ISSN 2515-8260 Volume 09, Issue 03, 2022

ORIGINAL RESEARCH

Clinical evaluation between Systolic and Diastolic Heart failure

[1]Panchanan Sahoo, [2]Ritesh Acharya

[1]Associate Professor, [2]Senior Resident, Department of Cardiology, Kalinga Institute of Medical Sciences, Bhubaneswar, India

Correspondence:
Panchanan Sahoo
Associate Professor, Department of Cardiology, Kalinga Institute of Medical Sciences, Bhubaneswar, India

ABSTRACT

Objectives: Diastolic heart failure (DHF) and Systolic heart failure (SHF) are two clinical subtypes of the Chronic Heart Failure (CHF) syndrome that is most frequently seen in clinical practise. SHF and DHF are the two most common clinical subgroups of Chronic Heart Failure syndrome. To assess the frequencies of CHF and the systolic dysfunction (SD) and diastolic dysfunction (DD) in the community. To also ascertain whether DD helps in predicting all-cause mortality.

Study design and sample: This cross-sectional study of 242 participants who have been selected randomly will be conducted in the state of Bhubaneshwar, India. The inclusive criteria of the sample are that the age groups must be 45 years or older. This study took place between June 2020 to July 2021.

Results: Validated CHF was found in 2.2 percent of the participants, with 44 percent of participants with an EF greater than 50%. 20.8 percent of participants had mild diastolic disfunction, 6.6 percent had moderate DD, and 0.7 percent had severe DD. There was a 6.0 percent occurrence of any SD, with 2.0 percent having severe or moderate SD. People with SD or DD had considerably higher rates of CHF than those participants with normal cardiac function. Even among individuals with severe or moderate DD or SD, however, only around half had heard of CHF. Mild DD, severe or moderate DD, and severe or moderate SD were predictive of mortality across multivariate analysis, adjusted for sex, EF and age.

Conclusion: SD is present among people who do not have recognised CHF. DD is common and is not accompanied by CHF. It is associated with an elevation in mortality.

INTRODUCTION

Congestive heart failure (CHF) can be defined by physical findings and characteristic symptoms. In people with CHF, echocardiography is frequently used to detect the ejection fraction (EF) and whether the systolic function is preserved or impaired (Flint et al., 2019; Bae et al., 2019). Additional to measuring the EF, comprehensive Doppler echocardiography may now describe diastolic function. CFDs like ischemic heart disease, hypertension, cardiomyopathies lead to diastolic and systolic ventricular dysfunctions (Kelley et al., 2021; Louca et al., 2020). It has been determined that certain patients with an advanced SD are free from CHF symptoms. Hence, without receiving treatment or diagnosis of CHF, people might present SD (Ladeiras-Lopes et al., 2019; Quesada et al., 2021). DD caused by impaired ventricular relaxation, compliance, filling, together with SD caused by poor contractile or pump function are not invariably linked to clinical heart failure shown by congestion or

diminished cardiac output (Robles et al., 2019). DD, as measured by changes in ventricular filling characteristics, is also frequent in SHF, especially in late heart failure. LV systolic contractility, function, and performance remain normal in DHF. In some studies, long-axis SD has been determined (Butler et al., 2018).

The CHF guidelines acknowledge the efficaciousness of therapy in aborting or delaying the progress of SD. It has been indicated by past literature that even simple Doppler evidences of DD tends to be a risk factor for future developments of cardiac death and CHF (Jung et al., 2019). Hence, a powerful strategy for the reduction of CHF incidence is the early identification and diagnosis of preclinical DD and SD. This study intends to demonstrate the occurrences of DD and SD and also the CHF in the selected sample. Another intent is to identify the existence of DD as predictive of mortality.

METHODOLOGY

SAMPLE

A random sampling of patients was undertaken for this cross-sectional study where 242 participants were selected. The inclusive criteria for the selection of the participants were that the age groups were 45 years or more. This study took place between June 2020 to July 2021.

TESTS CONDUCTED

The anamnesis of each participant was examined for hypertension and/or myocardial infarction using recognised criteria. Clinical diagnosis of atherosclerotic heart disease and DM were also kept track of. Every participant undertook a medical assessment that included height, weight, and blood pressure measurements. The BMI of each participant was determined, and their anamnesis was checked to see if they had been diagnosed with CHF. M-mode echocardiography utilising quantitative 2-D approach, semiquantitative 2-D visual estimate method and modified Quinones's formula were instrumentalised to evaluate EF of every participant. To be classified as having severe or moderate DD, participants had to meet two Doppler criteria. Subjects who satisfied one of these criteria for severe or moderate DD, or whose characteristics were suggestive but not decisive for DD. They were characterised as indeterminate rather than normal. 2-D data and M-mode were used to derive left atrial volume and left ventricular mass, which was then indexed to the surface area of the body.

STATISTICAL METHODS

The corresponding distribution was summed as an empirically calculated cumulative distribution function for every EF technique. With the associated 95 percent confidence interval based on the precise binomial distribution, the total prevalence of SD was assessed for each approach among subjects from whose EF was acquired by that method.

FINDINGS

The mean ages of research participants were 62.7 (10.6), with 29.3 percent between the ages of 45 and 54, 30.6 percent between the ages of 55 and 64, 25.4 percent between the ages of 65 and 74, and 14.6 percent between the ages of 75 and older. BMI was 27.4 on the mean (5.41). 8.8% were past or current smokers, 50.1 percent had diabetes, 4.4 percent had diabetes, 12.1% had a family history of atherosclerotic heart disease, and 4.9 percent had a prior myocardial infarction.

SYSTOLIC DYSFUNCTION

M-mode provided EF for 78.0 percent of participants, 79.2% for the biplane Simpson technique, and 99.7% for 2-D visual approaches. 92.5 percent of total 242 patients had their EF quantitatively assessed using M-mode or the biplane Simpson technique if M-mode was

not feasible. The prevalence was 6.0 percent (95 percent CI, 5.0 percent -7.1 percent) for those with an EF of 50 percent or less and 2.0 percent (95 percent CI, 1.4 percent -2.5 percent) for patients with an EF of 40 percent or less among 236 participants whose EF was evaluated with the 2-D visual technique. When the sample was restricted using only one quantitative technique, the prevalence of SD was lower. It was greater in males than women with and without correcting for age (P<0.001), and increased with age with and without adjusting for sex (P<0.001).

Table 1. Associating clinical parameters with diastolic dysfunction

	Number of patients affected Age, Group, y			
Variables	**Normal**	**Mild**	**Moderate**	**Severe**
Men	80 (70.2)	26 (22.5)	8 (6.7)	0 (0.6)
Women	94 (73.2)	25 (19.4)	8(6.6)	1 (0.8)
Age, y				
45-64	132 (87.2)	13 (8.9)	6 (3.7)	0 (0.2)
>_ 65	42 (46.1)	37 (40.7)	10 (11.5)	2 (1.6)
Ejection fraction, %				
>50	171 (74.5)	45 (19.6)	13 (5.6)	1 (0.3)
<_50	2 (20.5)	5 (44.3)	3 (26.1)	2 (9.1)
Hypertension				
No	138 (79.3)	27 (15.5)	9 (4.9)	0 (0.4)
Yes	36 (52.7)	23 (34.5)	8 (11.2)	1 (1.6)
Diabetes				
No	158 (73.3)	42 (19.5)	14 (6.5)	2 (0.7)
Yes	113 (52.4)	82 (38.1)	17 (7.9)	4 (1.6)
Coronary disease				
No	175 (75.3)	44 (19.1)	12 (5.3)	1 (0.3)
Yes	4 (42.3)	4 (35.4)	2 (18)	0 (4.2)
Myocardial infarction				
No	176 (73.4)	48 (19.9)	15 (6.2)	1 (0.5)
Yes	1 (35.5)	1 (42.1)	0 (15.8)	0 (6.6)
Validated CHF diagnosis				
No	174 (72.6)	49 (20.6)	15 (6.4)	1 (0.4)
Yes	0 (4.5)	1 (40.9)	1 (27.3)	1 (27.3)
CHF diagnosis				
No	173 (72.8)	49 (20.4)	15 (6.3)	1 (0.4)
Yes	0 (3.7)	2 (48.2)	1 (25.9)	1 (22.2)
Body mass index, kg/m^2				
<25	47 (75.1)	10 (16.2)	5 (7.6)	0 (1.1)
25-30	74 (72.6)	21 (20.3)	7 (6.4)	0 (0.7)
≥30	53 (68.0)	20 (25.3)	5 (6.2)	0 (0.5)

DIASTOLIC DYSFUNCTION

About 179 subjects (87.1%) had a normal or abnormal diastolic function, whereas 63 had uncertain diastolic function (12.9 percent). Only one of the five patients with confirmed CHF satisfied Doppler criteria for normal diastolic function. Two of the patients had diastolic dysfunction as evaluated by Doppler. The other three were still up in the air. Overall, 6.5% (94% CI, 5.4%- 7.7%) had moderate, 20.6% (96% CI, 18.0%- 22.6%) had mild, and 0.8%

(94% CI, 0.4%-1.0%) had severe DD with 5.7% (94% CI, 4.2%-6.7%) having severe or moderate DD with a normal EF level. Diastolic dysfunction became more prevalent as people became older, was more prevalent in participants with CVD, DM, or SD, and was equally common among women and men. When compared to the patients' moderate diastolic function (28.6%), normal (29.8%), or severe (24.2%) diastolic dysfunction, a higher number of participants with mild DD (38.9%) were obese (BMI >30).

DISCUSSION

The current investigation provided the first estimations of the existence of DD, based on Doppler criteria that were both rigorous and hemodynamically validated. Diastolic Dysfunction (DD) and isolated DD were both common. CHF has become more prominent as its severity has increased. Even in the absence of a CHF diagnosis, severe DD was typically preclinical. When sex, EF, and age were taken into account, both mild and severe or moderate DD was found to be predictive of mortality. SD was also widely used. Despite the fact that the frequency of CHF increased with declining systolic function, fewer than half of individuals with an EF of 40 percent or below received a diagnosis of CHF. Simple clinical tests can identify people who are most at risk for preclinical SD or DD.

Obokata et al. (2020), Sorrentino (2019), and Packer (2019) conducted participants-based investigations and found that 45% to 50% of people with CHF have normal EF, which was verified in our study. Individuals with normal EF and CHF consistently demonstrate DD when subjugated to hemodynamic testing, according to Myhre et al. (2019) and Ferreira et al. (2018), whereas patients presenting with normal EF and CHF do not have temporary SD. According to Cowie et al. (2018), mitral inflow patterns indicating severe, moderate or mild DD, independently predicted the future development of CHF in older volunteers. When technique-specific rates, sex and age were evaluated, participants-based studies like Yoldas et al. (2018) revealed similar prevalence rates as that of the findings of the current study.

For women and men over the age of 40, lifetime risks of having CHF are 20%, which is higher than lifetime risks of many other illnesses regularly checked for. CHF prevention is important (Zhang et al, 2018). The therapy of preclinical SD is suggested in CHF recommendations for moderate to severe DD versus normal diastolic function. Several therapeutic trials are now underway, despite the fact that deficiency of therapies in diastolic CHF alters the illness trajectory (Metkus et al., 2018). In order to extend the approach of CHF prevention through treatment of preclinical SD to individuals with preclinical DD, the present results are critical. Doppler echocardiography and maybe measurement of plasma brain natriuretic peptide concentrations are two screening techniques for detecting preclinical ventricular failure (Khan et al., 2020). However, studies on BNP's sensitivity and specificity for detecting SD and DD differ, and additional research is needed.

CONCLUSION

The conclusion that may be reached is that SD is common in those who do not have CHF. Furthermore, DD, as determined by comprehensive Doppler methods, is frequent, often without symptoms of CHF, and is linked to a significant increase in all-cause mortality. Although no significant variations in clinical characteristics were seen between participants and non-participants, it cannot be ruled out that those with or without disease would choose participate. SHF and DHF appear to be two distinct chronic heart failure syndromes based on clinical evidence. Although the hemodynamic consequences, clinical presentations, clinical manifestations, and prognosis are identical in these two disorders, the structural and functional impairments in the myocardium are distinct. Neurohormonal abnormalities are seen in each of these illnesses. Although great advances have been made in the treatment of SHF, the therapy of DHF is still mostly focused on symptom alleviation. Because of a lack of

knowledge of the molecular and biochemical processes of structural re-modelling and basic functional disruption in diastolic heart failure, treatments to improve prognosis have stagnated.

REFERENCES

1. Bae, E. H., Lim, S. Y., Han, K. D., Oh, T. R., Choi, H. S., Kim, C. S., ... & Kim, S. W. (2019). Association between systolic and diastolic blood pressure variability and the risk of end-stage renal disease. *Hypertension*, *74*(4), 880-887.
2. Butler, J., Kalogeropoulos, A. P., Anstrom, K. J., Hsue, P. Y., Kim, R. J., Scherzer, R., ... & Braunwald, E. (2018). Diastolic dysfunction in individuals with human immunodeficiency virus infection: literature review, rationale and design of the characterizing heart function on antiretroviral therapy (CHART) study. *Journal of cardiac failure*, *24*(4), 255-265.
3. Cowie, M. R., Woehrle, H., Wegscheider, K., Vettorazzi, E., Lezius, S., Koenig, W., ... & Teschler, H. (2018). Adaptive servo-ventilation for central sleep apnoea in systolic heart failure: results of the major substudy of SERVE-HF. *European journal of heart failure*, *20*(3), 536-544.
4. Ferreira, J. P., Duarte, K., Pfeffer, M. A., McMurray, J. J., Pitt, B., Dickstein, K., ... & High-Risk Myocardial Infarction Database Initiative. (2018). Association between mean systolic and diastolic blood pressure throughout the follow-up and cardiovascular events in acute myocardial infarction patients with systolic dysfunction and/or heart failure: an analysis from the High-Risk Myocardial Infarction Database Initiative. *European journal of heart failure*, *20*(2), 323-331.
5. Flint, A. C., Conell, C., Ren, X., Banki, N. M., Chan, S. L., Rao, V. A., ... & Bhatt, D. L. (2019). Effect of systolic and diastolic blood pressure on cardiovascular outcomes. *New England Journal of Medicine*, *381*(3), 243-251.
6. Jung, J. Y., Oh, C. M., Choi, J. M., Ryoo, J. H., Chung, P. W., Hong, H. P., & Park, S. K. (2019). Levels of systolic and diastolic blood pressure and their relation to incident metabolic syndrome. *Cardiology*, *143*(1), 224-231.
7. Kelley, G. A., Kelley, K. S., & Stauffer, B. L. (2021). Isometric exercise and inter-individual response differences on resting systolic and diastolic blood pressure in adults: a meta-analysis of randomized controlled trials. *Blood Pressure*, *30*(5), 310-321.
8. Khan, N., Hashmi, S., Siddiqui, A. J., Farooq, S., Sami, S. A., Basir, N., ... & Musharraf, S. G. (2020). Understanding of metals dysregulation in patients with systolic and diastolic dysfunction in ischemic heart disease. *Scientific reports*, *10*(1), 1-11.
9. Ladeiras-Lopes, R., Araújo, M., Sampaio, F., Leite-Moreira, A., & Fontes-Carvalho, R. (2019). The impact of diastolic dysfunction as a predictor of cardiovascular events: a systematic review and meta-analysis. *Revista Portuguesa de Cardiologia*, *38*(11), 789-804.
10. Louca, P., Mompeo, O., Leeming, E. R., Berry, S. E., Mangino, M., Spector, T. D., ... & Menni, C. (2020). Dietary influence on systolic and diastolic blood pressure in the TwinsUK cohort. *Nutrients*, *12*(7), 2130.
11. Metkus, T. S., Suarez-Pierre, A., Crawford, T. C., Lawton, J. S., Goeddel, L., Dodd-o, J., ... & Whitman, G. J. (2018). Diastolic dysfunction is common and predicts outcome after cardiac surgery. *Journal of cardiothoracic surgery*, *13*(1), 1-7.
12. Myhre, P. L., Claggett, B., Ballantyne, C. M., Selvin, E., Røsjø, H., Omland, T., ... & Shah, A. M. (2019). Association between circulating troponin concentrations, left ventricular systolic and diastolic functions, and incident heart failure in older adults. *JAMA cardiology*, *4*(10), 997-1006.

13. Obokata, M., Reddy, Y. N., & Borlaug, B. A. (2020). Diastolic dysfunction and heart failure with preserved ejection fraction: understanding mechanisms by using noninvasive methods. *JACC: Cardiovascular Imaging*, *13*(1 Part 2), 245-257.
14. Packer, M. (2019). Effect of catheter ablation on pre-existing abnormalities of left atrial systolic, diastolic, and neurohormonal functions in patients with chronic heart failure and atrial fibrillation. *European Heart Journal*, *40*(23), 1873-1879.
15. Quesada, O., Claggett, B., Rodriguez, F., Cai, J., Moncrieft, A. E., Garcia, K., ... & Bello, N. A. (2021). Associations of Insulin Resistance With Systolic and Diastolic Blood Pressure: A Study From the HCHS/SOL. *Hypertension*, *78*(3), 716-725.
16. Robles, N. R., Fici, F., & Grassi, G. (2019). J-shaped curve for cardiovascular mortality: systolic or diastolic blood pressure?. *Journal of nephrology*, *32*(3), 347-353.
17. Sorrentino, M. J. (2019). The evolution from hypertension to heart failure. *Heart failure clinics*, *15*(4), 447-453.
18. Yoldaş, T., Örün, U. A., Sagsak, E., Aycan, Z., Kaya, Ö., Özgür, S., & Karademir, S. (2018). Subclinical left ventricular systolic and diastolic dysfunction in type 1 diabetic children and adolescents with good metabolic control. *Echocardiography*, *35*(2), 227-233.
19. Zhang, K. W., Finkelman, B. S., Gulati, G., Narayan, H. K., Upshaw, J., Narayan, V., ... & Ky, B. (2018). Abnormalities in 3-dimensional left ventricular mechanics with anthracycline chemotherapy are associated with systolic and diastolic dysfunction. *JACC: Cardiovascular Imaging*, *11*(8), 1059-1068.