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TO STUDY RISK FACTORS, CLINICAL FEATURES AND ANALYSE DIASTOLIC DYSFUNCTION IN PATIENTS OF HFPEF

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Introduction

Heart Failure (HF) is a clinical syndrome affecting over 64 million people Worldwide andhas an increasing prevalence.[1] In the study conducted in India the estimated prevalence of HF is about 1% of the total population or about 8–10 million individuals. The estimated mortality attributable to HF is about 0.1–0.16 million individuals per year.[2]

Measurement of ejection fraction (EF) is used to categorize HF; while HF with reduced EF is relatively simple to identify, HFpEF is more complex, leading to differences in diagnostic criteria,[3] and likely contributing to "failed" clinical trials.[4] However, with mounting evidence indicating a beneficial impact of sodium-glucose cotransporter-2 inhibitors across the spectrum of HF,[5] a key focus must now be improving diagnostic capacity[6] in a patient population with poor 5-year survival rates, high hospital readmission rates, and substantial morbidity.[7,8]

HFpEF is a heterogeneous syndrome associated with various comorbidities, wherein cardiac and non cardiac factors contribute to elevated intra cardiac filling pressure, resulting in signs and symptoms of HF.[9] Although trans thoracic echocardiography (TTE) is routinely used to estimate intra cardiac filling pressure,[9,10] there is considerable var[1]iability in its performance and interpretation, and a high burden on skills, time, and expertise for acquiring diagnostic quality information which may not be feasible beyond expert clinical sites. Clinical algorithms, utilizing multiple sources of patient data,[11,12] may be limited by discordant or incomplete data.[13,14] These factors collectively contribute to variable diagnostic capacity, increasing the requirement for invasive confirmatory tests (e.g. right heart catheterization), adding further burden to the patient and health care system and potentially missing individual who might benefit from treatment.

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HFpEF is the dominant form of HF, and its prevalence relative to HFrEF has been growing due to the aging of the general population and the increasing burden of metabolic comorbidities, such as systemic hypertension, diabetes mellitus (DM), and obesity.[15-19] Rather than being characterized by an isolated abnormality in LV diastolic function, it is now evident that HFpEF is a heterogeneous syndrome that has multiple cardiovascular and peripheral limitations.[20]

Aims and Objectives

1. To analyze the Clinical presentation, Risk factor profile, Diagnostic evaluation with Echocardiograph correlation of Heart failure with normal/preserved ejection fraction.
2. To understand the variability of several ECHO characteristics with increasing diastolic dysfunction
3. To find a relation between several anthropometry measurements and increasing diastolic dysfunction.

Patients and Methods

This was a Cross Sectional Prospective Study, done in 50 patients in Medical ICU, Government Medical College and Hospital, Kadapa on patients admitted to medical wards, Department of General Medicine after taking consent over a period of 12 months. Sampling was done using Convenience Sampling Method.

Inclusion criteria: those patients with Symptoms and signs of HF (Framingham criteria), LV Ejection Fraction > 50%, and those in whom Mitral stenosis, Mitral regurgitation, pericardial disease, and noncardiac dyspnoea, odema and fatigue was ruled out. Exclusion criteria: Heart failure patients with EF %< 50%, Patients who underwent cardiac surgeries (CABG, valve repair, etc), Chest wall injuries (blunt/penetrating), Age< 14 years.

Statistical analysis of data: The categorical data will be ^{2}analyzed using percentages and the continuous data will be analyzed using mean and standard deviation. Inferential statistics will be analyzed as follows: Chi-square test, 't'test etc. will be used.

RESULTS

Table 1: Age distribution according to the gender

Age group	Gender		Total (%)
	Male (%)	Female (%)	

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40-60 years	9 (56.3)	7 (43.8)	16
61-80 Years	14 (66.7)	7 (33.3)	21
>80 Years	5 (38.5)	8 (61.5)	13
Total	28 (56)	22 (44)	50
Mean age	61.54 (13.57)	57.72(12.21)	59.86(13.00)

Table 2: Distribution based on anthropometry according to the gender

Anthropometry	Male Mean(SD)	Female Mean(SD)	P value
Height	158.89(8.01)	150.13(3.97)	0.309
Weight	74.04(8.97)	62.72(2.94)	<0.001
BMI	29.41(3.82)	27.87(1.73)	<0.001
BAS	1.86 (0.21)	1.81 (0.24)	<0.001
Waist circumference(cm)	93.14(8.15)	85.54(2.24)	0.087
Hip Circumference(cm)	97.04(5.67)	91.63(3.25)	0.473
W/H ratio	0.96 (0.06)	0.93 (0.03)	<0.001

Table 3: Association between BMI with grade of diastolic dysfunction

BMI	Grade of diastolic dysfunction		
	1 No. (%)	2 No. (%)	3 No. (%)
18.5-24.9	2 (66.7)	1 (33.3)	0 (0)
25.0-29.9	12 (36.4)	12 (36.4)	9 (27.3)
>30.00	2 (14.3)	8 (57.1)	4 (28.6)
Total	16 (32)	21 (42)	13 (26)
Correlationcoefficient 0.292		P value 0.032	

Table 4: Association between W/H ratio with grade o[3]f diastolic dysfunction

W/H ratio	Grade of diastolic dysfunction			Total	**Correlation coefficient** 0.303
	1 No. (%)	2 No. (%)	3 No. (%)		
<0.9	3 (42.9)	3 (42.9)	1 (14.3)	7	
0.9-1	11 (29.7)	15 (40.5)	11 (29.7)	37	P value 0.026
>1	2 (33.3)	3 (50)	1 (16.7)	6	
Total	16 (32)	21 (42)	13 (26)	50	

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Table 5: Risk factors distribution and presenting complaint among study population

Risk factors	Frequency	Percentage
Diabetes	31	62
Dyslipidemia	34	68
Hypertension	46	92
Metabolic syndrome	38	76
Obesity	14	28
Alcoholism & Smoking	32	64
Dyspnea	32	64
Edema	28	56
Fatigue	45	90
PND	24	48

Table 6: Physical examination according to the gender.

Physical examination	Male Mean (SD)	Female Mean (SD)	P value
Pulse rate	82.37(3.64)	81.67 (4.79)	0.566
SBP	178.64(2.85)	180.54(4.56)	0.458
DBP	104.39(4.56)	104.37(4.20)	0.982
Respiratory rate	22.07(4.67)	22.81 (3.33)	0.529

Table 7: Echo characteristics and gender distribution among study population

Echo characteristics	Male Mean (SD)	Female Meann(SD)	P value
E wave m/s	0.81 (0.23)	0.81 (0.22)	0.904
A wave m/s	0.88 (0.01)	0.87 (0.02)	0.563
E/A ratio	0.93 (0.26)	[4] 0.92 (0.26)	0.943
DT ms	162.18 (19.65)	154.77(14.69)	0.147
EF %	51.43(2.37)	52.00 (2.52)	0.416
LVEDV ml	101.85(6.20)	101.72(2.44)	0.939
LVEDV1 m1/m2	56.50(2.44)	56.63 (2.75)	0.854

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Table 8: Echo characteristics as per the grade of diastolic dysfunction

Echo characteristics	Grade of diastolic dysfunction			P value
	1	2	3	
E wave m/s	0.81 (0.26)	0.83 (0.19)	0.78 (0.23)	0.844
A wave m/s	0.87 (0.02)	0.88 (0.02)	0.87 (0.02)	0.128
E/A ratio	0.92 (0.31)	0.94 (0.23)	0.90 (0.27)	0.901
DT ms	154.44(13.07)	162.43(20.69)	158.77(18.09)	0.411
EF %	51.94(2.26)	50.85(2.59)	52.69(2.05)	0.088
LVEDV ml	101.37(5.56)	103.00(6.32)	100.38(5.49)	0.430
LVEDV1 m1/m2	56.50 (1.89)	56.67 (2.71)	56.46 (3.15)	0.969

Table 9: Distribution of various parameters and grade of diastolic dysfunction

Co morbidities		Grade of diastolic dysfunction			Total No.(%)	P value
		1No. (%)	2No. (%)	3No. (%)		
Diabetes	Yes	12 (38.7)	12 (38.7)	7 (22.6)	31	**0.422**
	No	4 (21.1)	9 (47.4)	6 (31.6)	19	
Hypertension	Yes	14 (30.43)	19 (41.30)	13 (28.3)	46	0.440
	No	2 (50)	2 (50)	0 (0)	4	
Dyslipidemia	Yes	10 (29.4)	13 (38.2)	11 (32.4)	16	0.328
	No	6 (37.5)	8 (50)	2 (12.5)	34	
Obesity	Yes	2 (14.3)	8 (57.1)	4 (28.6)	14	0.221
	No	14 (38.6)	13 (36.1)	9 (25)	36	
Metabolic syndrome(MS)	Yes	12 (31.6)	18 (47.4)	8 (21.1)	38	0.274
	No	4 (33.3)	3 (25)	55(41.7)	12	
Smoking	Yes	4 (25)	8 (50)	4 (25)	16	0.695
	No	12 (35.3)	13(38.2)	9 (26.5)	34	
Alcoholism	Yes	4 (25)	8 (50)	4 (25)	16	0.695
	No	12 (35.3)	13 (38.2)	9 (26.5)	34	
S3	Yes	8 (42.1)	7 (36.8)	4 (21.1)	19	0.482
	No	8 (25.8)	14 (45.2)	9 (29)	31	

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S4	Yes	11 (36.7)	11 (36.7)	8 (26.7)	30	0.597
	No	5 (25)	10 (50)	5 (25)	20	
Crepts	Yes	15 (38.5)	14(35.9)	10 (25.6)	39	0.143
	No	1 (9.1)	7 (63.6)	3 (27.3)	11	

Discussion

The mean age of the patients enrolled in the study was 62.54 years. Minimum age was 40 years and maximum age was 89 years. In Neena Nath et al study, a total of 105 patients with diagnosis of HFpEF. 66.6 % patients were between 50 and 70 years.[21] The female predominance in HFpEF are nonclear, but women have higher vascular and LV systolic and diastolic stiffness than men, and vascular and ventricular stiffness increases more dramatically with age in women[22]

In the study by Kuznetsova et al[23] The 539 participants included 272 (50.5%) women, and 221 (41.0%) hypertensive patients of whom 121 (23.6%) were on antihypertensivedrug treatment. Only 8 subjects (1.5%) had EF equal or less than 50%.

Obesity and increased adiposity have multiple adverse effects on the cardio vascular system, including hemodynamic, inflammatory, mechanical, and neurohormonal effects.[24] Increased visceral adiposity and epicardial fat in obese patients with HFpEF may cause to the hemodynamic perturbation during exercise.[25]Echocardiography may be useful in detecting the adverse effects of obesity. The degree of pericardial restraint is visually recognized as a D shaped LV cavity in the short-axis view, and this can be quantified by assessing the eccentricity index.[32]

In the study by Neena Nath et al[21] most common(64.76%) risk factor of HFpEF in this study followed by diabetes mellitus(33.33%), obesity(28.35%), coronary artery disease(23.80%) and atrial fibrillation(19%). 30.47% patients had history o smoking and 26.66% had history of alcohol intake. In the study by Bursi et al[26] found that 36% patients with HFpEF had diabetes mellitus. Similar result was found in a study conducted by Bhatia et al where diabetes mellituswas found in 32% patients. In a study by Owan et al[27] 41% of patient with HFpEF had obesity.

In a study by Bursi et al,[26] where AF was present in 31% of patients of HFpEF. AF may cause decompensated HF in patients having DD and diastolic dysfunction itself is a risk factor for atrial fibrillation. Thus, diastolic dysfunction, atrial fibrillation, and HFpEF are common and related conditions that probably share common pathogenic mechanisms, particular in the elderly. Toshihiko

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G et al[28] studied hemodynamic indices especially the augmentation index Alx, which shows the detrimental influence of arterial reflection wave from the lower body onLV diastolic function. They assessed the gender difference in these indices.

Neena Nath et al[21] study, dyspnea on exertion (92.3%), lower limb swelling (71.4%), orthopnea(47.61%), cough(40%) constituted majority of the symptoms. Majority of the patients had grade 2(47.61%), followed by grade 3(26.66) and grade 4(11.42%) dyspnea. In the study by Reddy YNV et al[24] The H2FPEF score is an evidence-based approach that was developed from the assessment of 414 patients with dyspnea which cannot be explained using the gold standard test of invasive exercise hemodynamic testing**.** In the study by Neena Nath et al[21] Pedal edema (71.4%) and raised JVP (64.76%) were the most common finding on general physical examination.

T. Harada, K. Kagami, T. Kato et al[29] showed that Echocardiography demonstrated normal EF (70%), LV mass index (74 g/m^2), and right ventricular (RV)size, with normal RVsystolic function. Transmitral Doppler and tissue Doppler showed an abnormal relaxation pattern (E/A ratio 0.63) with e' velocity of 4.8 cm/secand E/e' ratio of 13.90. In the study by Neena Nath et al[21] Most common chamber enlargement seen in 2Decho was left ventricular hypertrophy (68.57%) followed by left atrial hypertrophy(38%). In the study by Reddy YNV et al The H2FPEF incorporates four clinical (BMI, two or more antihypertensive medicines, AF, and age) and two echocardiographic variables (E/e' ratio and ePASP), and its robust discriminative ability has been demonstrated [area under thecurve (AUC) 0.886].[24]

In the study by Kuznetsova et al[23] In all subjects, the transmitral E/A ratio and the averaged mitral annular Ea/Aa ratio both independently and significantly decreased with body mass index, age, diastolic blood pressure and heart rate. Both ratios increased with the pulse pressure. The transmitral E/A ratio, but not the averaged Ea/Aa ratio increased7with the EF. Kurt et al.[30] proposed atrial stiffness index using the ratio between the E/e' and LA strain parameters. Comparing to the pulmonary artery wedge pressure, a cut-off value of 1.1 mmHg was established, showing 84% sensitivity and 100% specificity

Conclusions

In the study there was significant difference between male and female in mean weight, mean BMI, Mean BAS and mean W/H ratio. There was a significant positive correlation between grades of

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diastolic dysfunction and BMIand W/H ratio. There was no significant mean difference in mean E wave, mean A wave, mean E/A ratio, mean DT ms, mean EF%, mean LVEDV, mean LVEDV1 among grades of diastolic dysfunction. Echocardiography playsa keyrole in the evaluation of HFpEF and provides essential information to estimate elevated LV filling pressure and the probability of having HFpEF. In patients with intermediate probability, exercise stress echocardiography may be useful for further diagnostic evaluation. Phenotype- specific treatment is the key approach to overcoming pathophysiological diversity in HFpEF. Echocardiography may provide valuable insight into the pathophysiology and underlying phenotypes in HFpEF.

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