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ORIGINAL ARTICLE

Sociodemographic, Clinical Condition, and Functional Aerobic Capacity in Patients With Heart Failure With Varying Ventricular Ejection Fraction

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Abstract

Background: Recently, a new heart failure (HF) classification was made considering the left ventricular ejection fraction (LVEF) phenotype. Comprehensive assessments of the groups are required to guide patient management.

Objective: To determine the differences in sociodemographic, clinical, functional aerobic capacity, and health-related quality of life (HRQOL) variables in patients with HF classified with different LVEFs and to explore the correlations between the variables.

Methods: This work is a cross-sectional descriptive and correlational study. Three groups of patients with HF (LVEF≥50%, LVEF<40%, and LVEF40-49%) were compared. Sociodemographic, clinical variables and functional aerobic capacity with Sit to Stand (STS), 6-minute walk test (6MWT), Duke Activity Status Index (DASI), Minnesota Living with HF Questionnaire (MLFHQ), and Patient Health Questionnaire 9 (PHQ-9) were considered. The Chi-square test, one-way analysis of variance (ANOVA) test, and Spearman's correlation were used for statistical analysis. The statistical significance level was set at 5%.

Results: A total of 209 patients were admitted with a diagnosis of HF, with a more significant number of men. Marital status was a predominantly stable union in the HF with preserved ejection fraction (HFpEF) and HF with mid-range ejection fraction (HFmrEF) groups. A sedentary lifestyle was lower in the HF with reduced ejection fraction (HFrEF) group 59 (84.3%), p-value = 0.033, and the angina pectoris was higher in the HFpEF 30 (42.9%). Systolic blood pressure at the end of the 6MWT evidenced a higher score in HFpEF 132.0±17.25 concerning HFrEF 128.0±16.57, p-value=0.043. The fat percentage was higher in HFpEF 30.20±8.80 regarding the HFmrEF group 26.51±7.60, p-value = 0.028.

Conclusion: There were significant differences according to the LVEF classification in marital status, angina symptoms, fat percentage, and blood pressure at rest.

Keywords: Socioeconomic Factors; Heart Failure; Left Ventricular Function; Exercise Tests; Quality of Life.

Introduction

Heart failure (HF) is a clinical syndrome with evidence of structural or functional ventricular filling or blood ejection impairment, corroborated by elevated natriuretic peptide levels or objective evidence of pulmonary or systemic congestion. Patients frequently appear with dyspnea and fatigue that significantly limit exercise tolerance and functional capacity with or without fluid retention, which may lead to pulmonary and splanchnic congestion and peripheral edema.[1]

Considered a public health problem with more than 60 million people suffering from it worldwide,[2] HF has one of the highest prevalences related to noncommunicable diseases (NCDs) and the highest associated health costs.[2] Moreover, approximately half of the patients with HF have a preserved left ventricular ejection fraction (LVEF).[3]

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Central Illustration: Sociodemographic, Clinical Condition, and Functional Aerobic Capacity in Patients With Heart Failure With Varying Ventricular Ejection Fraction

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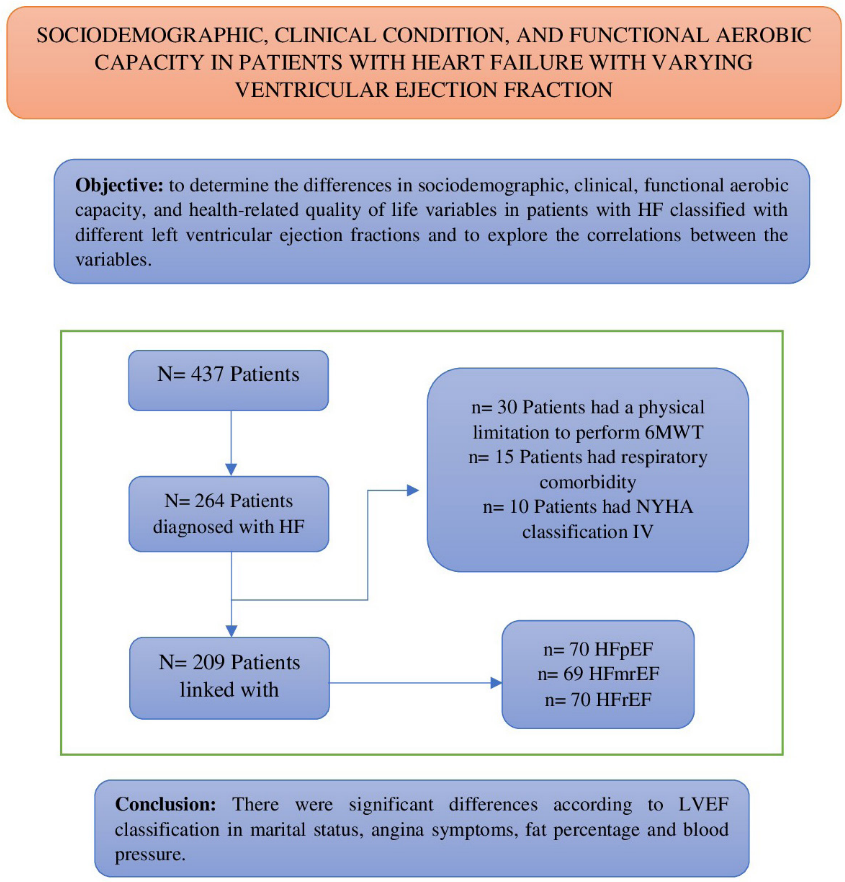

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HF classified with different LVEFs, sociodemographic and clinical conditions, functional aerobic capacity, and HRQL.

Recently, the European Society of Cardiology (ESC) created a new classification of HF, bearing in mind the phenotype of LVEF, which, combined with other signs and symptoms, can be classified into three categories: HF with preserved ejection fraction (HFpEF) (LVEF ≥50%), HF with reduced ejection fraction (HFrEF) (LVEF <40%), and HF with mid-range ejection fraction (HFmrEF) (LVEF 40-49%).[4]

The dyspnea, fatigue, and exercise intolerance caused by HF in those who suffer from it cause a significant deterioration in the quality of life, disease control, and mortality. Different studies show a relationship between skeletal muscle function and cardiac function, mainly in patients with HFpEF as compared to patients with HFrEF.[5,6] In turn, pharmacological treatment is the fundamental management of patients with HFpEF. However, many are not adherent to such treatment due to different sociodemographic and clinical conditions, representing more significant complications in patients, mainly in older adults with HF.[7]

As mentioned above, it is highly relevant to assess other conditions, including functional capacity and health-related quality of life (HRQOL), knowing that tests, such as the 6-minute walk test (6MWT) and the Sit to Stand (STS), are considered simple, inexpensive, safe, and reproducible.[7-11] Similarly, questionnaires, such as the Duke Activity Status Index (DASI), the Patient Health Questionnaire 9 (PHQ-9), and the Minnesota Living with Heart Failure Questionnaire (MLFHQ) would provide relevant information in patients with HF that would enable better decision-making in pharmacological interventions and the prescription of exercise for patients when they are referred to cardiac rehabilitation (CR) programs.[12,13] This study aimed to determine the differences in sociodemographic, clinical, functional aerobic capacity, and HRQOL variables in patients with HF classified with different LVEFs and to explore the correlations between variables.

Methods

This work is a descriptive, cross-sectional, and correlational study. From April to October 2022, three groups of patients with HF were linked: HFpEF defined by an LVEF ≥50%, HFmrEF if LVEF is 40-49%, and HFrEF if LVEF is <40% (4). The ethical principles of the Helsinki Declaration and resolution 008430 of 1993 of the Ministry of Health and Social Protection of Colombia were considered; in turn, the Ethics Committee of the Escuela Nacional del Deporte approved the study (#17.115), and the patients accepted their voluntary participation by signing the informed consent form.

All patients with HF who entered the CR program of a fourth-level Clinica de Occidente S.A., were included by convenience. Patients diagnosed with HF by a physician specializing in cardiology were included, adopting international recommendations[14] and those patients with an indication to enter a CR program for the first time. Patients with New York Heart Association (NYHA) functional class IV[15] were excluded, as were those who presented some limitations in performing active and resisted movements (recent fractures, recent hemodynamic alterations, coronary artery disease after the diagnosis of HF, infectious diseases, and neuromuscular restriction).

Variables

Variables related to sociodemographic characteristics, such as age, sex, marital status, health regime, occupation, level of schooling, and socioeconomic stratum, were taken into account, considering that, in Colombia, the low strata correspond to people with more insufficient resources, who are beneficiaries of subsidies for home public services, and the high strata, who do not require assistance.

Clinical variables were taken by applying a structured interview that was corroborated with the clinical history of the patients, such as risk factors, symptoms, physical activity, some anthropometric variables (body mass index, abdominal perimeter, percentage of fat, percentage of water, lean mass), and LVEF by transthoracic echocardiography performed by a Cardiology Specialist.

In addition, the DASI,[16] the MLFHQ,[17] and the PHQ-9[18] were used to assess functional capacity.

Subsequently, functional aerobic capacity was evaluated through the STS[19] and the TC6M, taking into account the recommendations of the American Thoracic Society (ATS);[20] two cones separated a 30-meter-long corridor at the end, and the patients were previously stimulated to walk as fast as possible; two tests were performed, and the test with the most significant distance covered was recorded by calculating VO2e, using the formula VO2e = 3.5 ml/kg/min + (vel m/min × 0.1).[21] Additionally, variables were taken in the TC6M, such as respiratory frequency (RF) at rest and the end, heart rate (HR) at rest and the end, peripheral oxygen saturation (SpO2) at rest and the end, and systolic/diastolic blood pressure at rest and the end.

The Central figure summarizes the main methodological findings of the study.

Procedures

After the cardiology consultation, the patients were referred to an initial meeting where the study's objective was explained, and the patients signed the informed consent form. They were then given a questionnaire in which sociodemographic and clinical data were recorded. Anthropometric variables were recorded for height with a Krammer® (Holtain Ltd., Crymych Dyfed, UK) 4-segment, 1 mm accurate measuring rod, Tanita IRON MAN BC 554 floor scale with 100 g accuracy to measure weight, percentage of fat, water, muscle mass, and abdominal circumference with a tape measure (LORD® LDC-338).

The DASI (16), the MLFHQ,[17] and the PHQ-9,[18] functional capacity questionnaires, were performed through an interview with the patient by the evaluator.

Finally, functional aerobic capacity was assessed using the STS[19] and the 6MWT,[20] taking SpO2, HR, and blood pressure with a blood pressure monitor and aneroid sphygmomanometer (WelchAllyn® DS44-11CBT).

Data analysis

The patients' information was entered into a database in Excel 2010 and exported to the SPSS 24 statistical package. The qualitative variables were presented in frequencies and percentages. For the quantitative variables, the Kolmogorov-Smirnov test was performed to determine the parametric behavior, which were presented as mean and standard deviation. A comparison was made between the three LVEF groups. The Chi-square test was used for qualitative variables, the one-way ANOVA test for quantitative variables with post hoc tests, and the Tukey test for variables with equal variances. The Dunnett's T3 test was used when there were no equal variances. The significance level for statistical analysis was set at 5%, and Spearman's correlation was used for quantitative variables, which were classified according to three categories: poor (rho ≤ 0.49), moderate (0.50 ≤ rho ≤ 0.74), and strong (rho ≥ 0.75).

Results

During the study, 437 patients were admitted to the CR program, of whom 264 were diagnosed with HF and met the inclusion criteria, and of these, 30 were excluded because they had physical limitations that prevented them from performing the 6MWT; 15 patients had respiratory comorbidities, such as COPD and asthma; 10 patients at the time of admission were decompensated and had an NYHA IV classification. Finally, 209 patients with a diagnosis of HF who met all the study entry criteria were analyzed (Figure 1).

Regarding sociodemographic variables, it is important to note that, for all LVEF groups, there was a significant number of men, which was higher in the HFmrEF group 53 (76.8%). Marital status was predominantly a stable union in the HFpEF and HFmrEF groups; by contrast, the HFrEF group had a higher prevalence without a stable union 40 (57.1%), showing a statistically significant difference. Table 1 shows no statistically significant differences in health regime, occupation, educational level, area of residence, and socioeconomic stratum.

Table 2 presents the clinical variables of the patients, showing statistically significant differences in the risk factor of sedentary lifestyle, in which a lower prevalence was observed in the HFrEF group 59 (84.3%), p-value=0.033.

Systolic blood pressure at the end of the 6MWT showed a higher value in the HFpEF group when compared to the HFrEF group, p-value=0.043. Fat percentage was higher in the HFpEF group than in the HFrEF group, p-value=0.028. The HFmrEF group was characterized by a greater distance covered in the 6MWT and repetitions in the STS (Table 3).

Significant correlations of less than rho ≤ 0.49 were found in variables PAS Final 6MWT, BMI (Kg/m^2),

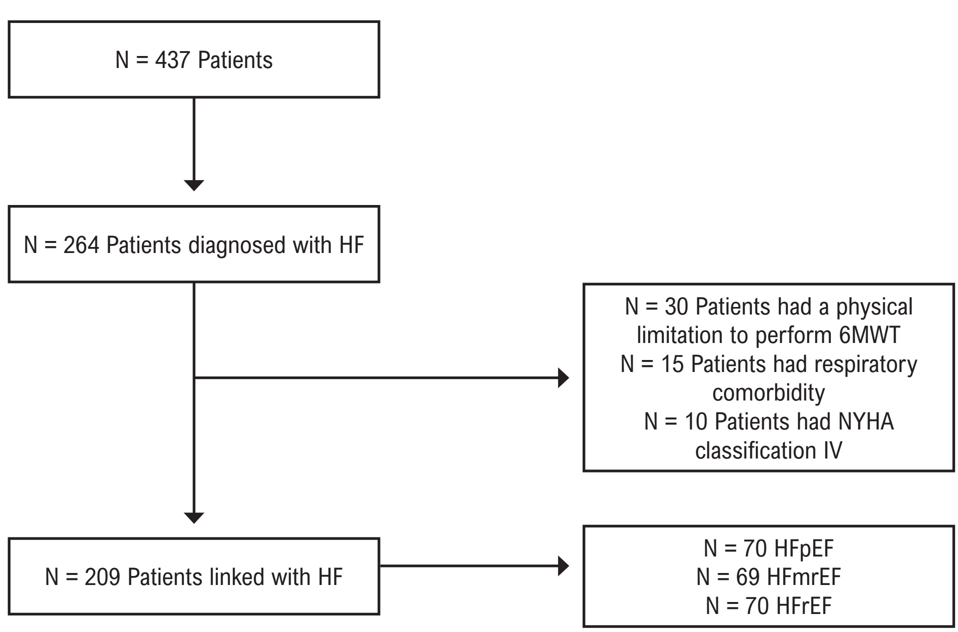

Figure 1 - Patient admission.
HFpEF: HF with preserved ejection fraction; HFrEF: HF with reduced ejection fraction; NYHA: MWT:

Table 1 - Sociodemographic variables of the patients

Variables	Total, n = 209	HFpEF n = 70	HFmrEF n = 69	HFrEF n = 70	P-value
Age*	62.70 ± 13.22	64.36 ± 13.91	61.46 ± 11.36	62.27 ± 14.20	0.413
Sex					
Male	141 (67.5%)	43 (61.4%)	53 (76.8%)	45 (64.3%)	0.121
Female	68 (32.5%)	27 (38.6%)	16 (23.2%)	25 (35.7%)	
Marital Status					
Stable union	120 (57.4%)	39 (55.7%)	51 (73.9%)	30 (42.9%)	0.001
No stable union	89 (42.6%)	31 (44.3%)	18 (26.1%)	40 (57.1%)	
Health Regimen					
Contributory	202 (96.7%)	69 (98.6%)	66 (95.7%)	67 (95.7%)	0.549
Subsidized	7 (3.3%)	1 (1.4%)	3 (4.3%)	3 (4.3%)	
Occupation					
Working	59 (28.2%)	20 (28.6%)	22 (31.9%)	17 (24.3%)	0.335
Disability	41 (19.6%)	12 (17.1%)	16 (23.2%)	13 (18.6%)	
Retired	43 (20.6%)	20 (28.6%)	10 (14.5%)	13 (18.6%)	
Not working	66 (31.6%)	18 (25.7%)	21 (30.4%)	27 (38.6%)	
Educational level					
None	5 (2.4%)	3 (4.3%)	-	2 (2.9%)	0.911
Incomplete elementary school	16 (7.7%)	5 (7.1%)	3 (4.3%)	8 (11.4%)	
Complete elementary school	25 (12.0%)	8 (11.4%)	8 (11.6%)	9 (12.9%)	
Incomplete high school	12 (5.7%)	5 (7.1%)	3 (4.3%)	4 (5.7%)	
Complete high school	78 (37.3%)	25 (35.7%)	27 (39.1%)	26 (37.1%)	
Technician	26 (12.4%)	8 (11.4%)	11 (15.9%)	7 (10%)	
Technologist	12 (5.7%)	3 (4.3%)	4 (5.8%)	5 (7.1%)	
University	24 (11.5%)	10 (14.3%)	8 (11.6%)	6 (8.6%)	
Postgraduate	11 (5.3%)	3 (4.3%)	5 (7.2%)	3 (4.3%)	
Residence					
Urban	208 (99.5%)	70 (100%)	68 (98.6%)	70 (100%)	0.361
Rural	1 (0.5%)	-	1 (1.4%)	-	
Stratum					
Low	61 (29.2%)	17 (24.3%)	21 (30.4%)	23 (32.9%)	0.822
Middle	114 (54.5%)	40 (57.1%)	38 (55.1%)	36 (51.4%)	
High	34 (16.3%)	13 (18.6%)	10 (14.5%)	11 (15.7%)	

**Values expressed in means and standard deviations. HFpEF: HF with preserved ejection fraction; HFmrEF: HF with mid-range ejection fraction; HFrEF: HF with reduced ejection fraction.*

Table 2 - Clinical variables of the patients

Variables	Total, n = 170	HFpEF n = 70	HFmrEF n = 69	HFrEF n = 70	P-value
LVEF Classification					
Preserved	70 (33.5%)	70 (100%)	-	-	**0.000**
Intermediate	69 (33.0%)	-	69 (100%)	-	
Reduced	70 (33.5%)	-	-	70 (100%)	
Risk Factor					
Dyslipidemia	111 (53.1%)	33 (47.1%)	42 (60.9%)	36 (51.4%)	0.253
Hypertension	139 (66.5%)	50 (71.4%)	41 (59.4%)	48 (68.6%)	0.294
Diabetes	69 (33.0%)	16 (22.9%)	27 (39.1%)	26 (37.1%)	0.083
Obesity	129 (61.7%)	50 (71.4%)	43 (62.3%)	36 (51.4%)	0.051
Overweight	134 (64.1%)	51 (72.9%)	45 (65.2%)	38 (54.3%)	0.071
Hypothyroidism	36 (17.2%)	15 (21.4%)	9 (13.0%)	12 (17.1%)	0.424
Postmenopausal	55 (26.3%)	19 (27.1%)	14 (20.3%)	22 (31.4%)	0.323
Current Smoking	6 (2.9%)	1 (1.4%)	3 (4.3%)	2 (2.9%)	0.588
Tobacco	75 (35.9%)	20 (28.6%)	27 (39.1%)	28 (40%)	0.293
Family History	114 (54.5%)	44 (62.9%)	35 (50.7%)	35 (50%)	0.230
Sedentary lifestyle	191 (91.4%)	66 (94.3%)	66 (95.7%)	59 (84.3%)	**0.033**
Symptoms					
Angina	66 (31.6%)	30 (42.9%)	18 (26.1%)	18 (25.7%)	**0.045**
Syncope	4 (1.9%)	3 (4.3%)	-	1 (1.4%)	0.171
Dyspnea	119 (56.9%)	42 (60%)	41 (59.4%)	36 (51.4%)	0.520
Fatigue	138 (66.0%)	53 (75.7%)	42 (60.9%)	43 (61.4%)	0.110
Palpitations	86 (41.1%)	32 (45.7%)	24 (34.8%)	30 (42.9%)	0.398
Lower limbs edema	46 (22.0%)	18 (25.7%)	12 (17.4%)	16 (22.9%)	0.485
Claudication	13 (6.2%)	5 (7.1%)	4 (5.8%)	4 (5.7%)	0.926
Dizziness	82 (83.7%)	34 (48.6%)	28 (40.6%)	20 (28.6%)	0.127
BMI Classification					
Thinness	21 (10.0%)	6 (8.6%)	6 (8.7%)	9 (12.9%)	0.228
Normoweight	55 (26.3%)	12 (17.1%)	23 (33.3%)	20 (28.6%)	
Overweight	92 (44.0%)	35 (50.0%)	30 (43.5%)	27 (38.6%)	
Obese	41 (19.6%)	17 (24.3%)	10 (14.5%)	14 (20%)	
BMI (Kg/m2) *	25.85 ± 4.69	26.85 ± 4.80	25.51 ± 4.01	25.19 ± 5.09	0.087
Weight (kg)*	70.55 ± 14.1	73.25 ± 15.40	69.55 ± 11.81	68.85 ± 14.62	0.141
Abdominal Perimeter	94.26 ± 10.89	96.56 ± 11.4	93.85 ± 9.52	92.38 ± 11.33	0.071
Fat (%) [a]	27.98 ± 8.42	30.20 ± 8.80	26.51 ± 7.60	27.26 ± 8.48	**0.028**
Water (%)	49.89 ± 6.23	48.91 ± 5.31	51.28 ± 6.48	49.46 ± 6.65	0.071
Mass (Kg)	45.14 ± 10.31	44.33 ± 10.9	45.73 ± 9.86	45.35 ± 10.16	0.724

Post hoc tests: statistically significant differences p<0.05, a: preserved LVEF group concerning intermediate LVEF group.
**Values expressed as means and standard deviation.*
BMI: body mass index; LVEF: left ventricular ejection fraction; **HFpEF:** *HF with preserved ejection fraction;* **HFmrEF:** *HF with mid-range ejection fraction;* **HFrEF:** *HF with reduced ejection fraction.*

Table 3 - Functional aerobic capacity, quality of life, and depression in patients.

Variables	Total, n = 209	HFpEF n = 70	HFmrEF n = 69	HFrEF n = 70	P-value
LVEF (%) [a,b,c]	43.12 ± 13.34	57.57 ± 5.66	43.27 ± 3.08	28.52 ± 8.23	**0.000**
Resting SpO2 (%)	96.30 ± 1.72	96.27 ± 1.43	96.37 ± 1.74	96.27 ± 1.97	0.918
SpO2 Final SpO2 6MWT (%)	95.37 ± 2.11	95.4 ± 2.12	95.35 ± 1.93	95.34 ± 2.30	0.976
Resting HR (bpm)	72.33 ± 12.93	73.69 ± 11.3	71.43 ± 13.85	71.87 ± 13.57	0.555
Final HR 6MWT (bpm)	98.11 ± 16.89	97.33 ± 15.13	99.77 ± 18.21	97.26 ± 17.34	0.611
Resting SBP (mmHg)	121.4 ± 14.27	122.8 ± 14.26	122.7 ± 13.72	118.9 ± 14.66	0.189
Final SBP 6MWT (mmHg) [b]	132.0 ± 17.25	135.1 ± 17.53	133.0 ± 17.09	128.0 ± 16.57	**0.043**
Resting DBP (mmHg)	74.41 ± 10.57	74.07 ± 11.05	75.8 ± 9.08	73.37 ± 11.40	0.377
PAD Final 6MWT (mmHg)	78.17 ± 11.21	78.84 ± 11.33	79.1 ± 12.00	76.59 ± 10.23	0.347
Distance 6MWT (m) [a]	255.4 ± 61.16	252.1 ± 46.78	269.5 ± 59.93	246.5 ± 71.26	0.066
VO2e 6MWT (ml/kg/dl) [a]	7.765 ± 1.02	7.71 ± 0.78	8.001 ± 0.99	7.61 ± 1.186	0.064
METs 6MWT	2.22 ± 0.29	2.21 ± 0.23	2.281 ± 0.28	2.180 ± 0.34	0.103
STS (Repetitions)	17.38 ± 4.97	17.23 ± 4.63	18.22 ± 5.04	16.86 ± 5.11	0.246
DASI Total	29.0 ± 15.7	30.77 ± 14.74	29.81 ± 17.17	26.63 ± 15.26	0.268
DASI VO2Max	22.0 ± 6.83	22.83 ± 6.34	22.41 ± 7.39	20.80 ± 6.67	0.180
DASI METs	6.29 ± 1.95	6.52 ± 1.81	6.40 ± 2.11	5.94 ± 1.91	0.181
MLHFQ Physical Dimension	14.6 ± 10.7	14.6 ± 10.94	14.59 ± 10.53	14.74 ± 10.88	0.997
MLHFQ Emotional Dimension	7.97 ± 6.58	7.14 ± 6.21	7.81 ± 6.68	8.94 ± 6.80	0.264
MLHFQ Total	35.0 ± 23.5	32.84 ± 24.41	35.43 ± 23.07	36.76 ± 23.35	0.609
PHQ-9 Total	6.05 ± 5.26	6.24 ± 5.62	5.75 ± 5.67	6.14 ± 4.48	0.847

Post hoc tests: statistically significant differences p<0.05 between groups a: Intermediate LVEF group compared to Reduced LVEF; b: Preserved LVEF group compared to Reduced LVEF; c: Preserved LVEF group compared to Intermediate LVEF group.
LVEF: left ventricular ejection fraction; SpO2: peripheral oxygen saturation; HR: heart rate; SBP: systolic blood pressure; DBP: diastolic blood pressure; VO2e TC6M: estimated oxygen consumption in the 6MWT. BMI: Body Mass Index; DASI: Duke Activity Status Index; MLHFQ: Minnesota Living with Heart Failure Questionnaire; PHQ-9: Patient Health Questionnaire 9; HFpEF: HF with preserved ejection fraction; STS: Sit to Stand; HFmrEF: HF with mid-range ejection fraction; HFrEF: HF with reduced ejection fraction.

abdominal perimeter, and fat percentage in all patients with HF. In the HFmrEF group, there were significantly lower correlations: rho ≤0.49 in the variables of muscle mass, total DASI, DASI VO2Max, DASI METs, and MLHFQ Physical Dimension. Finally, in the HFrEF group, there were significantly lower correlations: rho ≤0.49, DASI Total, DASI VO2Max, DASI METs, MLHFQ Physical Dimension, and MLHFQ Total

Discussion

Different studies have explored the functional aerobic capacity in patients with HF with different LVEF classifications.[6,7,22] Therefore, it is well-known that HF may appear with a limitation of the heart to supply an adequate blood volume to meet the metabolic requirements of the body so that patients have a marked limited capacity for exercise due to symptoms such as fatigue and dyspnea generated by low cardiac output and decreased blood flow to skeletal muscle.[1] Nevertheless, the addition of sociodemographic and clinical conditions has yet to be addressed in depth.

Regarding the sociodemographic variables, this study found a more significant number of male patients, especially in the HFmrEF group. This coincides with the findings of other authors who state that this population has a higher prevalence and is admitted to CR programs.[23,24]

Table 4 - Correlations with LVEF classification.

Variables	Total n = 209 Rho	Total n = 209 P-value	HFpEF n = 70 Rho	HFpEF n = 70 P-value	HFmrEF n = 69 Rho	HFmrEF n = 69 P-value	HFrEF n = 70 Rho	HFrEF n = 70 P-value
Final SBP 6MWT (mmHg)	0.154	0.026	-0.071	0.557	-0.159	0.192	0.124	0.124
BMI (Kg/m2)	0.170	0.014	0.073	0.546	0.030	0.807	0.129	0.129
Abdominal Perimeter	0.170	0.014	0.052	0.668	0.057	0.640	0.087	0.087
Fat (%)	0.169	0.017	0.114	0.362	0.008	0.947	0.122	0.122
Mass (Kg)	-0.063	0.379	-0.126	0.313	0.305	0.012	-0.150	-0.150
DASI Total	0.062	0.371	-0.092	0.447	0.308	0.010	-0.239	-0.239
DASI VO2Max	0.069	0.321	-0.094	0.441	0.308	0.010	-0.265	-0.265
DASI METs	0.069	0.322	-0.093	0.444	0.308	0.010	-0.265	-0.265
MLHFQ Physical Dimension	0.055	0.428	0.037	0.762	-0.241	0.046	0.336	0.336
MLHFQ Total	-0.020	0.768	0.044	0.717	-0.215	0.076	0.245	0.245

BMI: Body Mass Index; ***HFpEF:*** *HF with preserved ejection fraction;* ***HFmrEF:*** *HF with mid-range ejection fraction;* ***HFrEF:*** *HF with reduced ejection fraction; SBP: systolic blood pressure; 6MWT: 6-minute walk test; DASI: Duke Activity Status Index; MLHFQ: Minnesota living with heart failure questionnaire; MET: metabolic equivalent of task.*

Concerning the age of the patients, a statistically significant difference is evident between the groups with an average of 62.70±13.22 years, where the HFmrEF group presented a lower average age when compared to the other LVEF classification groups, which is related to the better performance in functional aerobic capacity in the 6MWT and the STS. These results coincide with those of Abdellatif et al., who report that age is an uncorrelated independent echocardiographic predictor of LVEF, which affects the functional performance of patients with HF.[25]

In the HFmrEF group, there was a significant difference in favor of marital status in a stable union, which could be related to more significant support for treatment and control of the disease, substantially favoring the clinical condition of these patients.[26] Additionally, it was found that men tend not to isolate themselves socially as much and receive more emotional support from family members even during exacerbations,[27] which is related to lower depression in men according to the PHQ-9 questionnaire score in the HFmrEF group.[26,28]

This study found a higher sedentary lifestyle in patients with HF than that reported by other authors,[29] which was lower in the HFrEF group and which could be explained by the fact that specialist physicians provide more recommendations related to physical activity in this group of patients as part of comprehensive treatment.[1]

Although there were no differences in BMI in this study, the HFpEF group had a slightly higher BMI associated with lower muscle mass and greater abdominal perimeter and fat percentage. This fact could explain some relevant findings in this group, such as higher blood pressure values[30] and a more significant clinical cardiovascular risk with comorbidities, such as angina and a sedentary lifestyle. Moreover, a greater abdominal perimeter, weight, and fat percentage in the obese group could evidence a greater clinical cardiovascular risk.[31]

There were no differences in functional aerobic capacity between the groups, but it is important to note that the HFmrEF group presented better results in the 6MWT and STS tests. This may well be because this group of patients had a better muscle mass, allowing them to present greater muscle efficiency and cover a greater distance in the 6MWT.[7,32]

In the DASI questionnaire, there were no differences between the groups. However, the HFrEF group had a lower score than the other groups, possibly because this group of patients is given more significant restrictions on strenuous activities.[1] This situation should be considered, since exercise-based interventions in patients with better ejection fraction have been studied and could be an alternative to increasing physical activity in patients with HF.

HRQOL showed no differences between the groups.

Finally, poor correlations were found in the HFmrEF group for muscle mass, DASI, and the physical dimension of the MLHFQ quality of life questionnaire. For the HFrEF group, for the variables of DASI, physical dimension, and a total of the MLHFQ quality of life questionnaire, which implies, as mentioned by Abdellatif et al.,[25] that the ejection fraction in patients with HF should be considered with other independent variables that enable the identification of authentic relationships, such as age and Myocardial contraction fraction.[25]

The limitation of this study is the fact that other methods for detecting ventricular dysfunction were not applied, such as myocardial contraction fraction and cardiac magnetic resonance, since it would possibly identify relevant differences between groups, including better correlations in variables, such as distance traveled in the 6MWT, and repetitions in the STS, DASI, and CVRS MLHFQ.[25] However, this screening method is rarely used in cardiac rehabilitation programs, so further research is required.

Conclusions

In this study, more men with HF were associated with significant differences according to LVEF classification in marital status, angina symptoms, fat percentage, and blood pressure at rest. The HFmrEF and HFrEF groups presented poor correlations in muscle mass, physical activity (DASI), and quality of life MLHFQ.

Author Contributions

Conception and design of the research, analysis and interpretation of the data, statistical analysis, writing of the manuscript and critical revision of the manuscript for intellectual content: Peña JB, Patino MJM, Pino IP; acquisition of data and obtaining financing: Peña JB.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the Institutional Ethics Committee of Institución under the protocol number 17.115. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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