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Cardiology

CLINICAL STUDY OF CARDIOMYOPATHY WITH SPECIAL REFERENCE TO ECHOCARDIOGRAPHY EVALUATION AT TERTIARY CARE HOSPITAL

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ABSTRACT Cardiomyopathy comprises a heterogeneous group of myocardial diseases associated with structural and functional abnormalities of the myocardium in the absence of coronary artery disease, hypertension, valvular heart disease, or congenital heart disease sufficient to explain the observed myocardial dysfunction. The present study was conducted as an observational cross-sectional study involving 76 patients with evidence of cardiomyopathy admitted to the Intensive Care Unit (ICU) under the Department of Medicine at a tertiary care hospital over a two-year period from 2023 to 2025. The mean age of the study subjects was 43.95 \pm 15.4 years, indicating a middle-aged adult predominance, with a significant male distribution (64.47%). Dilated cardiomyopathy (DCM) was the most prevalent type, observed in 56 patients (73.68%), followed by Hypertrophic Cardiomyopathy (HCM) in 18 patients (23.68%), while Restrictive Cardiomyopathy (RCM) and Arrhythmogenic Right Ventricular Dysplasia (ARVD) were rare, each identified in 1 patient (1.32%). Dyspnea on exertion (DOE) was the most common presenting symptom (78.95%), followed by orthopnea (59.21%) and paroxysmal nocturnal dyspnea (50.00%). Echocardiographic evaluation demonstrated significant structural and functional abnormalities, including a reduced mean ejection fraction of 34.8 \pm 9.6\% and increased ventricular volumes, confirming adverse cardiac remodeling. Electrocardiographic rhythm disturbances and ST T changes showed significant association with cardiomyopathy subtypes ($p<0.001$). The findings demonstrate that echocardiography remains an indispensable, non-invasive, and reliable tool for the assessment of cardiac structure and function in guiding subtype-specific diagnosis and therapeutic planning.

Keywords : Cardiomyopathy, Echocardiography, Dilated Cardiomyopathy, Ejection Fraction, Sustainable Clinical Evaluation

INTRODUCTION

Cardiovascular diseases (CVDs) are a leading cause of global morbidity and mortality and include coronary artery disease, cerebrovascular disease, rheumatic heart disease, congenital heart disease, and peripheral vascular disorders. Among these, heart failure is a major cause of hospitalization and mortality in tertiary care settings. Heart failure is characterized by the inability of the heart to maintain adequate cardiac output and may result from ischemic, valvular, hypertensive, congenital, or myocardial disorders. Cardiomyopathy is one of the important myocardial diseases contributing significantly to heart failure and adverse cardiovascular outcomes (Harish V et al, 2025 [1]).

Cardiomyopathy comprises a heterogeneous group of myocardial diseases associated with structural and functional abnormalities of the myocardium in the absence of coronary artery disease, hypertension, congenital heart disease, or valvular abnormalities sufficient to explain the myocardial dysfunction. These disorders are commonly associated with mechanical and electrical dysfunction and frequently demonstrate inappropriate ventricular hypertrophy or dilatation (Nighute SS et al, 2017 [2]). Genetic mutations, inflammatory processes, metabolic abnormalities, infections, toxins, and systemic diseases are recognized contributors to the development of cardiomyopathy (Chejerla S & Reddy M 2025 [3]; Rao JS 2022 [4]).

Early diagnosis and appropriate evaluation of cardiomyopathy are essential for risk stratification, prognostic assessment, and therapeutic decision-making. Various investigations including electrocardiography, chest radiography, cardiac biomarkers, Holter monitoring, cardiac magnetic resonance imaging, and genetic testing are utilized in the evaluation of these patients. However, echocardiography remains the cornerstone investigation in the diagnosis and follow-up of cardiomyopathy because of its wide availability, non-invasive nature, reproducibility, safety, and cost-effectiveness (Trasca L et al, 2022 [16] & Lang RM et al., 2015 [17]).

AIMS & OBJECTIVES

Aim

- To describe the echocardiographic changes of cardiomyopathy among patients attending a tertiary care hospital.

Objectives

- To study the clinical profile of patients with cardiomyopathy.
- To study echocardiography changes in patients with cardiomyopathy.
- To relate these findings with other investigations.

CASE STUDY (MATERIALS AND METHODOLOGY)

The present study was conducted as an observational cross-sectional study in the Department of Medicine at a tertiary care hospital over a period of two years from 2023 to 2025. The study population comprised patients with evidence of cardiomyopathy admitted to the Intensive Care Unit (ICU) under the Department of Medicine. The sample size was calculated based on the prevalence of cardiomyopathy in ICU patients reported in a previous study (5\%). The sample size was estimated at a 5\% level of significance with an absolute precision of 5\% using the standard formula:

n = \frac{z^2 \cdot p \cdot q}{e^2}

The calculated sample size was 76, and consequently, a total of 76 patients with evidence of cardiomyopathy were enrolled. Patients presenting with typical symptoms and signs of heart failure matching inclusion criteria provided written informed consent prior to data collection. Statistical analysis was conducted using SPSS version 24.0, expressing continuous parameters as mean \pm standard deviation (SD) and categorical sets via Chi-square filters.

RESULTS AND DISCUSSION

Section A: Demographic Layout

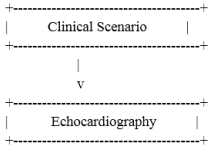

FIGURE 1: THE SPECTRUM OF CARDIOMYOPATHY PHENOTYPES [LVNC] |

Section B: Statistical Data Matrices
INDIAN TERTIARY CARDIOMYOPATHY SCREENING:

TABLE 1 AGE-WISE AND GENDER PROFILE MATRIX OF COHORT UNITS

Metric Descriptor	Baseline Profile Value (n=76)	Percentage (%) Allocation
Age Group: 18 30 Years	21	27.63%
Age Group: 31 50 Years	26	34.21%
Age Group: 51 70 Years	27	35.53%
Age Group: >70 Years	2	2.63%
Mean Age Profile Value	43.95 \pm 15.4 Years	—
Gender Assignment: Male	49	64.47%
Gender Assignment: Female	27	35.53%
Phenotype Variant: DCM	56	73.68%
Phenotype Variant: HCM	18	23.68%
Phenotype Variant: RCM	1	1.32%
Phenotype Variant: ARVD	1	1.32%

Source: Pre-coded Clinical Trial Register Archive, Department of Medicine

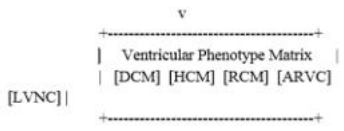

Figure 1: Overview of phenotypic diagnostic workflows via primary non-invasive modalities Sources: Adapted from ESC Guidelines Frameworks / Raw Dataset Diagnostics

INDIAN TERTIARY CARDIOMYOPATHY SCREENING: TABLE 2 SPECIFIC PARAMETRICECHOCARDIOGRAPHIC FINDINGS AMONG STUDY COHORT

Echocardiographic Structural / Functional Metric	Cohort Mean Core Value \pm Standard Deviation (SD)
Systolic Chamber Dimension (mm)	48.6 \pm 7.4
Diastolic Chamber Dimension (mm)	62.3 \pm 8.1
Fractional Shortening Rate (%)	22.5 \pm 6.3\%
Left Ventricular Ejection Fraction (LVEF %)	34.8 \pm 9.6\%
Left Atrial (LA) Diameter Measurement (mm)	42.7 \pm 6.8
Right Ventricular (RV) Diastolic Diameter (mm)	28.9 \pm 4.5
Calculated End-Diastolic Volume (EDV, mL)	142.6 \pm 35.2
Calculated End-Systolic Volume (ESV, mL)	92.4 \pm 28.7

Source: Echocardiographic Imaging Logs & Core Measurements, ASE Guidelines Registry

INDIAN TERTIARY CARDIOMYOPATHY SCREENING: TABLE 3 PHENOTYPE-SPECIFIC ELECTROCARDIO-GRAPHIC (ECG) CHANGE ASSOCIATIONS

Electrocardiographic (ECG) Abnormality	Dilated (DCM) (n=56)	Hypertrophic (HCM) (n=18)	Restrictive (RCM) (n=1)	Arrhythmogenic (ARVD) (n=1)	Subtype p-value Filter
Regular Rhythm Status	42 (75.00%)	14 (77.78%)	1 (100.0%)	0 (0.00%)	0.33
Irregular Rhythm Status	14 (25.00%)	4 (22.22%)	0 (0.00%)	1 (100.0%)	0.33
Left Axis Deviation (LAD)	14 (25.00%)	5 (27.78%)	0 (0.00%)	0 (0.00%)	0.22
ST-T Inversion / Changes	30 (53.57%)	11 (61.11%)	1 (100.0%)	1 (100.0%)	0.001
Atrial Fibrillation (AF)	10 (17.86%)	4 (22.22%)	1 (100.0%)	0 (0.00%)	0.001
Left Ventricular Hypertrophy	16 (28.57%)	14 (77.78%)	0 (0.00%)	0 (0.00%)	<0.001
Left Bundle Branch Block	18 (32.14%)	1 (5.56%)	0 (0.00%)	0 (0.00%)	0.001

Source: Twelve-Lead Electrocardiography Central Lab Repository Data

CONCLUSIONS

We can say that dilated cardiomyopathy represents the most common subtype encountered in clinical practice, predominantly impacting middle-aged males within this regional subset. Heart failure-related manifestations, notably dyspnea on exertion, orthopnea, and paroxysmal nocturnal dyspnea, remain the primary clinical drivers for admission.

Uses of comprehensive transthoracic echocardiography provide non-invasive structural quantification, mapping reduced fractional shortening metrics alongside left ventricular chamber spherical expansion. Advanced electro-structural coupling anomalies, notably Left Bundle Branch Block (LBBB) and atrial fibrillation, show tight, statistically validated correlations to specific mechanical remodeling patterns (p \le 0.05). An innovative personalized diagnostic strategy incorporating early baseline structural indexing is highly recommended to improve mortality reduction pathways within modern tertiary clinical frameworks.

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