IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 11, Issue 4 Ser. IV (Jul. – Aug. 2022), PP 44-48
www.iosrjournals.org

Comparison of Systemic Status of a Patient with LV Dimensions and Echocardiography Parameters

Iqra Ashfaq[1*], Rehan Afsar[2,3], Abid Ali[4], Maryam Jamil[2,3], Samama Ghuman[1]
1.Medical Imaging Doctor(MID),University Institute of Radiological and Medical Imaging Sciences, The University of Lahore, Gujrat, Campus
2. Lecturer,University Institute of Radiological and Medical Imaging Sciences, The University of Lahore, Gujrat, Campus
3. Lecturer, The University of Chenab
4. Associate Professor, Department of Allied Health Sciences,The University of Chenab, Gujrat
**Corresponding Author: 70058545@student.uol.edu.pk University Institute of Radiological and Medical Imaging Sciences, The University of Lahore, Gujrat Campus, Pakistan*

Abstract
Background: *Echocardiography is a significant and emerging imaging modality in patients having cardiac diseases. The functional classification of the New York Heart Association (NYHA) is the most widely used classification method for heart failure (HF). The purpose of the current study was to compare of systemic status of a patient with LV dimensions and echocardiography parameters.*
OBJECTIVE:*To compare of systemic status of a patient with LV dimensions and echocardiography parameters in Wazirabad, Pakistan.*
MATERIAL AND METHOD: *A cross-sectional study was organized at the echocardiography department of radiology (Wazirabad Institute of Cardiology/WIC, Wazirabad). The duration of the study was 3 months i.e. 14 January 2022 to 14 April 2022. The total number of participants was 146. Between 14 January 2022 and 14 April 2022, 146 patients who underwent Echocardiography for cardiac evaluation were analyzed. Written consents were signed by the patients. Questions were also ask for their physical condition and classified as per NYHA classification. Patients who refused to sign written consent were excluded from the study as well as the patient who had lung disorders and who were un-cooperative.*
RESULTS: *Of the 146patients, 96 (65.8%) were males and 50 (34.2%) were females with average age of 55 years. 30 (20.5%) patients were included in NYHA class 1, 83 (56.8%) patients in NYHA class 2, 28 (19.2%) patients in NYHA class 3 and 5 (3.4%) patients in class 4 ejection fraction of 56.8-60.7%, 50.8-55.0%, 35.5-44.1% and 20.6-29.4% respectively.*
CONCLUSION: *The NYHA classification had a modest relationship with echocardiography parameters and LV dimensions, while concordance was limited since only the doppler parameter and LV ejection fraction differed by NYHA class.*
Keywords: *Echocardiography, Systemic Status, NYHA Classification, Heart Failure, LV Dimensions, Diastolic Dysfunction, Cardiomyopathies*

Date of Submission: 14-08-2022 Date of Acceptance: 29-08-2022

I. Introduction

The NYHA classification is a well-known, low-cost, simple and direct functional stratification approach for HF that has prognostic significance. It separates patients into four categories based on self-reported dyspnea severity and physical activity limits[1,2]. The classification recommended by New York Heart Association has four stages, stage I patient don't have any shortness of breath and angina which mean the patient is healthy to do all its activity without any restriction. In stage II, patient may feel shortness of breath and angina while doing heavy work like lifting heavy objects and climbing stairs, which means patient can carry out ordinary activity with restriction on doing excessive work. In stage III, patient have shortness of breath and angina in ordinary activity like walking, taking etc., which means patient is unable to carry out routine work without any restriction and have to take support from others. In stage IV, patient experience shortness of breath and angina while lying down, they may wake up because of shortness of breath during the night, which means patient is restricted to do ordinary activities. New York Heart Association Classification has proved its role in evaluating the prognosis and mortality of Heart Failure (HF) patients. The NYHA functional class, on the other hand, is based on self-reported symptoms and hence is impacted by the individuality of each patient[3,4].

Echocardiography is among the most commonly utilized non-invasive diagnostic methods in patients with known or suspected cardiovascular disease. [5-7]. Furthermore, there are no known harmful consequences associated with echocardiography, even with regular and repeat testing. As a result, echocardiography has been successfully employed to provide mechanistic insights into therapy results, as well as to evaluate functional and structural changes that are thought to be therapeutically important (i.e., "surrogate" end points). Several diagnostic and hemodynamic modalities are available with a cardiovascular ultrasonography examination ("echocardiography"). The backbone of echocardiogram is two-dimensional (2D) echocardiography. By directing an ultrasound probe at the heart, the examiner must obtain many, properly oriented anatomic "slices" (cross-sectional scanning). These images are utilized in vascular imaging to provide high-resolution detail of static structures and can show high-resolution detail of atherosclerotic plaque and vascular architecture.M-mode or motion-mode images are a continuous 1-dimensional graphic display that may be created by selecting any of the individual sector lines that make up a 2D image. The temporal resolution in M-mode echocardiography is apparently very great, making it a good tool for timing valve action. The Doppler technique measures blood flow in the central and peripheral circulation by measuring reflections from moving red blood cells. Doppler echocardiography is a type of echocardiography that provides intracardiac hemodynamics information that is essential, such as systolic and diastolic blood circulation, blood kinematics and volumes, valvular lesions severity, position and severity of intracoronary shunts, and diastolic function assessment, in addition to M-mode and 2D echocardiography. There are 4 forms of doppler; (i) Pulsed-wave, (ii) continuous-wave, (iii) color flow mapping, and (iv) tissue Doppler. The color flow map, which measures the velocity along each fan line in a two-dimensional image and color-coded pixels are used to display the data, provides a complex flow map of a greater region. Diastolic blood flow imaging detects the presence of a heart bypass and searches for blood flow in the coronary arteries. Tissue Doppler detects the amplitude and phase of the relatively slow movements of the LV myocardium (usually the base of the heart). It is useful as a research tool for extension functions. Strain image is a comparatively recent echocardiography method and may be helpful in the evaluation of LV function in systolic and diastolic stages. This technique indicates the effectiveness of cardiac tissue, providing information about the local rate of dilatation and contraction. In contrast to endocardial travel, there is no tethering by adjacent myocardial segments[8].

II. Material and Method:

A cross-sectional study was organized at the echocardiography department of radiology (Wazirabad Institute of Cardiology/WIC, Wazirabad). The duration of the study was 3 months i.e. 14 January 2022 to 14 April 2022. The total number of participants was 146. Between 14 January 2022 and 14 April 2022, 146 patients who underwent Echocardiography for cardiac evaluation were analyzed. Written consents were signed by the patients. Questions were also ask for their physical condition and classified as per NYHA classification. Patients who refused to sign written consent were excluded from the study as well as the patient who had lung disorders and who were un-cooperative.

Patients who reported in the echocardiography department were included in this study. Echocardiography was performed on ultrasound machine, Toshiba (Apllio 300). Patients who have any type of lung disease was excluded from the study. Statistical analysis was done on IBM SSPS 26.

III. Results

Overall 146 patients were included who came to Echocardiography department in (WIC, Wazirabad) between 14January 2022 to 14 April 2022 were assessed for the study. All the patients underwent echocardiography for cardiac evaluation. Of the 146patients, 96 (65.8%) were males and 50 (34.2%) were females with average age of 55 years. In this study, 30 (20.5%) patients fall in NYHA class 1 with echocardiography values of Ao (27.44 - 29.70 mm), LA (30.8-33.9 mm), LVISd (8.1-9.0 mm), LVPWd (8.0-8.8 mm), LVIDd (45.1-48.1 mm), LVIDs (29.0-33.7 mm), LVEF (56.8-60.7%) E/A (1.0-1.2), DT (166.1-195.9 cm/sec) and E` (8.44-9.42 cm/sec), 83 (56.8%) patients fall in NYHA class 2 with echocardiography values of Ao (28.9-30.1 mm), LA (35.0-36.6 mm), LVISd (9.8-10.5 mm), LVPWd (9.5-10.1 mm), LVIDd (45.5-47.8 mm), LVIDs (30.1-33.0 mm), LVEF (50.8-55.0%) E/A (0.9-1.2), DT (207.6-235.6 cm/sec) and E` (7.34-8.17 cm/sec), 28 (19.2%) patients fall in NYHA class 3 Ao (29.3-31.7 mm), LA (36.3-39.6 mm), LVISd (9.7-11.0 mm), LVPWd (9.6-10.8 mm), LVIDd (49.0-54.4 mm), LVIDs (34.6-40.9 mm), LVEF (35.5-44.1%) E/A (0.9-1.3), DT (187.7-241.0 cm/sec) and E` (5.7-7.5 cm/sec) and 5 (3.4%) patients fall in NYHA class 4 with echocardiography values of Ao (24.2-29.8 mm), LA (31.7-41.9 mm), LVISd (6.8-11.6 mm), LVPWd (7.6-10.8 mm), LVIDd (42.5-68.3 mm), LVIDs (34.7-57.3 mm), LVEF (20.6-29.4%) E/A (1.1-2.0), DT (119.7-186.6 cm/sec) and E` (2.1-7.9 cm/sec).

Gender		
	Frequency	Percent
FEMALE	50	34.2
MALE	96	65.8
Total	146	100.0

Table 1: Showing frequency of males and females. 50 (34.2%) were females and 96 (65.8%) were males.

New York Heart Association Classification		
	Frequency	Percent
NYHA CLASS 1	30	20.5
NYHA CLASS 2	83	56.8
NYHA CLASS 3	28	19.2
NYHA CLASS 4	5	3.4
Total	146	100.0

Table 2: Frequency of patients in each NYHA Class. 30 (20.5%) patients were included in NYHA class 1, 83 (56.8%) patients in NYHA class 2, 28 (19.2%) patients in NYHA class 3 and 5 (3.4%) patients in class 4.

	NYHA 1	**NYHA 2**	**NYHA 3**	**NYHA 4**
Ao (mm)	27.4 – 29.7	28.9 – 30.1	29.3 – 31.7	24.2 – 29.8
LA (mm)	30.8 – 33.9	35.0 – 36.6	36.3 – 39.6	31.7 – 41.9
LVISd (mm)	8.1 – 9.0	9.8 – 10.5	9.7 – 11.0	6.8 – 11.6
LVPWd (mm)	8.0 – 8.8	9.5 – 10.1	9.6 – 10.8	7.6 – 10.8
LVIDd (mm)	45.1 – 48.1	45.5 – 47.8	49.0 – 54.4	42.5 – 68.3
LVIDs (mm)	29.0 – 33.7	30.1 – 33.0	34.6 – 40.9	34.7 – 57.3
LVEF (%)	56.8 – 60.7	50.8 – 55.0	35.5 – 44.1	20.6 – 29.4
E/A	1.0 – 1.2	0.9 – 10.8	0.9 – 1.3	1.1 – 2.0
DT (cm/sec)	166.1 – 195.9	207.6 – 235.6	187.7 – 241.0	119.7 – 186.6
E` (cm/sec)	8.44 – 9.42	7.34 – 8.17	5.7 – 7.5	2.1 – 7.9

Table 3: Showing echocardiography parameter's values in NYHA classes [Ao = Aortic Root, LA = Left Atrium, LVISd = Left Ventricular Inter Septal Diastole, LVPWd = LV Posterior Wall Diastole, LVIDd = LV Internal Dimension Diastole, LVIDs = LV Internal Dimension Systole, LVEF = LV Ejection Fraction, E = E wave (Early Diastole), A = A wave (Arterial Contraction), DT = Deceleration Time, E`= E Prime].

	Absent	**GIDD**	**GIIDD**	**GIIIDD**
Ao (mm)	27.5 – 29.7	29.1 – 31.1	27.1 – 34.6	25.7 – 31.7
LA (mm)	33.9 – 35.7	34.7 – 37.4	37.3 – 42.4	35.1 – 42.0
LVISd (mm)	9.2 – 9.8	9.5 – 10.9	10.0 – 10.6	9.8 – 11.3
LVPWd (mm)	8.9 – 9.5	9.5 – 10.5	9.8 – 11.3	9.7 – 11.2
LVIDd (mm)	46.6 – 49.0	44.7 – 48.5	50.4 – 58.4	40.4 – 57.61
LVIDs (mm)	31.4 – 34.9	29.7 – 34.8	34.4 – 43.6	27.4 – 45.4
LVEF (%)	50.1 – 54.8	47.7 – 54.8	31.7 – 39.8	25.9 – 49.7
E/A	1.1 – 1.2	0.6 – 0.7	0.8 – 1.5	1.1 – 3.4
DT (cm/sec)	185.5 – 204.3	233.9 – 270.8	115.3 – 290.7	68.0 – 324.8

E` (cm/sec)	8.0 – 8.8	6.3 – 7.2	3.5 – 6.7	3.0 – 5.8

Table 4: Showing echocardiography Parameters for Diastolic Dysfunction. [DD = Diastolic Dysfunction, GIDD = Grade 1 DD, GIIDD = Grade 2 DD, GIIIDD = Diastolic Dysfunction]. [Ao = Aortic Root, LA = Left Atrium, LVISd = Left Ventricular Inter Septal Diastole, LVPWd = LV Posterior Wall Diastole, LVIDd = LV Internal Dimension Diastole, LVIDs = LV Internal Dimension Systole, LVEF = LV Ejection Fraction, E = E wave (Early Diastole), A = A wave (Arterial Contraction), DT = Deceleration Time, E`= E Prime].

IV. Discussion:

The following are the study's main findings: (i) categorization of NYHA classification using echocardiography parameters and LV dimensions, which clearly revealed an increase in values as the class progressed and demonstrated that class 4 is associated with cardiac atrophy or hypertrophy. (ii) While the NYHA classification exhibited a small connection with echocardiography parameters and LV dimensions, concordance was restricted because only the Doppler parameter and the LV ejection percentage differed across all NYHA classes.(iii) For clinical use in individual patients with cardiovascular disease, Doppler echocardiographic hemodynamic assessment is more practicable than LV dimension.

This study also looked at the severity of diastolic dysfunction. From gathered data we analyzed that in Grade I, the doppler values were E/A = 0.6-0.8, DT = 233-271 cm/sec, and E' = 6.3-7.2 cm/sec. E/A = 0.8-1.5, DT = 115-291 cm/sec, E' = 3.5-6.7 cm/sec in Grade II. Whereas in Grade III the values were,E/A = 1.0-3.4, DT = 68-324 cm. In different studies, the ASE standards were used to determine the severity of diastolic dysfunction. The septal E′ was the only one that could be used. Grade 1 was characterised as E/A ≤ 0.8 in a summary. E/A = 0.8–1.2, E′ =8 cm/s were used to establish Grade II. E/A > 2, a deceleration duration of 160 ms, and septal E′8 cm/s were used to establish Grade III[9-11].

Doppler parameters (E/A, DT, E') and LVEF were shown to be more helpful in the assessment of cardiac disorders than echo parameters (Ao, LA) and LV dimensions in this investigation. Comprehensive hemodynamic assessment, in addition to basic clinical examination, is critical in the care of patients who have HF, especially those who have advanced HF.In their work, Temporelli*et al*[12], also mentioned that Doppler measurements can be used to identify advanced HF.

When we compared the echocardiography data in this study, we discovered that the NYHA classification helps predict HF risk and has an impact on therapy options. However, when compared to Doppler readings, its connection with LV dimension was quite low.NYHA classification, according to Ritt*et al*[3], can interfere subjectively with risk prediction and, as a result, therapeutic decisions.

The absence of diagnostic follow-up of our patient sample is one of our study's weaknesses. We did not include symptomatic anemia because we were focusing on clinical diagnoses, but asymptomatic anemia could have an impact on functional ability as well. In addition, the occurrence of depression in our patients was not investigated, despite the fact that it may play a role in their lack of effort. Only the NYHA classification, echocardiography parameters, and LV dimensions were considered. Future research focused on Weber classes, VE/VCO2 slope classes, and CPET score would be beneficial. Importantly, doppler parameters and LV ejection fraction were found to be more accurate predictors of heart failure.

V. Conclusion

The NYHA classification had a modest relationship with echocardiography parameters and LV dimensions, while concordance was limited since only the doppler parameter and LV ejection fraction differed by NYHA class.The first three classes of the NYHA classification are fluctuating within normal limits, but they are steadily growing; nonetheless, class 4 is linked to heart hypertrophy or atrophy.

Conflict of Interests: The authors of this research paper proclaim that there is no conflict of interest for the current study.

Acknowledgments

I would want to begin by thanking **ALLAH ALMIGHTY** for providing me with the abilities, protection, direction, and strength I needed to do my project.

I want to thank my mother**, Sofia Tabassum,**and my beloved grandparents, **Sheikh Shoukat Aziz & Zartaj Sultana**, for believing in me and supporting me whenever I needed it. She helped me spiritually, emotionally, and financially. I also want to thank my best friends **Samama Ghuman, Fatima Latif, and Maryam Riaz** for their cooperation and guidance.

Contribution statement:

IqraAshfaq: Conceptualization, Methodology, Software, Resources, Formal analysis, Writing - Original Draft, Writing - Review & Editing, Investigation, Visualization.

RehanAfsar: Formal analysis, Writing - Review & Editing, Supervision, Project administration, Visualization.

Abid Ali: Supervision.
Maryam Jamil: Supervision.
SamamaGhuman: Software, Validation, Formal analysis, Resources, Investigation.
Ethical Approval: The Hospital Ethical Panel granted ethical approval. During the data collection and procedure, the study's subject was kept safe.

References

[1]. Holland R, Rechel B, Stepien K, Harvey I, Brooksby I. Patients' self-assessed functional status in heart failure by New York Heart Association class: a prognostic predictor of hospitalizations, quality of life and death. *Journal of cardiac failure.* 2010;16(2):150-156.

[2]. Caraballo C, Desai NR, Mulder H, et al. Clinical implications of the New York heart association classification. *Journal of the American Heart Association.* 2019;8(23):e014240.

[3]. Ritt LEF, Ribeiro RS, Souza IPMAd, et al. Low Concordance between NYHA Classification and Cardiopulmonary Exercise Test Variables in Patients with Heart Failure and Reduced Ejection Fraction. *Arquivos Brasileiros de Cardiologia.* 2022.

[4]. Yap J, Lim FY, Gao F, Teo LL, Lam CSP, Yeo KK. Correlation of the New York Heart Association Classification and the - minute walk distance: a systematic review. *Clinical cardiology.* 2015;38(10):621-628.

[5]. Lyng Lindgren F, Tayal B, Bundgaard Ringgren K, et al. The variability of 2D and 3D transthoracic echocardiography applied in a general population. *The International Journal of Cardiovascular Imaging.* 2022:1-14.

[6]. Pickett CA, Cheezum MK, Kassop D, Villines TC, Hulten EA. Accuracy of cardiac CT, radionucleotide and invasive ventriculography, two-and three-dimensional echocardiography, and SPECT for left and right ventricular ejection fraction compared with cardiac MRI: a meta-analysis. *European Heart Journal–Cardiovascular Imaging.* 2015;16(8):848-852.

[7]. Gradl-Dietsch G, Menon A, Gürsel A, et al. Basic echocardiography for undergraduate students: a comparison of different peer-teaching approaches. *European Journal of Trauma and Emergency Surgery.* 2018;44(1):143-152.

[8]. Holm JH, Frederiksen CA, Juhl-Olsen P, Sloth E. Perioperative Use of Focus Assessed Transthoracic Echocardiography (FATE). *Anesthesia & Analgesia.* 2012;115(5):1029-1032.

[9]. Abbas AE, Khoury Abdulla R, Aggrawal A, Crile J, Lester SJ, Boura J. A novel echocardiographic hemodynamic classification of heart failure based on stroke volume index and left atrial pressure. *Echocardiography.* 2017;34(10):1417-1425.

[10]. Andersen OS, Smiseth OA, Dokainish H, et al. Estimating left ventricular filling pressure by echocardiography. *Journal of the American College of Cardiology.* 2017;69(15):1937-1948.

[11]. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography: an update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *European Journal of Echocardiography.* 2016;17(12):1321-1360.

[12]. Temporelli PL, Scapellato F, Eleuteri E, Imparato A, Giannuzzi P. Doppler echocardiography in advanced systolic heart failure: a noninvasive alternative to Swan-Ganz catheter. *Circulation: Heart Failure.* 2010;3(3):387-394.

Iqra Ashfaq, et. al. "Comparison of Systemic Status of a Patient with LV Dimensions and Echocardiography Parameters."*IOSR Journal of Nursing and Health Science (IOSR-JNHS)*, 11(4), 2022, pp. 44-48.