

# Heart Failure with Preserved Ejection Fraction: A Study of Clinical Profile in Indian Patients

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## ABSTRACT

**Introduction:** Heart failure is growing epidemic condition and nearly half of the patients have preserved ejection fraction (EF>50%). However, study regarding prevalence, and etiologies of diastolic heart failure are sparse for Indian population. So, we carried out a study to determine demography and clinical profile of heart failure patients with preserved ejection fraction.

**Material and Methods:** This was an observational Study. Patients, who presented with clinical features of heart failure according to Framingham Criteria, with Left ventricular EF > 50%, from 1st September 2015 to 30th May 2018, were included in the study. Patients underwent thorough physical examination, routine laboratory testing, and other relevant investigations. A detailed analysis of demography, and clinical profile, was performed. Statistical analysis was done using percentage analysis.

**Results:** Out Of 812 patients, 496 (61.08%) were females and 316 (38.91%) were males. The mean age of patient was 50.52 ( $\pm 15.81$ ) years with range of 35 to 92 years. Hypertension (78.94%) was the most common associated risk factor followed by obesity (56.03%), dyslipidemia (48.02%), diabetes mellitus (47.78%) and smoking (34.48%). Dyspnea (97.78%) was the most common presenting symptom followed by PND (55.78%), fatigue (51.10%) and cough (38.05%). Most of the patients (55.04%) had Grade 1 Left ventricular diastolic dysfunction. 58.12% patients had associated pulmonary arterial hypertension.

**Conclusion:** Heart failure with preserved ejection fraction (HFPEF) was more in female and hypertension was the most common associated risk factor in Indian population.

**Keywords:** Heart Failure, Preserved Ejection Fraction

## INTRODUCTION

In the recent years, heart failure with preserved ejection fraction (HFpEF) has been increasingly recognized as a pathophysiological entity.<sup>1</sup> The proportion of patients with heart failure with HFpEF is about 50% of the general heart failure population.<sup>2-4</sup> In epidemiological surveys, the prognosis of HFpEF is nearly as poor as for heart failure with reduced ejection fraction (HFrEF).<sup>5-8</sup>

Heart failure with preserved ejection fraction (HFpEF) is defined as heart failure symptoms and signs with a normal or near-normal EF with evidence of diastolic dysfunction.<sup>9,10</sup> HFpEF patients demographics, comorbid conditions, prognosis, and response to therapies differ from those with heart failure reduced ejection fraction (HFrEF).<sup>11</sup>

However, several studies have been conducted in western countries to study epidemiology in patients with preserved EF. Scarce data are available in Indian patients.

Current research aimed to study the epidemiology of Heart failure with preserved ejection fraction in Indian patients, who presented with clinical features of heart failure.

## MATERIAL AND METHODS

This was a prospective observational study in which patients presented with clinical features of heart failure according to Framingham Criteria, with Left ventricular EF > 50%, from the period of 1st September 2015 to 30th May 2018, were included in the study.

The patients, who had severe anemia (hemoglobin <8.00 g/dl), hemodynamically significant valvular disease, prosthetic valve replacement, constrictive pericarditis and ventricular pacemaker excluded from study. Clinical data, including the medical history, demographic detail, cardiovascular risk factors, and associate comorbidities, were collected. Patients underwent detailed clinical evaluation including 12 lead ECGs with rhythm strip recording, chest skiagram and routine laboratory tests (complete blood count, renal function test). Echocardiography was performed and, following diastolic function parameters were measured as follows: peak early diastolic filling (E) and late diastolic filling (A) velocities, E/A ratio, E deceleration time, early diastolic septal mitral annular velocity (e'), and E/e' as an index of LV filling pressure. Left atrial dimension was calculated. Diastolic dysfunction was classified into four grades according to ASE guidelines.<sup>12</sup>

## STATISTICAL ANALYSIS

Patient population was analyzed for demographic distribution, etiological associations, Continuous data are expressed as the mean value  $\pm$  2 standard deviations. Percentage analysis was used to describe distribution of demographic variables.

## RESULTS

### Baseline characteristics

Table 1 shows the baseline characteristics of study

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participants.

### 1. Age

In our study, the age of patients ranged from 35 years to 92 years and mean age was  $50.52 \pm 15.81$  years.

### 2. Gender

Of the 812 patients enrolled in the study, majority 496 patients (61.08%) were females.

### 3. Body Mass Index

In our study, the body mass index of patients ranged from 15.94 to 36.75 kg/m<sup>2</sup>. The mean body mass index of all the patients was  $25.03 \pm 3.8$  kg/m<sup>2</sup>.

### 4. Presenting complaint

In our study dyspnea (97.78%) was the commonest symptoms followed by history of paroxysmal nocturnal dyspnea (PND) (55.78%), fatigue (51.10%), and cough (38.05%). 203 (25%) patients had complaint of chest pain and history of orthopnea was present in 12.80% cases.

### 5. Comorbidities

In our study, majority of the patients were having systemic hypertension as the most common associated comorbidity (641 patients -78.94%). Other co-morbid conditions included – obesity 455 patients (56.03%), dyslipidemia - 390 patients (48.02%), diabetes mellitus- 388 patients (47.78%), smoking -280 patients (34.48%), chronic obstructive pulmonary disease -212 patients (26.10%), chronic kidney disease -162 (19.95%) Ischemic heart disease -147 (18.10%), atrial fibrillation - 60 patient (7.38%), cerebrovascular accident-49 patient (6.03%), and hypertrophic cardiomyopathy -17 patient (2.09%).

### ECG

In our study, we found that apart from sinus tachycardia, atrial arrhythmia was most common ECG finding 240 patients (29.55%), followed by 228 patients (28.07%) had left ventricular hypertrophy (LVH) at baseline ECG. 156(19.21%) had intraventricular conduction defect (IVCD), out of which 67 patients (8.25%) had right bundle branch block (RBBB), 33 patients (4.06%) had left bundle branch block (LBBB), 32 patient (3.94%) had left anterior hemi block (LAHB), and 24 patients (2.95%) had non-specific intraventricular conduction defect. 82 (10.09) patients had a baseline ECG showing pathological Q wave.

### Echocardiographic measurements

Table 2 shows the Echocardiographic measurements of study participants.

All patients has ejection fraction >50% with diastolic dysfunction. 447 (55.04%) patients had grade 1 diastolic dysfunction, 317 (39.03%) patients had grade 2, and 48 (5.91) patients had grade 3 or grade 4 diastolic dysfunction. Out of 812 patients 600 (73.89%) patients had concentric LVH. 366 (45.07%) patients had left atrial dimension (LAD) >4 cm. E/e' ratio was > 15 in 147 (18.10%) patients, and 528 (65.02%) patients had E/e' > 12. Out of 812 patients 666 (82.01%) patients had e'wave < 11 cm/s. Estimated systolic pulmonary pressure (ESPP) was > 35 mmHg in 472 (58.12%) of the patients (Table 2).

Characteristic	Mean, (Range)
Age (Years)	50.52 ( $\pm 15.81$ ), (35-92)
BMI (kg/m <sup>2</sup> )	25.03 ( $\pm 3.82$ ), (15.94-36.75)
Sex	No. (%)
Female	496 (61.08)
Male	316 (38.91)
Presenting complaint	
Dyspnea	794 (97.78)
H/O PND	453 (55.78)
Fatigue	415 (51.10)
Cough	309 (38.05)
Chest pain	203(25.00)
H/O Orthopnea	104(12.80)
Comorbidities	
Hypertension	641 (78.94)
Obesity	455 (56.03)
Dyslipidemia	390 (48.02)
Diabetes	388 (47.78)
Smoking	280 (34.48)
COPD	212 (26.10)
CKD	162 (19.95)
IHD	147 (18.10)
AF	60 (7.38)
CVA	49 (6.03)
HCM	17 (2.09)
ECG	
Atrial arrhythmia	240 (29.55)
LVH	228 (28.07)
Intraventricular conduction defect (IVCD)	156 (19.21)
RBBB	67 (8.25)
LBBB	33 (4.06)
LAHB	32 (3.94)
Non-specific IVCD	24 (2.95)
Pathological Q wave (Old MI)	82 (10.09)

BMI = Body mass index, IHD = Ischemic heart disease, COPD = Chronic obstructive pulmonary disease, CKD = Chronic kidney disease, CVA = Cerebrovascular accident, HCM = Hypertrophic cardiomyopathy, LVH = Left ventricular hypertrophy, LBBB = Left bundle branch block, RBBB = Right bundle branch block AF = Atrial fibrillation

**Table-1:** Baseline Characteristics (N=812)

Characteristic	No. (%)
Concentric LVH.	600 (73.89)
Left atrial dimension (LAD) was >4 cm	366 (45.07)
E/e' ratio > 15	147 (18.10)
E/e' > 12	528 (65.02)
e' wave < 11 cm/s	666 (82.01)
Estimated systolic pulmonary pressure (ESPP) > 35 mmHg	472 (58.12)
Grade 1 diastolic dysfunction	447 (55.04)
Grade 2 diastolic dysfunction	317 (39.03)
Grade 3/4 diastolic dysfunction	48 (05.91)

**Table-2:** Echocardiographic measurements (N=812)

## DISCUSSION

In this study prospectively 812 Patients of HFpEF were included. The HTN (78.10%) was commonest risk factor,

which is consistent with the reports of large-scale trials or clinical databases with HF<sub>p</sub>EF patients have shown that hypertension is present in 50–90% of patients with preserved ejection fraction, which is higher than its prevalence in the general population, and somewhat higher than in patients with HFREF<sup>20-27</sup> Klapholz et al. and Dubourg et al. had also reported hypertension being most commonly associated risk in their study.<sup>13,14</sup> Other conditions associated with an increased risk of HFPEF include diabetes,<sup>28</sup> obesity,<sup>29</sup> dyslipidemia<sup>30</sup>, chronic obstructive pulmonary disease,<sup>31</sup> renal dysfunction,<sup>16</sup> coronary artery disease, atrial fibrillation.<sup>32</sup> In our study, 26.10% patients had COPD comparable to other study.<sup>18</sup> 10% patients in our study had IHD consistent with the PREVENT trial.<sup>16</sup> dyslipidemia was found in 48.02% patients which is consistent with other studies.<sup>18,15,16</sup> Atrial fibrillation (7.38%) was a common finding in our study, similar to the other studies.<sup>15,19,20</sup> similar to the other studies 19.95% patients in our study had chronic kidney disease.<sup>15,21</sup> Obesity (56.03%), diabetes (47.78%), and smoking (34.48%), were the other associated risk factors.

The incidence of HFPEF increases rapidly with age.<sup>33</sup> For example, in a large Danish cohort study the prevalence of HFPEF was significantly higher among elderly patients compared with younger patients.<sup>34</sup> Patients in our study were younger than most of the western studies<sup>15,16</sup>, may be due to early occurrence and more prevalence of diabetes mellitus.

One of the most important risk factors for developing HFPEF is female sex.<sup>35,36</sup> In our study female constituted major bulk of the patients, similar to study conducted by Maestre et al.<sup>17</sup> In echocardiographic evaluation we found structural changes in heart, including concentric LV remodeling, concentric hypertrophy, and LA enlargement, All patients had LVEF> 50%. LVH (73.89%) were common findings as patients were older, more often women, and with a high prevalence of hypertension, and each of which associate with increase risk for developing concentric remodeling.<sup>22</sup> All of our patients had variable degrees of diastolic dysfunction, with increased LA dimension (45.07%), 58.12% patients had pulmonary hypertension, and these findings are comparable to the findings in other studies.<sup>15,6</sup>

## CONCLUSION

In conclusion, heart failure with preserved ejection fraction was more in female. Hypertension was the most common risk with dyspnea was the most common presenting symptom. Baseline information on heart failure with preserved ejection fraction revealed from this study can be used as reference for further studies.

## REFERENCES

1. Kitzman DW, Little WC, Brubaker PH, et al. Pathophysiological characterization of isolated diastolic heart failure in comparison to systolic heart failure. *JAMA* 2002; 288:2144–50.
2. Vasan RS, Larson MG, Benjamin EJ, Evans JC, Reiss CK, Levy D. Congestive heart failure in subjects with normal versus reduced left ventricular ejection fraction: prevalence and mortality in a population-based cohort. *J Am Coll Cardiol* 1999; 33:1948–55.
3. Bhatia RS, Tu JV, Lee DS, et al. Outcome of heart failure with preserved ejection fraction in a population-based study. *N Engl J Med* 2006; 355:260–9.
4. Owan TE, Hodge DO, Herges RM, Jacobsen SJ, Roger VL, Redfield MM. Trends in prevalence and outcome of heart failure with preserved ejection fraction. *N Engl J Med* 2006;355:251–9.
5. Lam CS, Donal E, Kraigher-Krainer E, Vasan RS. Epidemiology and clinical course of heart failure with preserved ejection fraction. *Eur J Heart Failure* 2011;13:18–28.
6. O'Connor CM, Abraham WT, Albert NM, et al. Predictors of mortality after discharge in patients hospitalized with heart failure: an analysis from the organized program to initiate life- saving treatment in hospitalized patients with heart failure (OPTIMIZEHF). *Am Heart J* 2008;156:662–73.
7. Tribouilloy C, Rusinaru D, Mahjoub H, et al. Prognosis of heart failure with preserved ejection fraction: a 5-year prospective population-based study. *Eur Heart J* 2008;29:339–47.
8. Senni M, Tribouilloy CM, Rodeheffer RJ, et al. Congestive heart failure in the community: a study of all incident cases in Olmsted County, Minnesota, in 1991. *Circulation* 1998;98:2282–9.
9. AlHabib KF, Elasar AA, AlBackr H, et al. Design and preliminary results of the heart function assessment registry trial in Saudi Arabia (HEARTS) in patients with acute and chronic heart failure. *Eur J Heart Failure* 2011;13:1178–84.
10. Magan a-Serrano JA, Almahmeed W, Gomez E, et al. Prevalence of heart failure with preserved ejection fraction in Latin American, middle eastern, and North African regions in the i prefer study.(Identification of patients with heart failure and preserved systolic function: an epidemiological regional study). *Am J Cardiol* 2011;108:1289–96.
11. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American college of cardiology foundation/ American heart association task force on practice guidelines. *Circulation* 2013;128:e240–319.
12. Nagueh MD, Chair Sherif F, Appleton MD Christopher P, Gillebert MD Thierry C, Marino MD Paolo N, Oh MD Jae K, Smiseth MD, PhD Otto A. \*Recommendations for the evaluation of left ventricular diastolic function by echocardiography. *J Am Soc Echocardiography* 2009;22:107–31.
13. Klapholz, M., Maurer, M., Lowe, A.M., Messineo, F., Meisner, J.S., Mitchell, J., Kalman, J., Phillips, R.A., Steingart, R. and Brown, E.J. Hospitalization for Heart Failure in the Presence of a Normal Left Ventricular Ejection Fraction Results of the New York Heart Failure Registry. *Journal of the American College of Cardiology*, 2004;43:1432- 1438.
14. Dubourg, O., Gueret, P., Beauchet, A., Nisse-Durgeat, S. and Ducardonnet, A. Focale: Study of Systolic and Diastolic Heart Failure in a French Elderly Population. *International Journal of Cardiology* 2008;124:188-192.
15. Donal Erwan, Lund Lars H, Oger Emmanuel, Hage Camilla,Reynaud Hans Persson Ame´ lie. Baseline

- characteristics of patients with heart failure and preserved ejection fraction included in the Karolinska Rennes (KaRen) study. *Arch Cardiovasc Dis* 2014;107:112–21.
16. Brouwers Frank P, de Boer Rudolf A, van der Harst Pim, Voors Adriaan A. Incidence and epidemiology of new onset heart failure with preserved vs. reduced ejection fraction in a community-based cohort: 11-year follow-up of PREVENT. *Eur Heart J* 2013;34:1424–31.
  17. Maestre, V.G., Gallego, J., García, M., García de Burgos, F. and Martín-Hidalgo, A. Prediction Clinical Profile to Distinguish between Systolic and Diastolic Heart Failure in Hospitalized Patients. *European Journal of Internal Medicine* 2009;20:313-318.
  18. Sharif-Askari Narjes Saheb, Sulaiman Syed Azhar Syed. Hospitalized heart failure patients with preserved vs. reduced ejection fraction in Dubai, United Arab Emirates: a prospective study. *Eur J Heart Failure* 2014;16:454–60.
  19. Yancy CW, Lopatin M, Stevenson LW, De Marco T, Fonarow GC. Clinical presentation, management, and in-hospital outcomes of patients admitted with acute decompensated heart failure with preserved systolic function: a report from the acute decompensated heart failure national registry (ADHERE) 1- database. *J Am Coll Cardiol* 2006;47:76–84.
  20. Klapholz Marc, Maurer Matthew, Lowe April M. Hospitalization for heart failure in the presence of a normal left ventricular ejection fraction results of the New York heart failure registry. *JACC* 2004;43:1432–8.
  21. McMurray John JV, Carson Peter E, Komajda Michel, McKelvie Robert. Heart failure with preserved ejection fraction: clinical characteristics of 4133 patients enrolled in the I-PRESERVE trial. *Eur J Heart Failure* 2008;10:149–56.
  22. Lam CSP, Roger VL, Rodeheffer RJ, Bursi F, Borlaug BA, Ommen SR, et al. Cardiac structure and ventricular-vascular function in persons with heart failure and preserved ejection fraction from Olmsted County, Minnesota. *Circulation* 2007;115:1982–90.
  23. Meta-analysis Global Group in Chronic Heart F. The survival of patients with heart failure with preserved or reduced left ventricular ejection fraction: an individual patient data meta-analysis. *European heart journal*. 2012; 33:1750–1757.
  24. Massie BM, Carson PE, McMurray JJ, et al. Irbesartan in patients with heart failure and preserved ejection fraction. *N Engl J Med*. 2008; 359:2456–2467.
  25. Cleland JG, Tendera M, Adamus J, et al. The perindopril in elderly people with chronic heart failure (PEP-CHF) study. *Eur Heart J*. 2006; 27:2338–2345.
  26. Chinali M, Joffe SW, Aurigemma GP, Makam R, Meyer TE, Goldberg RJ. Risk factors and comorbidities in a community-wide sample of patients hospitalized with acute systolic or diastolic heart failure: the Worcester Heart Failure Study. *Coronary artery disease*. 2010; 21:137–143.
  27. Redfield MM, Chen HH, Borlaug BA, et al. Effect of phosphodiesterase-5 inhibition on exercise capacity and clinical status in heart failure with preserved ejection fraction: a randomized clinical trial. *Jama*. 2013; 309:1268–1277.
  28. Fang ZY, Prins JB, Marwick TH. Diabetic cardiomyopathy: evidence, mechanisms, and therapeutic implications. *Endocrine reviews*. 2004; 25:543–567.
  29. Kenchaiah S, Evans JC, Levy D, et al. Obesity and the risk of heart failure. *The New England journal of medicine*. 2002; 347:305–313.
  30. Rijzewijk LJ, van der Meer RW, Smit JW, et al. Myocardial steatosis is an independent predictor of diastolic dysfunction in type 2 diabetes mellitus. *Journal of the American College of Cardiology*. 2008; 52:1793–1799.
  31. Ather S, Chan W, Bozkurt B, et al. Impact of noncardiac comorbidities on morbidity and mortality in a predominantly male population with heart failure and preserved versus reduced ejection fraction. *Journal of the American College of Cardiology*. 2012; 59:998–1005.
  32. Maisel WH, Stevenson LW. Atrial fibrillation in heart failure: epidemiology, pathophysiology, and rationale for therapy. *The American journal of cardiology*. 2003; 91:2D–8D.
  33. Hogg K, Swedberg K, McMurray J. Heart failure with preserved left ventricular systolic function; epidemiology, clinical characteristics, and prognosis. *Journal of the American College of Cardiology*. 2004; 43:317–327.
  34. Mogensen UM, Ersboll M, Andersen M, et al. Clinical characteristics and major comorbidities in heart failure patients more than 85 years of age compared with younger age groups. *European journal of heart failure*. 2011; 13:1216–1223.
  35. Fonarow GC, Stough WG, Abraham WT, et al. Characteristics, treatments, and outcomes of patients with preserved systolic function hospitalized for heart failure: a report from the OPTIMIZE-HF Registry. *Journal of the American College of Cardiology*. 2007; 50:768–777.
  36. Vasan RS, Benjamin EJ, Levy D. Prevalence, clinical features and prognosis of diastolic heart failure: an epidemiologic perspective. *Journal of the American College of Cardiology*. 1995; 26:1565–1574.

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