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Left Ventricular Ejection Fraction among Patients with Acute Myocardial Infarction

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ABSTRACT

After an acute myocardial infarction (AMI), the LVEF may be used for prognosis and therapy purposes. Despite the importance of left ventricular ejection fraction (LVEF) testing as a performance indicator for AMI patients, nothing is known about the current rates of in-hospital assessment or how it relates to therapeutic utilization. **Objective:** To ascertain the prevalence of LVEF patterns in individuals with AMI. **Methods:** It was a cross-sectional descriptive study conducted at the Department of Cardiology, King Edward Medical University/ Affiliated Hospital, Lahore, from March 2025 to September 2025 under IRB number 783/RC/KEMU. A total of 110 patients were enrolled through nonprobability purposive sampling. Data analysis was done on SPSS version 26.0. Quantitative variables were presented as mean ± S.D. Qualitative variables, i.e., gender, types of myocardial infarction (STEMI/ NSTEMI), and patterns of left ventricular function (Abnormal/ moderately to severely impaired) were presented as frequency and percentage. **Results:** The average age of the cases in this study was 52.74 ± 8.08 years. There were 72 (65.5%) males and 38 (34.5%) females enrolled in this study. The mean BMI, LVEF, and duration of MI were 27.62 ± 4.27 (kg/m2), 35.30 ± 7.88 (%), and 176.18 ± 5.65 (minutes). There were 35 (31.8%) patients diagnosed with STEMI and 75 (68.2%) diagnosed with NSTEMI. There were 40 (36.4%) patients found with abnormal LVEF patterns and 70 (63.6%) with moderately to severely impaired LVEF. **Conclusion:** The results of this study showed that the majority of patients with acute MI had moderately to severely impaired LVEF.

INTRODUCTION

Acute myocardial infarction (AMI) is one of the major causes of morbidity and mortality throughout the world. Several recent studies have highlighted a fall in acute and long-term mortality following ST-elevation myocardial infarction (STEMI) in parallel with greater use of reperfusion therapy, primary percutaneous coronary intervention (PCI), modern antithrombotic therapy, and secondary prevention. Unfortunately, STEMI mortality rates are still too high [1]. The measurement of left ventricular ejection fraction (LVEF) after acute myocardial infarction (AMI) has both prognostic and therapeutic implications and is a class I clinical practice guideline recommendation, as well as a core AMI performance measure recommended by the American College of Cardiology (ACC) and American Heart Association (AHA) [1, 2]. Reduced LVEF is associated with greater mortality among patients with coronary artery disease [3] and predicts increased risks of early all-cause mortality [4], as

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well as sudden cardiac death [5] after AMI. Improvement of LVEF with revascularization is associated with improved long-term survival among AMI patients [6]. Clinical practice guidelines provide several therapeutic recommendations for both the acute and long-term post-discharge management of AMI based on LVEF. Specifically, indications for angiotensin-converting-enzyme inhibitor (ACE-I), angiotensin receptor blockers (ARB), and aldosterone antagonists are LVEF dependent [6]. Given that assessment of primary prevention implantable cardioverter-defibrillator candidacy after AMI is also determined primarily by LVEF, patients with reduced LVEF during the AMI hospitalization require appropriate follow-up care to avoid missed prevention opportunities [7, 8]. In a previous study, as per the pattern of left ventricular ejection fraction, the abnormal LVEF was found in 45.6% patients, and moderately to severely impaired LVEF was found in 22.6% patients [4].

By providing insight into the frequency and risk factors of acute left ventricular dysfunction in individuals who have had myocardial infarction, this research aims to influence future treatments and management techniques. This study aimed to determine the frequency of patterns of left ventricular ejection fraction among patients with acute myocardial infarction.

METHODS

The research was a cross-sectional descriptive study done at the Department of Cardiology, King Edward Medical University/Affiliated Hospital, Lahore, over a period of six months from 15 March 2025 to 15 September 2025 under IRB number 783/RC/KEMU. The sample size of 110 individuals was determined using a 95% confidence level, an 8% margin of error, and an anticipated frequency of moderately to severely reduced LVEF at 22.6% [4]. (8% margin was chosen to achieve a feasible sample size (n=110), given practical constraints (time, budget, patient availability). The wider margin still provides a statistically acceptable confidence interval for the exploratory nature of the study, balancing precision with logistical feasibility. VT (Ventricular Tachycardia) /VF (Ventricular Fibrillation) episodes were not assessed as an outcome in the present study; therefore, effect modification of age or BMI in relation to VT/VF could not be evaluated. Since the study objective was descriptive, focused solely on LVEF patterns, no stratified or interaction analyses for VT/VF were undertaken. This study enrolled male and female patients of age 18-60 years presenting with myocardial infarction (as per operational definition) within 24 hours of the start of symptoms. Patients having permanent atrial fibrillation were excluded from the study. Patients with creatinine concentration > 176.8 mmol/L by laboratory test and history of cardiogenic shock on admission were excluded from the study. Myocardial infarction: It was defined as symptoms of ischemia and ECG changes indicative of new ischemia (new ST-T changes or new left bundle branch block or development of pathological Q waves in the ECG), rise and or fall of cardiac biomarkers, evidence of new loss of viable myocardium or new regional wall motion abnormality or evidence of fresh thrombus by coronary angiography [9]. Patterns of left ventricular ejection fraction (LVEF): It was described in terms of Abnormal. It was labeled if LVEF < 50% on echocardiography. Moderately to severely impaired: it was defined as LVEF < 40% on echocardiography [9]. One hundred and ten patients from the cardiology and Emergency Departments at King Edward Medical University/Affiliated Hospital in Lahore met the inclusion criteria and were recruited for the research. All patients were asked to provide their informed consent. All patients underwent echocardiography. Chamber dimensions, myocardial wall thickness, and LVEF parameters: LVEF is calculated using the biplane disc method in both four-chamber and two-chamber views. The wall motion score index is the result of dividing all scores by the number of segments seen using the 16-segment LV segmentation model. Normokinesia, hypokinesia, akinesia, and dyskinesia are each assigned a score of 1, 2, 3, and 4 points, respectively [9]. The operational definition was used to identify the patterns of LVEF. Data analysis was done on SPSS version 26.0. Quantitative variables, i.e., age and BMI, were presented as mean ± S.D. Qualitative variables, i.e., gender, types of myocardial infarction (STEMI/ NSTEMI), and patterns of left ventricular function (Abnormal/ moderately to severely impaired) were presented as frequency and percentage. Normality of continuous variables was assessed using the Shapiro–Wilk test. All variables (age, BMI, LVEF, and MI duration) demonstrated non-significant results ($p>0.05$), confirming that the data were normally distributed. Post-stratification chi-square test was applied. Chi-square assumptions were verified for all contingency tables. Whenever any expected cell count fell below 5, Fisher's Exact Test was automatically applied. A p-value of <0.05 was considered significant.

RESULTS

The average age of the cases in this study was 52.74 ± 8.08 years. There were 72 (65.5%) males and 38 (34.5%) females found in this study. The mean BMI, LVEF, and duration of MI were 27.62 ± 4.27, 35.30 ± 7.88, and 176.18 ± 5.65. There were 35 (31.8%) patients diagnosed with STEMI and 75 (68.2%) diagnosed with NSTEMI. There were 40 (36.4%) patients found with abnormal LVEF patterns and 70 (63.6%) with moderately to severely impaired LVEF (Table 1).

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Table 1: Examining Demographic and Clinical Factors

Demographic and Clinical Factors		Mean ± SD, n (%)	CI
Age	(95% CI)	52.74 ± 8.08	51.23 – 54.25
Gender	Male	72 (65.5%)	–
	Female	38 (34.5%)	–
BMI (kg/m^2)	(95% CI)	27.62 ± 4.27	26.82 – 28.42
LVEF (%)	(95% CI)	35.30 ± 7.88	33.83 – 36.77
Duration of MI	(Minutes)(95% CI)	176.18 ± 5.65	175.12 – 177.24
Type of MI	STEMI	35 (31.8%)	–
	NSTEMI	75 (68.2%)	–
Pattern of LVEF	Abnormal	40 (36.4%)	–
	Moderately to Severely Impaired	70 (63.6%)	–

The stratification of STEMI and NSTEMI patients according to gender, age, and BMI did not show any significant difference, i.e., p-value 0.969, 0.826, and 0.504, respectively (Table 2).

Table 2: Stratification According to Age, Gender, BMI, and Types of MI

Variables		STEMI	NSTEMI	p-value
Gender	Male	23 (65.7%)	49 (65.3%)	0.969
	Female	12 (34.3%)	26 (34.7%)	
Age (Years)	18-28	0 (0%)	1 (1.3%)	0.826
	29-39	2 (5.7%)	4 (5.3%)	
	40-50	13 (37.1%)	23 (30.7%)	
	51-60	20 (57.1%)	47 (62.7%)	
BMI	< 30	24 (68.6%)	56 (74.7%)	0.504
	≥ 30	11 (31.4%)	19 (25.3%)	

DISCUSSION

When it comes to risk-stratifying individuals with AMI, left ventricular ejection fraction is one measure that the guidelines advocate using [10, 11]. Heart failure, sudden cardiac death, cardiovascular and overall mortality, and reduced EF after myocardial infarction have all been linked in many investigations [12]. The patients with improved ejection fractions after leaving the hospital had a reduced risk of cardiovascular events and a higher quality of life, according to many studies [13-15]. Patients who have had heart failure in the past with a low ejection fraction and now have a LVEF more than 40% are considered to have the phenotype of heart failure with improved ejection fraction, as newly acknowledged by the recommendations [16-18]. The average age of the cases in this study was 52.74 ± 8.08 years. There were 72 (65.5%) males and 38 (34.5%) females found in this study. The mean BMI, LVEF, and duration of MI were 27.62 ± 4.27, 35.30 ± 7.88, and 176.18 ± 5.65. There were 35 (31.8%) patients diagnosed with STEMI and 75 (68.2%) diagnosed with NSTEMI. There were 40 (36.4%) patients found with abnormal LVEF patterns and 70 (63.6%) with moderately to severely impaired LVEF. The majority of patients were diagnosed with NSTEMI (68.2%), reflecting contemporary trends in MI presentation. Importantly, a substantial proportion of patients 70 (63.6%) demonstrated moderately to severely impaired LVEF, highlighting the high burden of left ventricular systolic dysfunction in this cohort. These findings emphasize the continued clinical relevance of early and accurate assessment of LVEF in post-MI patients, particularly in populations with a high prevalence of cardiometabolic risk factors, as reflected by the elevated mean BMI in this study. A prior study also found that between 25% and 40% of individuals had acute anterior MI at the time of hospitalization [19]. The proportion of patients with significantly reduced LVEF in our cohort aligns with prior studies reporting that a considerable number of MI patients present with impaired systolic function at the time of hospitalization [19]. Previous literature indicates that pulmonary congestion or left ventricular systolic dysfunction occurs in approximately 13–32% of MI cases and is associated with a two- to threefold increase in the risk of subsequent mortality or heart failure–related hospitalization. Furthermore, earlier studies have demonstrated that nearly two-thirds of MI patients have LVEF values below 40%, reinforcing the prognostic importance of ventricular dysfunction in this population [19]. Information about left ventricular systolic function after MI is lacking, as ejection fraction (EF) was not typically measured. Just 73% of patients with STEMI and 61% of patients without had their EF evaluated in the 25 European countries that took part in the Euro Heart Survey, which looked at MI therapy [20]. As a result, there is a chance that the data presented contains selection bias. Patients with pulmonary congestion or left ventricular systolic dysfunction, which occur in 13–32% of MI cases, are two to three times more likely to die later or be admitted to the hospital as a result of heart failure. According to earlier research, 39% of patients had left ventricular ejection fractions (LVEFs) between 41% and 55%, 6% had LVEFs between 55% and 70%, and 65% of patients had LVEFs below 40% [19]. The study has a focused aim to determine the prevalence of LVEF patterns in AMI patients, which guides the research design and analysis. It investigates an important clinical parameter (LVEF) in AMI, providing data on STEMI/NSTEMI distribution and LVEF impairment, which can inform therapeutic decisions.

Using a non-random sampling technique may introduce selection bias, limiting the generalizability of the results to the broader AMI population. The study captures data at a single time point, so causal relationships between AMI types and LVEF patterns cannot be established. The study reports age and gender but lacks other potential confounders (e.g., comorbidities, medications) that could

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influence LVEF. A single-center setting (KEMU Affiliated Hospital, Lahore) may restrict the applicability of findings to other populations or settings. VT/VF was not assessed as an outcome variable in this study; therefore, effect modification analysis between age/BMI, MI type, and VT/VF could not be conducted. The study did not evaluate VT/VF incidence; therefore, no association could be drawn between LVEF category, MI type, and VT/VF risk. Use probability sampling in future studies to improve representativeness and reduce bias. Conduct a cohort design to assess changes in LVEF over time and its relation to therapeutic outcomes. Include additional variables such as comorbidities, treatment protocols, and echocardiographic details to enable multivariate analysis. Extend the study to multiple centers to increase sample diversity and external validity of the results. Investigate how LVEF patterns influence treatment choices and patient prognosis to bridge the knowledge gap mentioned in the background.

CONCLUSIONS

The results of this study showed that in patients with acute myocardial infarction, most of them (63.6% of the patients) had moderate-to-severe left ventricular ejection fraction (LVEF). Such results reveal the high prevalence of left ventricular dysfunction among this group and the urgent need to conduct routine, in-hospital LVEF evaluation to inform prognosis and maximize the effectiveness of evidence-based therapy.

Authors' Contribution

Conceptualization: AT
Methodology: MN, ZA, NS
Formal analysis: ZI, ZA, NUS, UGC, NS
Writing and Drafting: ZI, NS
Review and Editing: MN, ZI, ZA, NUS, UGC, NS, AT

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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