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COMPARING CLINICAL CHARACTERISTICS AND OUTCOME OF PATIENTS OF ACUTE HEART FAILURE WITH REDUCED EJECTION FRACTION TO THOSE WITH PRESERVED EJECTION FRACTION

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ABSTRACT

Objective: To compare profile, clinical characteristics and outcomes of patients admitted with acute heart failure and reduced ejection fraction to those patients with preserved ejection fraction.

Study Design: Descriptive cross sectional study.

Place and Duration of Study: The study was carried out at Armed Forces Institute of Cardiology & National Institute of Heart Diseases from April to November 2016.

Material and Methods: All patients presenting to AFIC ER and diagnosed with acute heart failure were included in this study. Echocardiography was done for all the patients. Baseline characteristics, clinical profile, lab investigations and outcomes were documented.

Results: A total of 288 patients were included in this study, 223 (77.4%) patients had reduced ejection fraction (EF) <50% (HFrEF), 65 (22.5%) patients had preserved EF >50% HFpEF. Significantly higher numbers of female patients were seen in HFpEF group (0.04). Patients with preserved EF were significantly more hypertensive than patients with reduced EF (75.5% vs 54.0%, *p*-value 0.05), similarly systolic blood pressure >161 mmHg and diastolic blood pressure >101 mmHg was observed in patients with preserved EF as compared to patients with reduced EF. Heart failure complications including valvular heart disease (severe MR) and atrial fibrillation were more frequent in patients with preserved EF as compared to patients with reduced EF (10.8% vs 2.6% *p* 0.05 and 9.0% vs 1.3% *p* 0.04). Cardiogenic shock was more commonly encountered in patients with reduced EF (30.1% vs 4.6% *p* 0.03). NSTEMI was diagnosed in 15.6 (35.0%) patients with reduced EF and 3 (4.61%) patients with preserved EF (*p*-value 0.04). In hospital mortality was similar for both groups.

Conclusion: Hypertension, valvular heart disease and a trial fibrillation is more commonly present in acute heart failure patients with preserved EF. However acute heart failure patients with reduced EF more frequently have ischemic heart disease and present with NSTEMI and cardiogenic shock. Whereas, mortality is same for both groups. Therefore patients presenting with acute heart failure and preserved EF should be treated as aggressively as those with reduced EF.

Keywords: Heart failure, Left ventricular failure, Mortality.

INTRODUCTION

Heart failure (HF) is a major cause of morbidity and mortality in western countries. In the United States, almost 5 million people have heart failure and each year 550,000 patients are newly diagnosed with this condition. Heart failure with preserved ejection fraction (HFPEF) is an increasingly recognized form, and accounts for almost 50% of all admissions for decompensate heart failure. Limited data is available on inhospital outcome of these patients with preserved ejection fraction[1]. Acute heart failure is described as gradual or sudden worsening in sign and symptoms of heart failure requiring urgent therapy. These symptoms are primarily causes by pulmonary congestion due to increased LV filling pressures. Acute heart failure can occur with both preserved ejection fraction and reduced ejection fraction. Acute heart failure is precipitated by concurrent cardiovascular conditions, acute coronary syndrome, hypertension, valvular heart disease, a trial arrhythmias. Non cardiac conditions may also be

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present such as renal dysfunction, anemia and diabetes[2].

Acute heart failure is a life threatening medical emergency, and it is one of the most common reasons for hospital admissions. One out of 10 patients with acute heart failure dies in hospital, and one in three dies after an episode of acute heart failure within one year. In spite of advances in long-term care, no new treatments for acute heart failure have been developed during the past two decades[3].

Based on the data from both ADHERE and OPTIMIZE HF trial the average risk of death during hospital admission is approximately 4%. Patients who are admitted with acute heart failure and require vasoactive drugs for low blood pressure have a poor outcome as compared to the rest In the ADHERE trial mortality was 12 to 13% for patients who required ionotropic treatment[4].

The purpose of this study was to compare heart failure with reduced EF to patients of heart failure with preserved EF in terms of baseline characteristics and prognostic outcome.

MATERIAL AND METHODS

This is a cross sectional study, conducted at Armed Forces Institute of Cardiology Rawalpindi. Permission was obtained from hospital ethical committee prior to conducting the study. Informed Verbal consent was taken from all the patients. All patients diagnosed with acute heart failure on the basis of history and clinical examination are included in this study.Using WHO calculator a total of 288 patients were included in this study. All patients presenting with acute heart failure were divided into two groups group-1 included patients with reduced EF (EF<50%) and group-2 included patients with preserved EF (EF>50%).

Baseline characteristics, hemodynamic profile, co morbid (diabetes mellitus, hypertension, chronic obstructive pulmonary disease, ischemic heart disease), were documented. ECG was done to investigate atrial fibrillation. ECHO was done to evaluate any

Table-I: Demographic and clinical characteristics of acute heart failure patients with reduced and preserved ejection fraction.

Baseline characteristics	group-1 hfref (ef < 50%) n=223	group-2 hfpef (ef > 50%) n=65	*p*-value
Age in years mean ± sd	65.8 ± 12.4	68.9 ± 10.8	0.8
Age in groups			
<20 years	1(0.5%)	0	0.72
21-39	4(1.8%)	1 (1.5%)	0.81
40-59	50(22.4%)	7 (10.8%)	0.10
60-70	109(43.0%)	30 (46.1%)	0.50
70+	72(32.0%)	27 (41.5%)	0.50
Gender			
Males	183 (82.0%)	40 (61.0%)	0.09
Females	40 (18.0%)	25 (39.0%)	0.04
Diabetes mellitus	105 (30.1%)	30 (46.9%)	0.09
Hypertension	121 (54.0%)	49 (75.5%)	0.05
COPD	16.5 (7.4%)	6 (9.1%)	0.41
IHD	126 (56.5%)	22 (33.5%)	0.11
Atrial fibrillation	3 (1.3%)	6 (9.1%)	0.04
MR			
Mild	64 (28.6%)	3 (4.6%)	0.03
Moderate	48 (21.5%)	5 (7.6%)	0.08
Severe	6 (2.6%)	7 (10.8%)	0.05

valular abnormality and to determine ejection fraction by eye balling method. Determinants of prognostic outcomes like peak CPK, CKMB, serum Creatinine, cardiogenic shock (at presentation), NSTEMI (diagnosed at admission) was noted. In-hospital mortality in two groups was collected and documented.

Data analysis were done using SPSS version 24, Frequency percentages were carried out for qualitative variables that are gender, clinical characteristics and inhospital mortality. Mean and standard deviations were calculated for quantitative variables such as age, serum creatinine, sodium and cardiac enzymes.

RESULTS

A total no. of 288 patients were included in the study, out of which 223 (77.4%) patients had reduced EF (group-1) on Echoe and 65 (22.5%) patients had preserved EF (group-2) of >50%. Mean age for patients with reduced EF was 65.8 ± 12.4 years and for patients with preserved EF was 68.9 ± 10.8 years. There were 183 (82.0%) and 40 (18.0%) males and females respectively in group-1, while 40 (61.0%) and 25 (39.0%) males and females respectively in group-2. A comparatively higher number of female patients were observed in HFpEF group (0.04). Patients with preserved EF were significantly more hypertensive than patients with reduced EF (75.5% vs. 54% *p* 0.05), similarly systolic blood pressure >161 mmHg and diastolic blood pressure >101 mmHg was observed in patients with preserved EF as compared to patients with reduced EF (fig). Heart failure complications including valvular heart disease (severe MR) and atrial fibrillation were more frequent in patients with preserved EF as compared to patients with reduced EF (10.8% vs. 2.6% *p*-value 0.05 and 9.0% vs. 1.3% *p* 0.04) as shown in table-I. Cardiogenic shock was more commonly encountered in patients with reduced EF (30.0% vs. 4.6% *p* 0.03). NSTEMI was diagnosed in 15.6 (35.0%) patients with reduced EF and 3 (4.61%) patients with preserved EF (*p*-value 0.04). Lab data (cardiac biomarkers, creatinine and serum sodium) and inhospital mortality was similar for both groups (table-II).

Table-II: Comparison of prognostic outcomes of acute heart failure patients with reduced and preserved ejection fraction.

Prognostic Outcomes	Group-1 HFrEF (EF <50%) n=223	Group-2 HFpEF (EF>50%) n=65	*p*-value
Cardiogenic shock	67 (30.1%)	6 (9.0%)	0.03
Systolic blood pressure			
<140mmHg	160 (71.8%)	37 (57.0%)	0.05
141-160mmHg	38 (17%)	9 (13.8%)	0.11
>161mmHg	25 (11.2%)	19 (29.2%)	0.05
Diastolicblood pressure			
<90 mmHg	164 (73.7%)	37 (57.1%)	0.04
91-100 mmHg	41 (18.3%)	10 (15.3%)	0.10
>101 mmHg	18 (8.1%)	18 (28.2%)	0.04
NSTEMI (dx during admission)	35 (15.6%)	3 (4.6%)	0.04
Creatinine mg/dl (mean)	3.0	2.0	0.51
Cardiac enzymes			
CPK	442	337	0.72
CKMB	41	3	
Serum Sodium	135	134	0.91
In hospital mortality	50 (22.4%)	15 (23.0%)	0.81

DISCUSSION

Heart failure (HF) is a major cause of morbidity and mortality in western countries. In the United States, approximately 5 million people have heart failure and each year 550,000 are newly diagnosed with this condition[1]. Acute heart failure is described as gradual or sudden worsening in sign and symptoms of heart failure requiring urgent therapy[2]. According to European society of cardiology patients with acute heart failure can be divided into six possible categories overlap between these profiles can occur (1) worsening of decompensate chronic heart failure (2) hypertensive acute heart failure syndrome (3) Cardiogenic pulmonary edema (4) Cardiogenic shock (5) isolated right heart failure (6) acute heart failure with acute coronary syndrome[4-6].

Heart failure with preserved EF (HFpEF) is clinical syndrome comprising of symptoms of heart failure but left ventricle ejection fraction is not decreased. HFpEF has become prime form of heart failure in the developing world. It is one of the most challenging clinical syndromes Patients with heart failure preserved EF have multiple co morbidities including diabetes, hypertension, atrial fibrillation, vasculopathy, renal disease, metabolic syndrome all having a major impact on mortality[7].

Trials on heart failure with preserved EF show that 50% of all cases of new onset heart failure occur in presence of preserved ejection fraction (>50%)[1]. Epidemiological studies demonstrated patients with HFpEF were older, more frequently females and mainly cause of heart failure in these patients was due to hypertension. In our study patients with HFpEF had a mean age of 68.9 ± 10.8 years and 25 (39.0%) of patients were females, 19 (29.2%) patients had systolic bp greater than 160mmHg and 28 (28.2%) had diastolic bp greater than 110mmHg. French data from the EFICA (Epidémiologie Francaise de l'Insuffisance Cardiaque Aiguë) study performed in patients with acute HF demonstrated Cardiogenic shock is more frequently seen in patients with reduced EF. There is significant co-relation between systolic blood pressure and in hospital outcome[8]. In our study Cardiogenic shock was seen more frequently in patients with reduced EF, 67 (30.0%) patients with reduced EF had Cardiogenic shock whereas 6 (9.0%) patients with preserved EF had Cardiogenic shock. Atrial fibrillation at baseline is a predictor of poor outcome[1]. In our study atrial fibrillation was seen in 3 (1.3%) patients with reduced EF and 6 (9.0%) patients with preserved EF.

Previous studies demonstrated better outcome in patients with preserved EF, a study

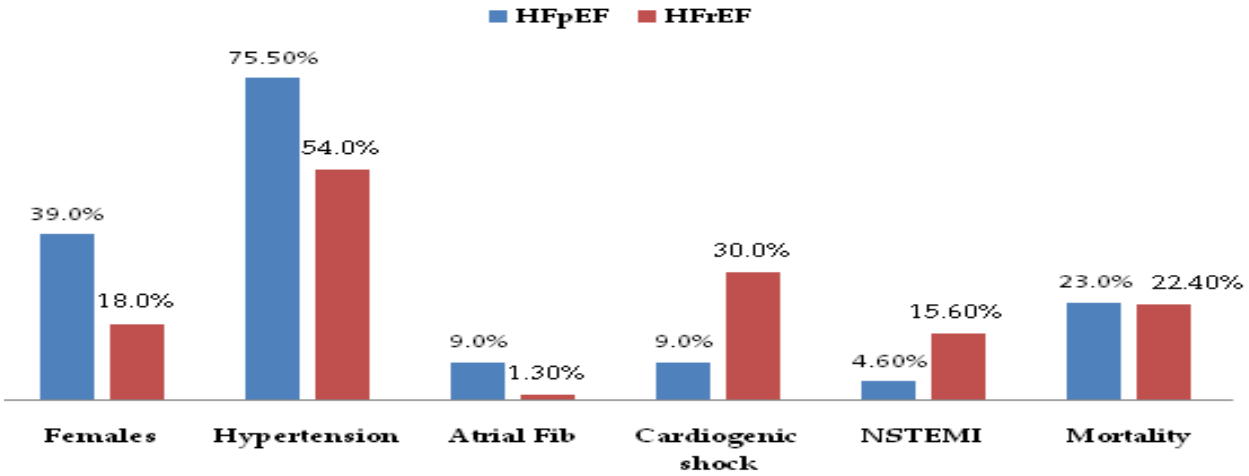

Figure: Comparison of risk factors and outcomes between heart failure patients with and without reduced ejection fraction.

conducted in 2008 in France by Tribouilloy demonstrated reduced mortality in patients with preserved EF[1].

However a cohort study conducted in South Asian population in 2015 demonstrated one year mortality was similar in patients with reduced EF and those with preserved EF. There was also no significant difference in 90-day Rehospitalization rates between the two groups[9]. In our study mortality was same for both groups.

Mitral regurgitation is associated with prognostic outcome in patients of acute heart failure. Even mild mitral regurgitation is associated with a poor prognostic outcome in patients having preserved EF however only moderate and severe MR is associated with poor outcome in patients with reduced EF[10]. In our study severe MR was more prevalent in patients with reduced EF, 7 (10.8%) patients with preserved EF and 6 (2.6%) patients with reduced EF had severe MR[11,12].

The Japanese Cardiac Registry of Heart Failure in Cardiology (JCARE-CARD) studied the characteristics and treatment of patients with acute heart failure. The prevalence of cardiovascular death was similar in patients with HFrEF and HFpEF. In contrast, mortality due to non-cardiovascular causes was significantly higher in patients with HFpEF than those with HFrEF[13,5]. NSTEMI was diagnosed in 35 (15.6%) patients with reduced EF and 3 (4.6%) patients with preserved EF in our study.

In the Acute Decompensate Heart Failure Syndromes (ATTEND) registry in Japan, patients with acute heart failure were assessed to demonstrate the association of EF and clinical features and co-morbidities with all-cause mortality after admission. The all-cause mortality rate did not differ between the reduced EF and preserved EF groups. Patients with preserved EF had non ischemic and hypertension as cause of new onset heart failure. In contrast, influence of diabetes mellitus and anemia on risk of all cause mortality was higher in patients with reduced EF[14]. In our study hypertension was more prevalent in patients with preserved EF, 121 (54.0%) patients with reduced EF and 49 (75.5%) with preserved EF were hypertensive.

The OPTIMIZE HF registry also proves that majority of patients with acute heart failure have preserved EF there is no significant difference in terms of hospital stay and in patient mortality between patient with reduced EF and preserved EF[15,16].

CONCLUSION

Hypertension, valvular heart disease and atrial fibrillation are more commonly present in acute heart failure patients with preserved EF. However acute heart failure patients with reduced EF more frequently have ischemic heart disease and present with NSTEMI and Cardiogenic shock. Whereas, mortality is same for both groups. Therefore patients presenting with acute heart failure and preserved EF should be treated as aggressively as those with reduced EF.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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