International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.72

ORIGINAL RESEARCH

Dilated Cardiomyopathy in the Modern Era: Insights from a North Indian Tertiary Care Experience

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Received: 12 January, 2025 Accepted: 30 January, 2025 Published: 14 February, 2025

ABSTRACT

Background: Dilated cardiomyopathy (DCM) represents a heterogeneous group of myocardial disorders characterized by ventricular dilation and impaired contractility. **Objective**: This study aimed to analyze the clinical presentation, risk factors, and echocardiographic findings in patients with DCM at a tertiary care center in North India. **Methods:** In this hospital-based cross-sectional observational study conducted from January to December 2024, 100 patients diagnosed with DCM were evaluated. Diagnosis was based on established echocardiographic criteria including left ventricular ejection fraction <45%, fractional shortening <25%, and left ventricular end-diastolic dimension >112% of predicted value. Comprehensive clinical evaluation, laboratory investigations, chest X-ray, ECG, and echocardiography were performed for all patients. **Results:** The study population had a mean age of 60±14 years with male predominance (68%). Dyspnea was the universal presenting symptom (100%), followed by fatigue (73%) and palpitations (71%). The mean left ventricular ejection fraction was 36.2±5.2%. Major risk factors included ischemic heart disease (78%), diabetes mellitus (70%), and alcohol consumption (61%). Echocardiography revealed global hypokinesia in 81% of patients, secondary mitral regurgitation in 57%, and left atrial enlargement in 66%. The majority of patients (57%) presented in NYHA Class II. **Conclusion:** DCM predominantly affects middle-aged males and presents with significant cardiovascular risk factors. The high prevalence of modifiable risk factors, particularly ischemic heart disease and diabetes mellitus, emphasizes the need for aggressive risk factor management. Early recognition of symptoms and regular echocardiographic monitoring are crucial for optimal patient outcomes.

Keywords: Dilated cardiomyopathy, Echocardiography, Heart failure

INTRODUCTION

Cardiomyopathies represent a heterogeneous group of myocardial disorders that significantly impact cardiac function. Among these, Dilated Cardiomyopathy (DCM) is characterized by ventricular dilation and impaired myocardial contractility. According to the European Society of Cardiology Working Group on Myocardial and Pericardial Diseases, DCM is defined as a structural and functional abnormality of the heart muscle occurring in the absence of coronary artery disease, hypertension, valvular disease, or congenital heart disease sufficient to cause the observed phenotype.[1] The epidemiological burden of DCM is substantial, with an annual incidence of 5 to 8 cases per 100,000 population and a notably higher prevalence in males.[2] However, these figures likely underestimate the true incidence due to underreporting of asymptomatic cases and varying diagnostic criteria across different regions.[3] The classification of cardiomyopathies has evolved significantly since the initial categorization in 1980, which established five primary categories: dilated, hypertrophic, restrictive, arrhythmogenic right ventricular, and non-classifiable cardiomyopathies.[4,5] Understanding the clinical and echocardiographic profile of DCM patients is crucial for early diagnosis and optimal management, particularly in the context of varying presentations and outcomes across different populations.

MATERIAL AND METHODS

Study Design and Setting

This cross-sectional observational study was conducted at a tertiary care center in North India from Jan 2024 to Dec 2024. The study protocol was

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approved by the institutional ethics committee, and informed consent was obtained from all participants.

Diagnostic Criteria

DCM was diagnosed based on the following echocardiographic criteria:[6]

- Left ventricular ejection fraction <45%
- Fractional shortening <25%
- Left ventricular end-diastolic dimension >112% predicted value corrected for age and body surface area

Exclusion Criteria

- Valvular heart disease
- Congenital heart disease
- Systemic hypertension
- Coronary artery disease

Data Collection

Each participant underwent a comprehensive clinical evaluation that encompassed detailed history taking, thorough physical examination, and relevant laboratory investigations. The diagnostic workup included routine blood investigations, NT-proBNP levels, chest X-ray, 12-lead ECG, and 2D-Echocardiography with color Doppler. All clinical findings, demographic data, and investigation results were systematically recorded using standardized data collection forms.

Statistical Analysis

Data analysis was performed using MS Excel. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparative analyses were conducted using standard statistical tests, with a p-value <0.05 considered statistically significant.

RESULTS

Demographic Profile

The study population comprised 100 patients with DCM, demonstrating a clear male predominance (68% males vs 32% females) (Table 1). The mean age of presentation was 60±14 years, with a range from 21 to 94 years. Age distribution analysis revealed that the majority of patients (47%) were in the 41-60 years age group, followed by 39% in the 61-80 years group. The younger (21-40 years) and elderly (>80 years) age groups constituted 9% and 5% of the population, respectively (Figure 1).

Clinical Presentation

All patients (100%) presented with dyspnea as the primary symptom, followed by fatigue (73%) and palpitations (71%). Other common symptoms included pedal edema (67%), cough (63%), paroxysmal nocturnal dyspnea (55%), orthopnea (47%), chest pain (36%), and abdominal pain (29%), as shown in Figure 2. Physical examination revealed basal crackles and added heart sounds in 82% of patients, raised JVP in 69%, apex beat displacement in 60%, hepatomegaly in 45%, and irregular pulse in 34%, as shown in Figure 3. According to the NYHA functional classification, the majority of patients (57%) were in Class II, while 29% were in Class III, 9% in Class IV, and 5% in Class I (Table 2).

Laboratory Investigations

Laboratory findings showed significant abnormalities across multiple parameters. Anemia was present in 45% of patients (hemoglobin <12 g/dL), while renal dysfunction (elevated creatinine >1.5 mg/dL) was observed in 35% of cases. Liver function tests revealed elevated transaminases in 30% of patients. NT-proBNP levels were elevated (>400 pg/mL) in 85% of patients. Serum electrolyte abnormalities, particularly hyponatremia and hypokalemia, were observed in 25% and 20% of patients respectively.

Chest X-ray Findings

Radiographic examination revealed cardiomegaly (cardiothoracic ratio >0.5) in 90% of patients. Pulmonary venous congestion was observed in 75% of cases, while pleural effusion was noted in 30% of patients. Kerley B lines were visible in 40% of cases, and upper lobe diversion was present in 55% of patients.

Electrocardiographic Findings

The ECG analysis revealed several significant findings consistent with previous studies. The most common ECG abnormalities included sinus tachycardia (61%), left bundle branch block (49%), and left ventricular hypertrophy (38%). Other findings included presence of ST-T changes (49%), poor R wave progression (31%), and atrial fibrillation (22%).

Echocardiographic Findings

Echocardiographic evaluation revealed a mean left ventricular ejection fraction of 36.2±5.2%, with values ranging from 22.0% to 45.0%. The mean end-diastolic diameter was 5.9±0.5 cm (range: 5.3-7.2 cm), and the mean end-systolic diameter was 4.8±0.5 cm (range: 4.0-6.0 cm). Global hypokinesia was observed in 81% of patients, while regional wall motion abnormalities were present in 49% of cases. Secondary mitral regurgitation was noted in 57% of patients, and left atrial enlargement was present in 66% of cases (Figure 4).

Risk Factors and Comorbidities

The study identified ischemic heart disease as the predominant risk factor, present in 78% of patients, followed by diabetes mellitus (70%). A significant proportion of patients reported alcohol consumption (61%) and smoking history (39%).

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Table 1: Demography of Study Participants

Characteristic	Value
No. of participants	100
Males	68 (68%)
Females	32 (32%)
Mean Age (in years)	60±14 years

Table 2: Distribution of patients according to NYHA (New York Heart Association) classification

CLASS I	5%
CLASS II	57%
CLASS III	29%
CLASS IV	9%

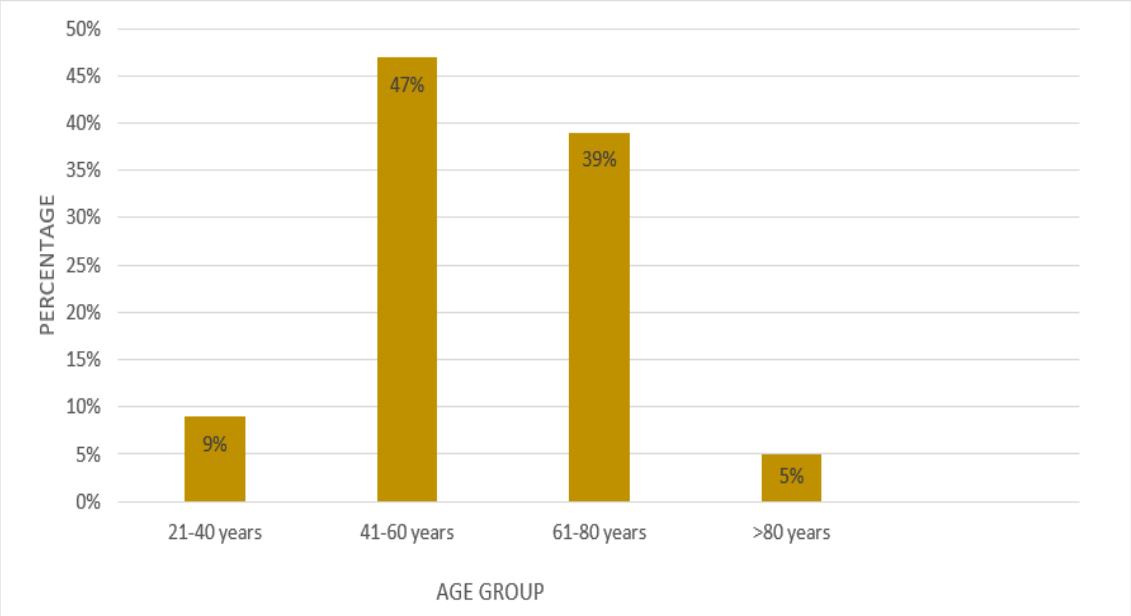

Figure 1: Distribution of patients according to age group

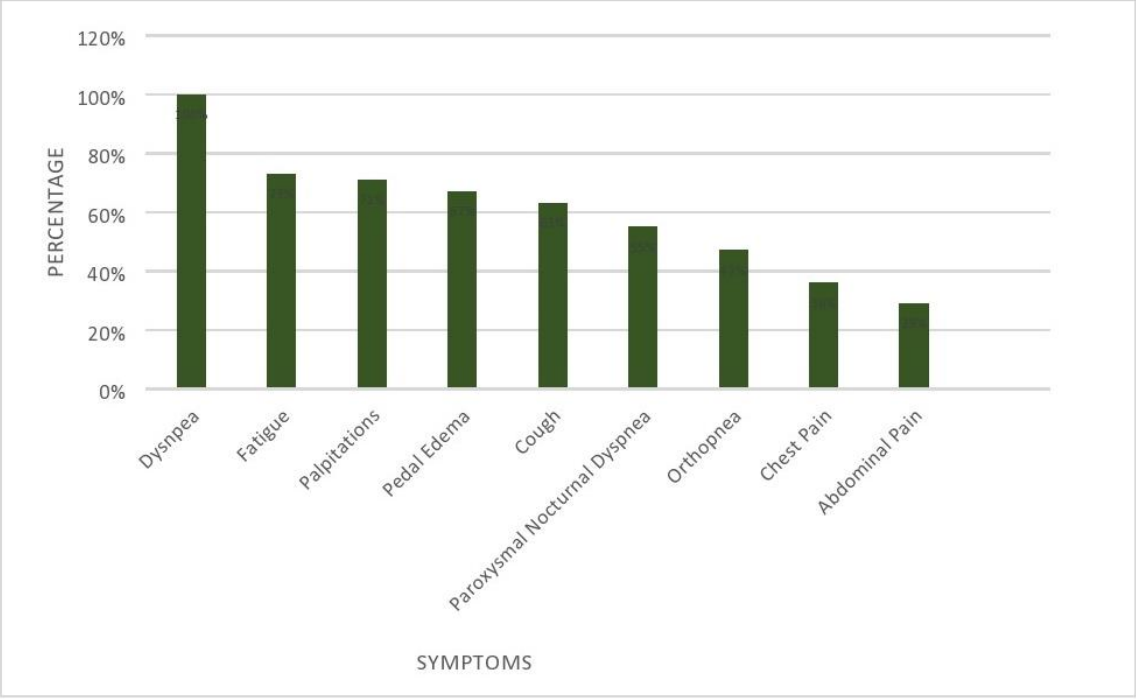

Figure 2: symptoms in patients of Dilated Cardiomyopathy

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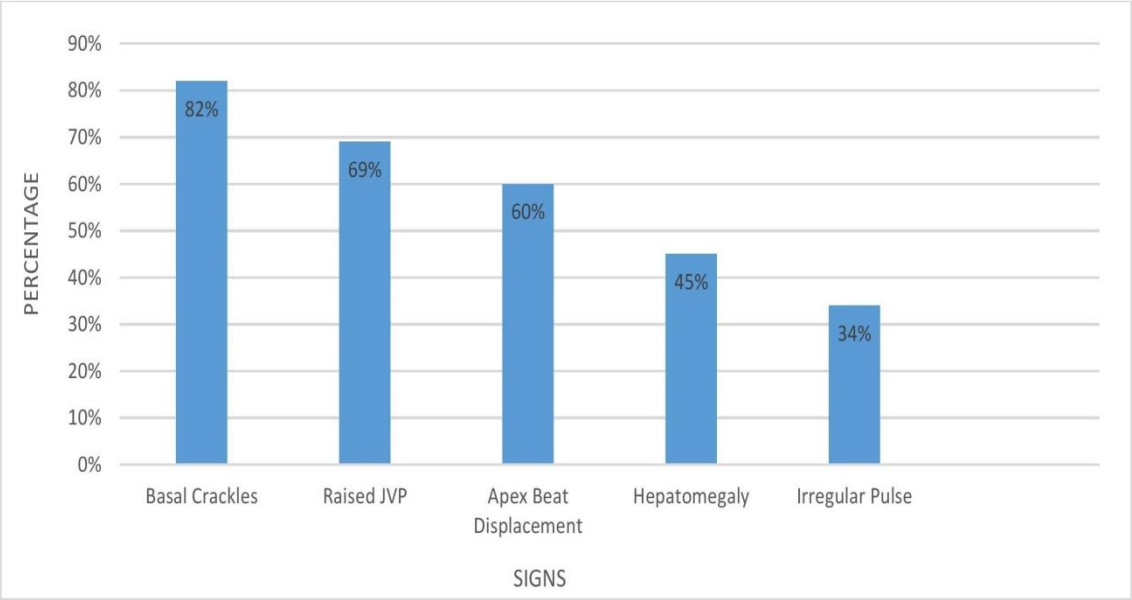

Figure 3: Signs on physical examination in patients of Dilated Cardiomyopathy

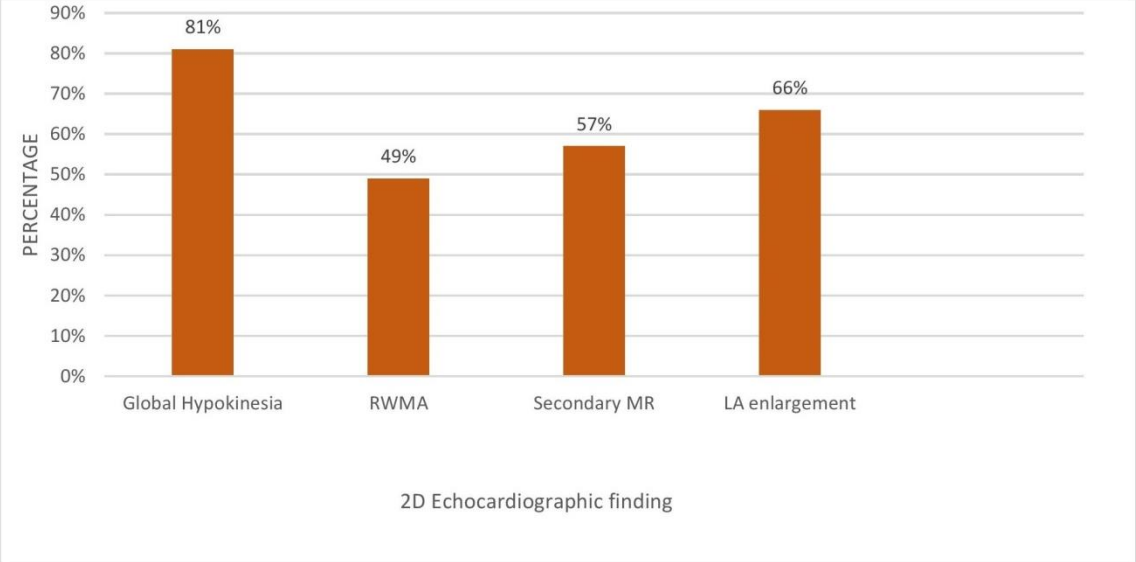

Figure 4: Echocardiographic findings in patients of Dilated Cardiomyopathy. RWMA : Regional Wall Motion Abnormality, MR : Mitral Regurgitation , LA : Left Atrium.

DISCUSSION

Our comprehensive study of 100 DCM patients at a North Indian tertiary care center provides significant insights into the demographic, clinical, and diagnostic characteristics of this condition. The findings demonstrate notable patterns across multiple parameters that warrant detailed discussion.

The demographic analysis revealed a striking male predominance (68%), which aligns with previous studies by Dudharejia et al., Kumar et al., and Teple et al., who reported male percentages of 66%, 66.7%, and 76% respectively.[7,8,9] However, our study population's mean age of 60±14 years was notably higher than previous Indian studies, with Kumar et al. reporting 48.37±10.82 years and Dudharejia et al. finding most patients in the 40-59 years range.[7,8] This age difference might reflect either evolving disease patterns, regional variations, or potentially delayed diagnosis in our catchment area.

The clinical presentation pattern showed remarkable consistency in certain symptoms, with dyspnea being universal (100%), followed by high frequencies of fatigue (73%) and palpitations (71%). The NYHA functional classification distribution, showing 57% in Class II and 29% in Class III, suggests that most patients presented at moderate stages of functional impairment. The physical examination findings, particularly the high prevalence of basal crackles (82%) and raised JVP (69%), indicate significant cardiac dysfunction in our cohort.

Laboratory investigations revealed a complex pattern of systemic involvement. The high prevalence of anemia (45%) and renal dysfunction (35%), findings similar to those reported by Kumar et al.[8] suggests

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significant end-organ effects. The elevated NT-proBNP levels in 85% of patients, consistent with the findings of Sonowal et al.[10], confirm the utility of this biomarker in DCM diagnosis. The presence of electrolyte abnormalities in a significant proportion of patients (hyponatremia 25%, hypokalemia 20%) highlights the importance of careful metabolic monitoring.

Radiographic findings were particularly revealing, with 90% of patients showing cardiomegaly and 75% displaying pulmonary venous congestion. These findings align with those reported by Barman et al.[4] and Hoskatti et al.[11], who documented similar radiographic patterns in their respective studies. These findings, along with the presence of Kerley B lines (40%) and upper lobe diversion (55%), demonstrate the significant cardiac remodeling and hemodynamic consequences of DCM.

The electrocardiographic profile showed diverse abnormalities, with sinus tachycardia (61%), left bundle branch block (49%), and ST-T changes (49%) being the most prevalent, consistent with findings reported by Barman et al.[4], Kumar et al.[3] and Hoskatti et al.[11]. The relatively high frequency of atrial fibrillation (22%) suggests significant atrial remodeling in our population.

Echocardiographic findings in our study showed relatively better ventricular function (mean LVEF 36.2±5.2%) compared to Teple et al.'s[9] findings (mean LVEF 26.3±10.3%). The high prevalence of global hypokinesia (81%) and secondary mitral regurgitation (57%) reflects the widespread myocardial involvement characteristic of DCM. The left atrial enlargement in 66% of cases correlates with the high burden of atrial fibrillation.

Perhaps most striking is our finding of a higher prevalence of ischemic heart disease (78%) and diabetes mellitus (70%) compared to previous studies[3,11]. This observation, along with the significant proportion of patients with alcohol consumption history (61%) and smoking (39%), suggests a possible shift in the risk factor profile of DCM patients in recent years. This changing pattern might reflect broader epidemiological transitions in cardiovascular disease risk factors in the Indian population.

These findings collectively paint a picture of DCM as a complex disorder with significant systemic implications, marked by substantial cardiovascular risk factor burden and end-organ involvement. The relatively better left ventricular function in our cohort, despite the high prevalence of comorbidities, might suggest either earlier diagnosis or better compensatory mechanisms in our patient population.

CONCLUSION

DCM presents with significant clinical variability but predominantly affects middle-aged males. The high prevalence of modifiable risk factors suggests the need for aggressive risk factor management. Early recognition of symptoms and regular monitoring through echocardiography are essential for optimal patient care. The presence of comorbidities, particularly ischemic heart disease and diabetes mellitus, necessitates a comprehensive approach to management. Future research should focus on risk factor modification strategies and their impact on disease progression.

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