Clinical, Electrocardiographic, and Echocardiographic Profile of Ischemic Cardiomyopathy: An Analysis of 100 Cases

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Abstract: *Background:* Ischemic cardiomyopathy (ICM) remains a major contributor to the heart failure burden worldwide, characterized by significant morbidity and mortality. In Bangladesh, where cardiovascular disease prevalence is rising, understanding the local clinical profile of ICM patients is crucial for optimizing management strategies. *Objective:* This study aimed to analyze the clinical, electrocardiographic, and echocardiographic characteristics of ischemic cardiomyopathy patients. *Methods:* A retrospective cross-sectional study was conducted at Community Based Medical College Bangladesh, from January 2023 to December 2024. Using purposive sampling, we enrolled 100 consecutive ICM patients. Data on demographics, risk factors, clinical presentation, NYHA functional class, ECG findings, and echocardiographic parameters were collected and analyzed using MS Office. *Results:* The cohort had a mean age of 58.2±12.4 years with male predominance (68%). Major comorbidities included hypertension (62%) and diabetes (58%). Most patients presented with paroxysmal nocturnal dyspnea (84%) and pedal edema (62%), with 48% in NYHA Class III. ECG abnormalities included pathological Q waves (72%) and LBBB (32%). Echocardiography revealed a mean LVEF of 32.5±6.8%, with severe dysfunction (LVEF≤30%) in 36%. Anterior wall hypokinesia (54%) and moderate mitral regurgitation (68%) were common. Anterior MI (58%) showed worse LV function (30.2±5.6%) than inferior MI (35.1±7.2%). *Conclusion:* This Bangladeshi ICM cohort demonstrated advanced disease presentation with high rates of conduction abnormalities and ventricular dysfunction. The strong association of anterior MI with worse systolic function highlights the need for targeted management approaches in this population.

Keywords: ECG abnormalities, Echocardiography, Heart failure, Ischemic cardiomyopathy, Q waves, Ventricular dysfunction.

INTRODUCTION

Ischemic cardiomyopathy (ICM) represents the most common etiology of heart failure worldwide, accounting for nearly 60-70% of cases in developed nations and showing increasing prevalence in developing countries [1, 2]. This condition arises from significant coronary artery disease leading to myocardial damage, ventricular remodeling, and subsequent systolic dysfunction [3]. The global burden of ICM continues to rise, with an estimated 26 million people affected by heart failure, of which ischemic causes predominate [4, 5]. In South Asia, particularly Bangladesh, the epidemiological transition has led to a dramatic increase in cardiovascular diseases, with ICM emerging as a major public health concern [6, 7]. Recent data from the Bangladesh Demographic and Health Survey indicate that cardiovascular diseases account for 27% of all adult deaths, with ischemic heart disease being the leading contributor [8]. This trend reflects the complex interplay of traditional risk factors (hypertension, diabetes, smoking) and unique regional factors including air pollution, dietary changes, and limited access to timely revascularization [9, 10]. The clinical presentation of ICM varies widely, ranging from asymptomatic left ventricular dysfunction to advanced heart failure with NYHA Class IV symptoms [11]. Electrocardiographic

Peer Review Process: The Journal "Middle East Research Journal of Medical Sciences" abides by a double-blind peer review process such that the journal does not disclose the identity of the reviewer(s) to the author(s) and does not disclose the identity of the author(s) to the reviewer(s).

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findings typically include pathological Q waves, conduction abnormalities, and arrhythmias, while echocardiography reveals characteristic wall motion abnormalities and reduced ejection fraction [12, 13]. Several studies have demonstrated that anterior wall myocardial infarction carries worse prognosis compared to inferior wall involvement due to greater myocardial damage [14, 15]. Despite established international guidelines for ICM management [16], significant gaps exist in understanding the region-specific clinical profiles and management outcomes in low-resource settings like Bangladesh. Most existing data come from Western populations, while Asian cohorts, particularly from Bangladesh, remain underrepresented in the literature [5-17]. This is particularly concerning given the documented ethnic variations in disease presentation and treatment responses [18]. The current study was designed to address this knowledge gap by comprehensively evaluating the clinical, electrocardiographic, and echocardiographic characteristics of ICM patients in a Bangladeshi tertiary care center. Our findings will contribute to the limited local evidence base and potentially inform context-specific management protocols for ICM in resource-constrained settings.

METHODOLOGY

This retrospective cross-sectional study was conducted at the Department of Cardiology, Community Based Medical College Bangladesh, from January 2023 to December 2024. We enrolled 100 consecutive patients diagnosed with ischemic cardiomyopathy (ICM), defined by left ventricular ejection fraction (LVEF) ≤40%, with documented coronary artery disease on angiography or prior history of myocardial infarction. Patients were selected through purposive sampling to ensure representation of typical ICM cases in our population. Data were collected from electronic medical records using a standardized case report form that included: (1) demographic characteristics (age, gender), (2) cardiovascular risk factors (hypertension, diabetes mellitus, smoking status), (3) presenting symptoms, and (4) functional status assessed using the New York Heart Association (NYHA) classification system [19]. Two experienced cardiologists independently reviewed all electrocardiograms for rhythm abnormalities, conduction defects, and evidence of prior infarction. Echocardiographic parameters, including LVEF (measured by modified Simpson's method), left ventricular dimensions, wall motion abnormalities, and valvular regurgitation, were analyzed. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Data analysis was performed using Microsoft Excel (version 2019).

RESULT

The study included 100 patients with ischemic cardiomyopathy, predominantly male (68%), with a mean age of 58.2 years. Smoking was reported in 52% of participants, and hypertension (62%) and diabetes (58%) were the most common comorbidities. A family history of coronary artery disease was noted in 42% of cases. Paroxysmal nocturnal dyspnea (84%) and pedal edema (62%) were the most frequent symptoms. According to the NYHA classification, 48% of patients were in Class III, while 14% had Class IV symptoms, reflecting advanced heart failure. Pathological Q waves were observed in 72% of patients (anterior: 44%, inferior: 28%). Conduction abnormalities included LBBB (32%) and RBBB (10%). Sinus tachycardia was present in 12% of cases. The mean LVEF was 32.5%, with severe systolic dysfunction (LVEF ≤30%) in 36% of patients. Anterior wall hypokinesia (54%) was more prevalent than inferior hypokinesia (38%). Moderate mitral regurgitation (Grade II) was observed in 68% of cases. Anterior MI (58%) was associated with lower mean LVEF (30.2% vs. 35.1% in inferior MI) and higher prevalence of severe LVSD (41% vs. 29%). LBBB was more common in anterior MI (38% vs. 24%). Pulmonary rales (78%) and pedal edema (62%) were the most common physical signs. Hypotension (systolic BP <100 mmHg) was noted in 32% of patients, predominantly in those with Class IV symptoms. All patients received conservative medical therapy, with no revascularization interventions reported during the study period.

Table 1: Demographic and clinical characteristics

Variable	Category	Value
Age (years)	Mean ± SD	58.2 ± 12.4
Gender	Male	68 (68%)
	Female	32 (32%)
Smoking Status	Smoker	52 (52%)
	Non-smoker	48 (48%)
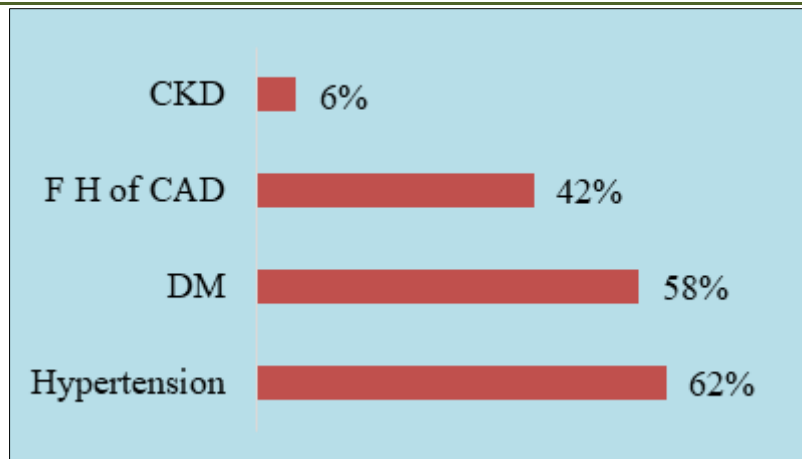
Figure 1: Comorbidities and risk factors

Table 2: Symptom profile and NYHA classification

Symptom	n	NYHA Class
PND	84	II: 38%
Chest pain	48	III: 48%
Pedal edema	62	IV: 14%

PND: Paroxysmal nocturnal dyspnea

Table 3: Electrocardiographic findings

ECG Feature	Subtype	n/ (%)
Q Waves	Anterior	44 (44%)
	Inferior	28 (28%)
Conduction abnormality	LBBB	32 (32%)
	RBBB	10 (10%)

Table 4: Echocardiographic parameters

Parameter	Measurement	Impaired Severity
LVEF (%)	32.5 ± 6.8	Severe: 36 (36%)
LVIDd (mm)	6.8 ± 1.1	Moderate: 46 (46%)
Mitral regurgitation	Grade II: 68 (68%)	Mild: 18 (18%)

Table 5: Myocardial infarction characteristics

Variable	Anterior MI (n=58)	Inferior MI (n=42)
Mean LVEF (%)	30.2 ± 5.6	35.1 ± 7.2
LBBB prevalence	22 (38%)	10 (24%)
Severe LVSD	24 (41%)	12 (29%)

Table 6: Physical examination findings

Finding	n	Symptom
Pulmonary rales	78	Dyspnea (84%)
Systolic BP <100 mmHg	32	Fatigue (62%)
Pedal edema	62	Orthopnea (58%)

DISCUSSION

The present study provides a comprehensive analysis of the clinical, electrocardiographic, and echocardiographic characteristics of ICM patients in a Bangladeshi tertiary care center. Our findings demonstrate several important patterns that warrant discussion in the context of existing literature. The demographic profile of our cohort, with a mean age of 58.2 years and male predominance (68%), aligns with regional studies from South Asia [20, 21], but contrasts with Western populations where ICM typically presents a decade later [22]. This earlier disease onset may reflect the high burden of untreated cardiovascular risk factors

in our setting, as evidenced by the significant prevalence of hypertension (62%) and diabetes (58%) in our study. These findings are consistent with recent reports from Bangladesh highlighting the growing epidemic of metabolic diseases [23, 24]. The high frequency of NYHA Class III symptoms (48%) at presentation suggests delayed diagnosis and referral patterns in our healthcare system. This observation is particularly concerning given that earlier intervention in ICM can significantly improve outcomes [25]. Our data reveal that paroxysmal nocturnal dyspnea (84%) and pedal edema (62%) were the most common symptoms, which contrasts with Western cohorts where fatigue often predominates [26]. This difference may reflect cultural variations in symptom reporting or disease severity at presentation. Electrocardiographic findings in our study, particularly the high prevalence of pathological Q waves (72%) and LBBB (32%), provide important prognostic information. These results are consistent with previous reports linking these ECG markers with adverse outcomes in ICM [27, 28]. The predominance of anterior wall hypokinesia (54%) and its association with lower LVEF (30.2% vs 35.1% for inferior MI) corroborates established literature on the detrimental impact of anterior wall involvement [12-14]. Several limitations should be acknowledged. The single-center design may limit generalizability, and the retrospective nature introduces potential documentation bias [29]. The lack of follow-up data prevents assessment of long-term outcomes, an important consideration given the progressive nature of ICM [30]. Additionally, we did not assess biomarkers like BNP or troponin, which could have provided additional prognostic information [31]. Our findings have important clinical implications. The high burden of modifiable risk factors underscores the need for aggressive primary prevention strategies [17]. The predominance of advanced symptoms at presentation suggests the need for community-based screening programs [32]. The frequent identification of conduction abnormalities supports the importance of regular ECG monitoring in ICM patients [33]. Future research should focus on longitudinal studies to assess disease progression and treatment responses in our population [34]. Comparative studies between urban and rural populations would help identify geographic disparities in disease presentation [35]. Additionally, research evaluating the cost-effectiveness of different management strategies in resource-limited settings is urgently needed [36].

Limitations
This study has several limitations, including its single-center design and retrospective nature, which may affect generalizability. The lack of long-term follow-up data and biomarker analysis limits prognostic assessment. Selection bias may exist due to the purposive sampling method employed in patient selection.

CONCLUSION
This study highlights the distinct clinical profile of ICM patients in Bangladesh, characterized by early onset, high risk factor burden, and advanced symptoms at presentation. The frequent ECG abnormalities and significant ventricular dysfunction underscore the need for improved early detection and management strategies. These findings contribute valuable regional data to the global understanding of ICM and emphasize the importance of context-specific approaches in resource-limited settings.

Recommendation
1. Implement community-based screening for early ICM detection.
2. Strengthen primary prevention of modifiable risk factors.
3. Establish registries for long-term outcome monitoring.
4. Develop cost-effective management protocols tailored to local resources.
5. Promote multidisciplinary care models for comprehensive ICM management.

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