and specificity of 70% while pedal oedema has a sensitivity of 50% and specificity of 78% for a diagnosis of HF. Although these symptoms are not highly specific or sensitive for a diagnosis of HF, their association with an acute episode of HF is well documented in medical literature. Also, dyspnea as a symptom is incorporated into Category I of the Boston Criteria for Diagnosing Heart Failure.

In our study, 10%-50% presented with hypertension (26.4%), hypotension, and tachycardia (25%), while <5% were noted to have jaundice and bradycardia. Data from our study has shown crackles, pedal oedema and pallor to be the most common physical signs seen in acute HF in decreasing order of frequency. Ashiq Shukkoor et al[4] has reported pulmonary edema in 92.6%, pedal edema in 80.6% . Fonseca et al study has reported crackles to have a sensitivity of 60% and specificity of 78%. Another study has shown that tachycardia (defined as heart rate > 110/min) has a sensitivity of 5.08% and specificity of 99.81% [6]. Therefore, tachycardia can be considered as important clinical indicators of acute HF and are included in the Boston Criteria for Diagnosing Heart Failure. Also, 2-D Echocardiographic evaluation was performed for all patients included in the study. This assessment revealed that systolic HF was more common than diastolic HF in our study population. Similar observations have been noted in Ashiq Shukkoor et al[4] study.in our study 61.1% patients having MR and 31.1 % patients having TR while Ashiq Shukkoor et al[4] study show similar 2D ECHO findings i.e., MR in 64.3% and TR in 25.6%.

The etiology and risk factors associated with heart failure are diverse and are likely to vary across world regions based on risk factor prevalence and quality of health care available. Our analysis has identified hypertension (61.1%) to be the most common etiology associated with heart failure followed by ischemic heart disease (52.80%) and fluid overload (27.80%). It is also well known that many heart failure cases are associated with multiple risk factors. Other etiologies associated with heart failure in this study population were valvular heart disease, co-existing hypertension and diabetes mellitus, and co-existing diabetes mellitus and ischemic heart disease. Amongst lifestyle related risk factors, alcohol and tobacco use were most prevalent in this cohort.

The findings discussed above are in accordance with results obtained from previous studies. Analysis from the ATTEND Registry has shown hypertension and valvular heart disease as the most common underlying diseases for patients aged >85 years[7]. Ischemic heart disease was the most common underlying condition noted in elderly patients aged between 75-84 years, while dilated cardiomyopathy was more frequently seen in those <65 years of age. The proportion of patients with valvular heart disease as an underlying cause increased linearly with advancing age. Data from the Framingham Heart Study also reported the probable causes of HF to be coronary artery disease (52%), hypertension (26%) and valvular heart disease (8%)[8]. Similarly, another study in the Japanese population identified ischemic heart disease (34%), valvular heart disease (22%), dilated cardiomyopathy (11%) and hypertension (10%) as the major underlying conditions associated with HF. This study reported that life expectancy of patients with HF caused by ischemic heart disease was the poorest. Results from the Helsinki Ageing Study have also identified ischemic heart disease (54%), hypertension (54%) and moderate-to-severe mitral or aortic valve

disease as the main underlying conditions for HF. The etiological factors associated with heart failure appear to be similar across these studies with a variation in prevalence.

Table 8. Etiology of HF in elderly patients

Etiology	Our study	Sri Harsha Onteddu et al.[3]	Ashiq Shukkoor et al[4]	Stella et al	Goncalvesova et al
HTN	HTN-61%	54%	54%	25.6%	10.5%
IHD	IHD -53%	68.9%	47.8%	36.86%	67%

Another important aim of this study was to identify factors associated with increased mortality in elderly patients with acute heart failure at presentation. Data analysis has shown increasing age (>70years) as a significant patient characteristic associated with a higher mortality rate (p=0.022). The comorbidities associated with increased mortality were pre-existing diabetes mellitus and hypertension and hyperthyroidism. Physical findings associated with an incremental mortality rate were low mean blood pressure (p=0.018) at the time of presentation. Several laboratory parameters were also assessed in this study group on admission. Analysis of laboratory data has shown that decreased creatinine clearance(p=0.048), and higher uric acid values were associated with an increased mortality rate in elderly patients. These findings are in accordance with previously conducted studies where similar observations have been noted [9].

These findings are in line with results from previous studies. Analysis of data from the ATTEND Registry has identified age to be linearly associated with higher mortality in elderly patients hospitalized with HF. Importantly, data from this registry has revealed that elderly patients >85 years of age were at high-risk for in-hospital cardiac death, even though it was their first episode of decompensation[6]. Moreover, data from a prospective registry in Netherlands has identified ischemic cardiomyopathy to have the worst prognosis compared to all other etiologies including advanced age, male gender, previous history of heart failure, diabetes mellitus and poor LVEF. Comparatively, a study from Japan reported the frequency of death to be highest secondary to dilated cardiomyopathy (60%) followed by ischemic heart disease (49.2%).

Additionally, data from the ATTEND Registry has identified elevated BUN levels as a predictor of adverse outcomes, which is similar to our results. We found the mean BUN levels to be higher in patients who died due to HF, however, this association was not statistically significant. Also, one study of hyperuricemia and incident heart failure by Eswar Krishnan published in 2009 identified that hyperuricemia is a novel, independent risk factor for heart failure[9]. A meta-analysis done by Gang Huang had shown that AHF patients with a higher values of SUA significantly increase risk of all-cause mortality and the combined endpoint of death or readmission, even after adjustment for conventional confounding factors. Determination of SUA level may improve risk stratification in patients with AHF. These findings are consistent with our study[10].

Table 9. Indicators of poor prognosis

Our study	CHS study[11]	Ashiq Shukkoor et al [4]
Normal SBP	Low SBP	SBP is normal

High Creatinine	Creatinine>1.4	Creatinine>1.4

Above table showing our study showing normal SBP similar to that of Ashiq shukkoor et al study. Also, creatinine level was high in our study as well as others like CHS study and Ashiq shukkoor et. Most of patients presented with baseline renal function and AKI.

Table 10. Population of Diabetes with heart Failure

	Our study	Sri Harsha Onteddu et al.[3]	Ashiq Shukkoor et al [4]
Diabetes	58.3%	60.07%	62.8%

Above table shows the percentage of diabetes population is 58.3% which is similar to that as found by Sri Harsha Onteddu et al, 62.8% Ashiq Shukkoor et al as compared to our study showing 58.3 % of study sample as diabetes.

Table 11: Classification of heart Failure based on left ventricular ejection fraction

	Our study	Ashiq Shukkoor et al [4]
HFrEF	87.50%	65.9%
HFmrEF	5.50%	20%
HFpEF	6.90%	14%

Above table shows that HFrEF constituted 87.5% of patients which is more than as found by Ashiq Shukkoor et al while HFmrEF and HFpEF constituted 5.5 and 6.9% patients which is lower than Ashiq Shukkoor et al.

Table 12- Mortality of heart failure

	Our study	Sri Harsha Onteddu et al.[3]	Ashiq Shukkoor et al [4]	AHEAD trial[12]
Mortality	8.3%	17%	2%	12.7%

Our study showed 8.3% mortality which is lower as shown in Sri Harsha Onteddu et al i.e. 17%, 2% Ashiq Shukkoor et al et al and 12.7% by AHEAD trial.

There are some limitations to this study that should be addressed. Firstly, the sample size for this study was relatively small in comparison to the densely populated region due to which the epidemiology and clinical profile of acute HF in the elderly population could not be assessed across all regions. Secondly, the study group was recruited from a single tertiary care hospital. Hence, it cannot be considered to be entirely representative of elderly patients throughout Mumbai. Thirdly, our dataset did not include past history of hospitalization for heart failure and previous treatment, which could be an important variable associated with mortality. Lastly, our laboratory assessment includes the natriuretic peptides, B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT-proBNP), which are known to be useful biomarkers for HF diagnosis, estimation of severity and prognosis but these were not available in majority of our patients.

Abbreviations:

HF: Heart failure, HFrEF: Heart failure with reduced ejection fraction, HFpEF: Heart failure with preserved ejection fraction, HFmrEF: Heart failure with mildly reduced ejection fraction, DM: Diabetes mellitus, HTN: Hypertension, IHD: Ischemic heart disease, AHF: Acute heart failure

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