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ORIGINAL ARTICLE

COMPARATIVE STUDY OF HEART FAILURE WITH PRESERVED EJECTION FRACTION VERSUS DECREASED EJECTION FRACTION

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ABSTRACT: BACKGROUND AND OBJECTIVES: To study the socio demographic profile, risk factors, clinical presentation and comorbidies in patients with heart failure. To compare the socio demographic profile, risk factors, clinical presentation and comorbidities in patients with Heart failure with normal ejection fraction (HFnEF) and Heart failure with reduced ejection fraction (HFrEF). **METHODS:** The primary study population consisted of 100 cases of adult men and women aged more than 18 years with symptoms of Heart failure diagnosed by Framingham's criteria. The study population was selected from inpatients and outpatients attending Department of Medicine of KIMS hospital between January to December 2012. The study was a hospital based observatory and comparative study. **RESULTS:** Out of 100 cases included in our study 50% cases had HFrEF & 50% cases had HFnEF as confirmed by echocardiographic parameters. There was no statistically significant difference between the two groups with respect to age and sex. However there were significant statistical significant differences between the groups with respect to clinical features, risk factors and co morbidities. Clinical features like oedema, hepatomegaly and rales were common in HFrEF group ($P<0.05$). Also LVESD & LVEDD were increased in patients with HFrEF. Risk factors like prior MI/IHD were more common in patients with HfrEF ($P<0.05$). History of hypertension and left ventricular hypertrophy were common in patients with HFnEF ($P< 0.05$). Among the comorbidities: IHD Conduction abnormalities were common in HFrEF group. Pericardial effusion was more common in HFnEFgroup.

KEYWORDS: Heart failure with reduced ejection fraction (HFrEF), heart failure with normal ejection fraction (HFnEF), left ventricular end diastolic dimension (LVEDD), left ventricular end systolic dimension, ischaemic heart disease (IHD).

INTRODUCTION: Heart failure is a patho-physiological state in which an abnormality of the cardiac function is responsible for the failure of the heart to pump blood at a rate commensurate with the requirements of the metabolizing tissues. Heart failure (HF) is a major epidemic and a significant public health problem [1]. Heart failure has classically been considered to be a clinical syndrome associated with cardiac dilatation and impaired cardiac contractility. However studies have found that increasing numbers of patients with heart failure have an ejection fraction more than 50%.

The clinical syndrome of heart failure with preserved left ventricular function (LVF) also defined as HF with a normal ejection fraction, is defined by the presence of symptoms and signs of heart failure, evidence of normal systolic function during a heart failure event and evidence of diastolic dysfunction chiefly from echocardiography - A condition resulting from an increased resistance.

Definitions of Heart Failure: A pathophysiological state in which an abnormality of cardiac function is responsible for the failure of the heart to pump blood at a rate commensurate with requirements of the metabolizing tissues (Braunwald1994).[2, 3]

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Congestive heart failure represents a complex clinical syndrome, characterized by abnormalities of left ventricular function and neurohormonal regulation, which are accompanied by effort intolerance, fluid retention and reduced longevity. (Packer 1988).[2,3]

The lifetime risk of developing HF at the age of 40 yr is 11.4 per cent for men and 15.4 per cent for women. More than 500, 000 new cases are diagnosed each year [4, 5, 6.] The epidemiological transition reflects changes in disease patterns as societies develop, as described by Yusuf and colleagues in 2005[7,8]

A study showed that over the past two decades there has been a significant increase in the number of patients admitted to hospital with heart failure and preserved LVF [9.] The outcome in these patients may be better than in patients with reduced LVF. However, recent studies suggest that the prognosis in these patients is not so benign.[9,10]

OBJECTIVES OF THE STUDY:

1. To study the socio demographic profile, risk factors, clinical presentation and comorbidities in patients with heart failure.
2. To compare the socio demographic profile, risk factors, clinical presentation and comorbidities in patients with Heart failure with normal ejection fraction (HFnEF) and Heart failure with reduced ejection fraction (HFrEF).

MATERIALS AND METHODS: The primary study population consisted of 100 cases of adult men and women aged more than 18 years with symptoms of Heart failure diagnosed by Framingham's criteria. The study population was selected from inpatients and outpatients attending Department of Medicine of KIMS hospital between January to December 2012. The study was a hospital based observatory and comparative study.

Inclusion Criteria: Patients aged >18 years satisfying Framingham's criteria for heart failure.

Exclusion Criteria:

1. Those not satisfying Framingham's criteria for heart failure.
2. Comatose patients.
3. Patients with heart failure of age less than 18 years.
4. Patients unable to give informed consent.
5. Patients with congenital heart disease.
6. Patients with acute myocardial infarction /cerebrovascular accidents.

Clinical Data: Patients presenting to K.I.M.S hospital with symptoms of heart failure were manually reviewed to establish the diagnosis of heart failure using Framingham's criteria. Patients with heart failure were contacted directly and were requested to give consent for the study. Such patients underwent Doppler echocardiography to assess ejection fraction and other parameters.

Statistical Analysis: The test of significance used between the associations of different characteristics in this descriptive in hospital study was done using chi square test. For statistical significance, the P value was calculated and a value of less than 0.05 was considered significant.

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RESULTS:

DISTRIBUTION OF DEMOGRAPHIC FACTORS BETWEEN THE GROUPS (HFrEF Vs HFnEF)

SEX	HFrEF	HFnEF	Total
Males	30	23	53
Females	20	27	47
Total	**50**	**50**	**100**

Table 1: Comparison of sex distribution between the study population

P value=1.445

Among cases of HFrEF 60% were males and 40% females. Among cases of HFnEF

46% were males and the rest 54% females. However there was no statistically significant differences between the groups. Studies have shown increased prevalence of HFnEF among elderly females.

HF type	N	Mean age	SD of age
HFrEF	50	56.82	7.386
HFnEF	50	63.1	7.863

Table 2: Comparison of Age distribution between the study population

P value =1.000 Mean age of patients with HFrEF is 56.82 years and that of patients with HFnEF is 63.1 years. However the age distribution is not statistically significant. Studies have shown higher mean age among patients with HFnEF.

Age group	HFrEF	HFnEF	Total
25-35	nil	1	1%
36-45	6	Nil	6%
46-55	14	6	20%
56-65	26	22	48%
66-75	4	21	25%

Table 3: Age wise distribution of the study population

Maximum distribution of cases was in the age group of 55 to 65 years with HFnEF increasing steeply at 65-75 years. Other studies have also found the similar trend in the age distribution of cases.

DISTRIBUTION OF CARDIAC RISK FACTORS BETWEEN THE GROUPS:

DM	HFrEF	HFnEF	Total
Present	5	7	12
Absent	45	43	88
Total	**50**	**50**	**100**

Table 4: Distribution of Diabetes Mellitus between the groups

P value =0.095

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12% of the cases had Diabetes Mellitus type 2. 10% among cases of HFrEF and 14 amongst cases of HFnEF. This distribution has a modest statistical significance weighing towards HFnEF.

Smoking	HFrEF	HFnEF	Total
Present	29	20	49
Absent	21	30	51
Total	**50**	**50**	**100**

Table 5: Distribution of smoking habits between the groups

P value=0.187

49% of the study population are smokers.58% of patients with HFrEF were smokers compared to 40% of patients with HFnEF. However there was no statistically significant difference noted between the groups.

Obesity	HFrEF	HFnEF	Total
Present	3	5	8
Absent	47	45	92
Total	50	50	100

Table 6: Distribution of obesity/overweight between the groups

P value=0.712

8% of the study population had obesity defined by BMI of >30 kg/M2. However there was no statistically significant difference noted between the two groups.

Dyslipidemia	HFrEF	HFnEF	Total
Present	20	17	37
Absent	30	33	63
Total	**50**	**50**	**100**

Table 7: Distribution of Dyslipidemia between the groups

P value=0.364

37% of the cases had dyslipidemia defined by LDL levels appropriate for the presence of IHD/DM. However there was no statistically significant difference noted between the two groups.

HT N	HFrEF	HFnEF	Total
Present	21	30	51
Absent	29	20	49
Total	50	50	100

Table 8: Distribution of Hypertension between the groups

P value=0.12

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51% of the cases had Hypertension defined by the JNC criteria. 42% cases of HFrEF and 60% cases of HFnEF had hypertension. However no statistically significant difference was noted between the two groups.

IHD	HFrEF	HFnEF	Total
Present	37	7	44
Absent	13	43	56
Total	**50**	**50**	**100**

Table 9: Distribution of IHD/MI between the groups

P value=0.0001

IHD was defined by the presence of typical findings on ECG /ECHO/Angiography.44% of the cases had IHD. The results were statistically very significant.

DISTRIBUTION OF COMORBIDITIES BETWEEN THE GROUPS

Arrhythmias	HFrEF	HFnEF	Total
Present	6	14	20
Absent	44	36	80
Total	50	50	100

Table 10: Distribution of Arrhythmias between the groups

P value=0.08

Arrhythmias were present in 20% of the cases. Majority of the cases had atrial fibrillation. There was modest statistically significant difference noted between the groups weighing towards HFnEF.

Anemia	HFrEF	HFnEF	Total
Present	7	4	11
Absent	43	46	89
Total	**50**	**50**	**100**

Table 11: Distribution of Anaemia between the groups

P value=0.416

11% of the cases had Anaemia defined by Hb% of <12 for females & <13 for males. However there was no statistically significant difference noted between the two Groups.

DISTRIBUTION OF ECHOCARDIOGRAPHIC VARIABLES BETWEEN THE GROUPS

ECHO	HFrEF		HFnEF		
	Mean	SD	Mean	SD	P value
LVESD(mm)	48.02	10.02	29.6	8.1	<0.001
LVEDD(mm)	56.08	8.67	39.71	7.23	<0.001
LAsize(mm)	34.76	4.433	30.5	4.5	<0.001

Table 12

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Ejection Fraction was calculated using the Simpson's formula. Statistically significant difference was noted between the two groups with respect to the above mentioned echo parameters.

DISCUSSION: Nearly 50% of the patients attending to the hospital with heart failure have normal ejection fraction. Few epidemiological studies have examined differences in the prevalence of risk factors and co morbidities in patients with systolic heart failure as compared to those with preserved ejection fraction in India. The results of our study showed that multiple risk factors and co morbidities are present in patients with heart failure. Consideration of these co morbidities and risk factors should be taken into account in distinguishing patients with HFrEF from those with HFnEF and in their optional management since prognosis, morbidity and mortality differ between these groups.

The present study which included 100 cases was carried out on cases presenting to KIMS hospital with symptoms of heart failure during the time period from January 2012 to December 2012. Detailed medical history was taken. Cases were meticulously examined and manually revived to establish the diagnosis using Framingham criteria. Each patient underwent echocardiography to assess ejection fraction and other parameters. Based on the echo parameters the patients were categorized to two groups (HFpEF & HFrEF). Patients were subjected to basic investigations –ECG, CXR, hemograms, serum chemistries and PFT wherever essential.

Out of 100 cases included in our study 50% cases had HFrEF & 50% cases had HFnEF as confirmed by echocardiographic parameters. There was no statistically significant difference between the two groups with respect to age and sex. However there were significant statistical significant differences between the groups with respect to clinical features, risk factors and co morbidities. Clinical features like oedema, hepatomegaly and rales were common in HFrEF group ($P<0.05$). Also LVESD & LVEDD were increased in patients with HFrEF. Risk factors like prior MI/IHD were more common in patients with HfrEF ($P<0.05$).History of hypertension and left ventricular hypertrophy were common in patients with HFnEF ($P< 0.05$). Among the comorbidities: IHD Conduction abnormalities were common in HFrEF group. Pericardial effusion was more common in HFnEFgroup.

LIMITATIONS OF OUR STUDY:

1. The sample size of patients included in the study is smaller compared to other studies.
2. A large scale community based study on the general population would have been ideal but was not possible because this being a dissertation there were constraints of logistics.
3. Some other co morbidities like depression, cerebrovascular accidents, cancer, peptic ulcer disease and liver dysfunction could not be studied.
4. Optimum management, prognosis and mortality in these groups could not be studied.
5. Role of diet, newer cardiac biomarkers like BNP and NT pro BNP in the diagnosis and prognostication could not be studied. In the view of the above facts and despite the limitations, our study gives an unbiased and clearer picture of the risk factors and co morbidities in patients presenting with heart failure. Also differences in the risk factors as well as co morbidities between the patients presenting with HFrEF and HFnEF is comparable to the data obtained from other studies.

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CONCLUSIONS:

- Nearly half of the 100 heart failure patients presented to our hospital had normal ejection fraction.
- Mean age of the patients was 60 Years. However there was no significant difference in the age as well as sex distribution in patients with HFrEF and HFnEF.
- Important risk factors for HFnEF were hypertension and left ventricular hypertrophy.
- Single most important risk factor for HFrEF was previous MI or Ischemic heart disease (74%).
- One of the echo cardiographic variables to differentiate between HFrEF and HFnEF was left ventricular end diastolic diameter.
- No significant differences in risk factors like obesity, smoking, and diabetes mellitus was present between the groups.
- No significant differences in the co morbidities like anaemia and arrhythmias were present between the groups.

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