



CLINICAL PROFILE OF HEART FAILURE PATIENTS AND THEIR BNP LEVELS

General Medicine

Dr. Mahesh Babu Cherukuri

MGM Medical college and Hospital, Navi Mumbai.

Dr. Sandeep Rai

MGM Medical college and Hospital, Navi Mumbai.

Dr. Awais Farooque

MGM Medical college and Hospital, Navi Mumbai.

Dr. Shripal Jain

MGM Medical college and Hospital, Navi Mumbai.

ABSTRACT

Background: Heart failure (HF) is seen among 1.5% to 2% population and a main reason for hospital admission. The estimated prevalence increases about 10% in patients aged over 65 years. **Aims:** To study the clinical profile of patients with HF and compare BNP levels in patients of reduced and preserved ejection fraction. **Methodology:** This prospective observational study was conducted among 110 patients with signs and symptoms of HF, attending a tertiary care hospital in Navi Mumbai. Left ventricular ejection fraction (LVEF) was measured by 2D ECHO. Patients having LVEF <40% were grouped as reduced ejection fraction (HFrEF) while those with > 50% as preserved ejection fraction (HFpEF). **Results:** The mean age of study group was 64.49±13.8 years and 55.5% were male. Hypertension and diabetes were documented among 52.7% and 30% respectively. Reduced ejection fraction was seen among 58.2% and preserved among 41.8%. The mean BNP value of HFrEF and HFpEF were 379.6 ± 156.9 pg/mL and 135.1± 52.3 pg/mL respectively and this difference was statistically significant (p<0.05). **Conclusion:** Incidence of HFrEF (58.2%) more than that of HFpEF (41.8%). The BNP values were found to be lower among the HFpEF than the HFrEF, which needs to be interpreted with caution in predicting prognosis.

KEYWORDS

Heart Failure; BNP; Ejection fraction; Left ventricular dysfunction

INTRODUCTION

Heart failure (HF) is the pathophysiologic state in which the heart, via an abnormality of cardiac function (detectable or not), fails to pump blood at a rate commensurate with the requirements of the metabolizing tissues or is able to do so only with an elevated diastolic filling pressure. HF represents a clinical syndrome with increasing prevalence and causing an increased risk of death, increased hospitalization rates, a decrease in quality of life and higher costs through complex therapeutic strategies.

Many consider heart failure with preserved ejection fraction (HFpEF) to be a disorder of diastolic function (hence the term 'diastolic heart failure'), whilst others believe that it may be due to a combination of diastolic abnormalities with subtle disturbances of systolic function that are insufficient to reduce left ventricular ejection fraction (LVEF).¹ HFpEF refers to heart failure patients with an LVEF of greater than 50%.²

AIMS:

- To study the clinical profile of patients of heart failure
- To compare BNP levels of patients with Heart failure reduced ejection fraction (HFrEF) with patients of Heart failure preserved ejection fraction (HFpEF)

METHOD:

Study Design: A prospective observational study

Study Setting: Patients attending the general medicine and emergency OPD of a tertiary care teaching hospital in Navi Mumbai during the period June 2021 to December 2022

Sample size: Calculated using the formula, $n = (Z_{\alpha/2} + Z_{\beta})^2 \cdot \sigma^2 / d^2$, where, $Z_{\alpha/2}$ is the critical value of the normal distribution at $\alpha/2 = 1.96$, Z_{β} is the critical value of the normal distribution at $\beta = 0.84$ and σ^2 is the pooled standard deviation (SD), and d is the difference between the two groups. The values of pooled SD and d was obtained from a previous study (Okamoto, R et al)³ and the sample size was found to be 109 which was rounded off to 110.

Selection Criteria:

Inclusion Criteria

- Patients having symptoms and signs of heart failure (based on Framingham criteria)
- Age more than 18 years of both the sex
- 2D Echo findings suggestive of heart failure

Exclusion Criteria

- Patients who have undergone recent cardiac surgeries (CABG, valve repair, etc)
- Patients with chest wall injuries (blunt/penetrating)
- Patients who have non cardiac causes of dyspnoea, oedema and fatigue
- Patients not willing to give voluntary signed consent for study

Sampling Method:

Consecutive sampling of patients fulfilling the selection criteria was done during the study period till the desired sample size was obtained.

Procedure:

Complete history and general examination were done for all study participants. 2D ECHO was done to measure the Left Ventricular Ejection Fraction (LVEF). Those with LVEF <40% were grouped as Heart failure with reduced ejection fraction (HFrEF) and those having LVEF >50% as Heart failure with preserved ejection fraction (HFpEF). The study participants were followed up at regular interval till they got discharged or died.

Statistical Analysis:

Data entry was done MS excel soft and analysis was done using SPSS ver. 20. Quantitative data is presented in mean and standard deviation. Comparison among the study groups was done with the help of unpaired t test and chi-square test as per results of normality test with 'p' value less than 0.05 was taken as significant. Qualitative data is presented in frequency and percentage table.

Ethics:

The study was conducted after obtaining institutional ethics clearance (IEC) certificate. Informed consent was obtained from all patients before enrolling the study.

RESULTS:

The mean age of study participants with HF was 61.49 ± 13.88 years with majority belonging to the age group of 61 to 70 years. The male constituted 55.5% and females 45.5%. Based on NYHA, 69 (62.7%) belonged to Class III and 41 (37.3%) Class IV. Of the total 110 patients, 30.9% were smokers and 8.2% had history of alcohol consumption. Details of co-morbidities are given in Table 1.

Table 1: Distribution Of Patients Based On Co-morbidities (N=110)

Co-morbidities	Frequency (n)	Percentage (%)
Arterial hypertension	58	52.7

Diabetes	33	30
Coronary Artery Disease	29	26.4
Chronic Atrial Fibrillation	28	25.4
Atrial fibrillation in anticoagulation	19	17.3
Chronic Obstructive Pulmonary disease	14	12.7

Based on the ejection fraction, it was seen that 64 (58.5%) had Reduced Ejection Fraction (HFrEF) (EF<40%) and 46 (41.8%) had Preserved Ejection Fraction (HFpEF) (EF>50%). The complications documented among the study patients were respiratory tract infection (24.5%), atrial fibrillation (4.5%), unstable angina with dialysis (2.7%), bradycardia (1.8%), acute myocardial infarction (1.8%) and pulmonary thromboembolism (1.8%). The comparison of BNP values of the two groups HFrEF and HFpEF is given in table 2. There was statistically significant difference in the mean values of BNP between the two group, $t(df) = 10.15(108)$, $p < 0.05$.

Table 2: Comparison Of BNP Levels Among HFrEF And HFpEF Group

	HFrEF (n=64)	HFpEF (n=46)	t-test (df), p value
	Mean \pm SD	Mean \pm SD	
BNP (pg/ml)	379.59 \pm 156.91	135.13 \pm 52.27	10.15 (108), $p < 0.0001$

On follow-up of the 110 patients, 98 (89.1%) were discharged while 12 (10.9%) expired. There was statistically significant difference in age, NYHA class, serum urea, creatine, potassium and BNP levels among those who got discharged and expired. Even the complications were more among the expired group than discharged group.

DISCUSSION:

Our study results majority (70%) with HF belonged to the age group of more than 60 years. The result of present study is similar with the findings of the study conducted by Framingham study.⁴ In our study, the mean age of patients was 61.49 ± 13.88 , similar observations were made in a study by Fathima et al.⁵ Several others studies^{6,7} conducted among hospitalized heart failure patients suggest that, the mean age (\pm SD) of population to be in the range of 69 to 80 years, suggesting that the heart failure occurrence was more in older age group. Our study reports that that out of 110 study subjects, around 56% were male and 44% were females. Other studies also reported similar findings that the male gender was dominant among the heart failure patients.⁵

The most common co-morbidity among patients with HF was Arterial hypertension. The prevalence of hypertension as a heart failure aetiology differs geographically. The study conducted by Tromp et al.⁸ reported that 36.7% of the heart failure patients had hypertensive heart failure. The Framingham Heart Study cohort found that 91% of the study subjects with Heart Failure had history of hypertension.⁹ Our study findings suggests that around 30% of the heart failure patients had history of diabetes. Diabetes and dyslipidaemia frequently co-exist with hypertension which further increases the risk of heart failure. Similar results were presented in the studies conducted by Jan H de Boer et al.¹⁰ and Toshiaki Otsuka et al.¹¹ In our study, 26.4% had coronary artery disease, 25.4% had chronic atrial fibrillation, 17.3 % had atrial fibrillation in anticoagulation and 12.7% had COPD. Palkhiwala N et al.¹², found in this study conducted among 70 heart failure patients that, 48.6% patients had diabetes, 38.6% had hypertension. In our study, 30.9% patients were smokers and 8.2% were consuming alcohol. Reddy et al.¹³ concluded that the smoking, alcoholism, ischemic heart disease and hypertension were the leading risk factors in developing HF.

We found 58.2% patients with HF to have a reduced ejection fraction (HFrEF) (EF<40%) and 41.8 % to have preserved ejection fraction (HFpEF) (EF \geq 50%). In a study by Solani Y et al.¹⁴ the results showed that 57% of heart failure patients had HFrEF and 43 % had HFpEF. There was significant difference in the mean BNP value of HFrEF and HFpEF in our study. In a similar study by Van et al.¹⁵, BNP values were lower among the HFpEF than HFrEF, but the prognosis of patients with HFpEF for any given level were poorer than those with HFrEF. Hence, physician need to be aware of this and take precaution among HFpEF with low BNP values.

The proportion of expired males in our study was 66.7% and that of females was 33.3%. Krittayaphong et al.,¹⁶ obtained a slightly different proportion of mortality among males (63.0%) and among

females (37.7%). According to the NYHA class, higher mortality among class IV patients was observed as compared to class III. Levy D et al.⁹ also reported similar findings.

CONCLUSION:

Incidence of HFrEF (58.2%) was compared to HFpEF (41.8%). Brain natriuretic peptide levels are cost effective and simple measures of cardiac function and thus BNP level can be used to diagnose the heart failure. Early diagnosis and proper treatment during the initial stage of heart failure can slow the progression of heart failure and thus improve prognosis.

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