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Frequency of New Onset Atrial Fibrillation in 24 Hours Post Acute ST Elevation Myocardial Infarction

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ABSTRACT

Objective: To find out the frequency of new onset atrial Fibrillation in 24 hours post-acute ST elevation myocardial infarction. **Study Design:** Cross Sectional study. **Place and Duration:** Department of Cardiology, Mayo Hospital Lahore in the duration from 14th March, 2025 to 20th June, 2025. **Methodology:** This cross sectional study included 323 patients. After informed consent demographic details, including patient age and sex, were documented. An electrocardiogram (ECG) was initially conducted to identify ST-Elevation Myocardial Infarction (STEMI). Following this, all individuals were continuously monitored using ECG for a 24-hour period in the cardiology department to observe the onset of atrial fibrillation (AF). Troponin-T testing was performed to confirm the diagnosis of acute STEMI. SPSS version 25.0 was used to analyze the data. To evaluate the association between new onset atrial fibrillation (AF) and various clinical and demographic factors, the Chi-square test was used for categorical variables. A p-value of less than 0.05 was considered statistically significant. **Results:** A total of 323 participants were included in this study. Among the 323 patients, 16.7% developed AF. No statistically significant association was found with gender (p = 0.498), diabetes mellitus (p = 0.081), smoking (p = 0.537), dyslipidemia (p = 0.528), or BMI (p=0.11). A significant association was found with age group (p=0.022) and hypertension (p=0.015). **Conclusions:** The findings of this study revealed that atrial fibrillation is a frequent complication associated with ST-elevation myocardial infarction.

INTRODUCTION

Acute coronary syndrome (ACS) encompasses a range of clinical conditions, from ST-segment elevation myocardial infarction (STEMI) to non–ST-segment elevation myocardial infarction (NSTEMI) and unstable angina. It is predominantly caused by the disruption of an atherosclerotic plaque, often resulting in either partial or complete obstruction of the affected coronary artery.[1] Atrial fibrillation (AF), a frequently observed cardiac arrhythmia, significantly heightens the risk of stroke and thromboembolic events, making it a considerable challenge for healthcare systems.[2] Although there have been significant improvements in ACS management and diagnostic approaches, AF remains a frequent and serious complication, negatively impacting both short and long-term patient outcomes across all ACS subtypes.[3] The onset of AF is typically linked to ectopic electrical activity originating from the muscular sleeves of the pulmonary veins. These abnormal impulses are frequently initiated by autonomic nerve clusters located near the junction of the pulmonary veins and the left atrium. [4, 5]

According to research conducted by Saczynski JS and colleagues, the incidence of newly diagnosed atrial fibrillation was reported at 13.3%.[6] In clinical practice, identifying AF at an early stage and initiating appropriate preventative treatments can be crucial in preventing its advancement from a controllable rhythm disorder to one that is resistant to treatment. Nevertheless, due to the frequently asymptomatic presentation of AF, early recognition proves challenging. In fact, nearly one-third of individuals with atrial fibrillation remain unaware of their condition, as they do not experience any noticeable symptoms.[7]

From a clinical perspective, atrial fibrillation (AF) is commonly linked to multiple risk factors, including increasing age, valvular abnormalities, high blood pressure, cardiomyopathic disorders, heart failure, obesity, and thyroid imbalances.[8] This arrhythmia contributes to a wide range of serious health outcomes such as strokes, increased mortality, and other thromboembolic complications, as well as heart failure, decreased physical endurance, impaired left ventricular

function, and reduced quality of life. The likelihood of developing AF rises notably with age, with prevalence rates of around 0.5% in individuals aged 50–59, climbing to approximately 9% among those aged 80–89.[9] Managing AF in the context of ST-segment elevation myocardial infarction (STEMI) presents clinical difficulties due to the limited availability of clear protocols addressing thromboembolic and hemorrhagic risks, as well as appropriate antithrombotic strategies. While many AF cases are persistent or chronic, episodes of newly emerging AF do occur. These two forms differ significantly in terms of their underlying mechanisms, treatment approaches, and clinical consequences.[10]

This study aimed to determine the frequency of atrial fibrillation within the first 24 hours following an acute ST-segment elevation myocardial infarction (STEMI). There is very little knowledge regarding new-onset AF with STEMI for the Pakistani population. As a result, it is critical to assess the burden of this exacerbating complication in a potentially fatal STEMI presentation.

METHODOLOGY

This cross-sectional study was conducted at the Department of Cardiology, Mayo Hospital, Lahore, from 14th March 2025 to 20th June 2025. The study parameters were established after an extensive literature review. From this analysis, we determined a sample size of 323 participants utilizing the World Health Organization (WHO) sample size calculator. This determination was based on a 5% margin of error, a 95% confidence level, and the prevalence of acute ST elevation myocardial infarction at 30%.[11]A non-probability consecutive method of sampling was used for the sampling process.

Inclusion Criteria

All individuals admitted to the critical care unit (CCU) with ST elevation myocardial infarction, including both genders and aged between 18 to 80 years.

Exclusion Criteria

All the individuals with previous history of AF, those taking medication for AF, patients who had undergone CABG combined with valvular or congenital heart surgery as well as those with thyroid disease were excluded from the study.

All patients provided written agreement before the enrolment, and their confidentiality was maintained at all levels. The institutional ethics committee's approval was also obtained prior to beginning the study. Patient demographic details, including age and sex, were documented. An electrocardiogram (ECG) was initially conducted to identify ST-Elevation Myocardial Infarction (STEMI) prior to the participants' enrollment in the study. Following this, all individuals were continuously monitored using ECG for a 24-hour period in the cardiology department to observe the onset of atrial fibrillation (AF), and any episodes of arrhythmia were recorded for evidence. The diagnosis of AF on ECG was independently verified by two senior cardiologists. Additionally, each patient underwent echocardiographic evaluation to exclude any underlying valvular heart disease (VHD). Troponin-T testing was performed to confirm the diagnosis of acute STEMI.

All the data collected during this research were analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables, such as age, were assessed for normality and expressed as median with interquartile range (IQR) due to non-normal distribution. Categorical variables, including gender, presence of diabetes mellitus, hypertension, smoking status, dyslipidemia, BMI categories, and type of myocardial infarction, were presented as frequencies and percentages. To evaluate the association between new onset atrial fibrillation (AF) and various clinical and demographic factors, the Chi-square test was used for categorical variables. A p-value under 0.05 was regarded as indicative of statistical significance.

RESULTS

A total of 323 participants were included in this study. Out of the total, 218 (67.5%) were male with the median age of 60.00 (54.00-63.25) and 105 (32.5%) were female with the median age of 58.00 (45.00-60.00) years. Table I presents the initial demographic and clinical profiles of the individuals included in the study.

Table I

Baseline Demographic and Clinical Characteristics of Study Participants (n = 323)

Variables		Median, IQR
Age		59.00 (54.00-63.00)
		n (%)
Gender	Male	218 (67.5%)
	Female	105 (32.5%)
Age Groups	20-50 years	48 (14.9%)
	51-80 years	275 (85.1%)
Onset of AF within 24 Hours	Yes	54 (16.7%)
	No	269 (83.3%)
Diabetes Mellitus	Yes	108 (33.4%)
	No	215 (66.6%)
Hypertension	Yes	139 (43.0%)
	No	184 (57.0%)
Smoking	Yes	121 (37.5%)
	No	202 (62.5%)
Dyslipidemia	Yes	148 (45.8%)
	No	175 (54.2%)
BMI Groups	Underweight	18 (5.6%)
	Normal	160 (49.5%)
	Overweight	107 (33.1%)
	Obese	38 (11.8%)

The association between various demographic and clinical risk factors with the new onset atrial fibrillation (AF) within 24 hours following ST-elevation myocardial infarction (STEMI) is shown in Table-II. Among the 323 patients, 16.7% developed AF. No statistically significant association was found with gender (p = 0.498), diabetes mellitus (p = 0.081), smoking (p = 0.537), or dyslipidemia (p = 0.528). However, a significant association was observed with hypertension, where 22.3% of hypertensive patients developed AF compared to 12.5% of non-hypertensive (p = 0.015). Regarding BMI, although AF was more frequent among overweight individuals (23.4%), the association did not reach statistical significance (p = 0.110).

Table II

Association of Patient Demographics and Risk Factors with New Onset Atrial Fibrillation within 24 Hours Post-STEMI (n = 323)

Variables		Onset of AF within 24 Hours		Total	p-Value
		Yes	No		
Gender	Male	37 (17.0%)	181 (83.0%)	218 (67.5%)	
	Female	17 (16.2%)	88 (83.8%)	105 (32.5%)	0.498
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
Age Groups	20-50 years	3 (6.3%)	45 (93.8%)	48 (14.9%)	
	51-80 years	51 (18.5%)	224 (81.5%)	275 (85.1%)	0.022
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
Diabetes Mellitus	Yes	23 (21.3%)	85 (78.5%)	108 (33.4%)	
	No	31 (14.4%)	184 (85.6%)	215 (66.6%)	0.081
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
Hypertension	Yes	31 (22.3%)	108 (77.7%)	139 (43.0%)	
	No	23 (12.5%)	161 (87.5%)	184 (57.0%)	0.015
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
Smoking	Yes	20 (16.5%)	101 (83.5%)	121 (37.5%)	
	No	34 (16.8%)	168 (83.2%)	202 (62.5%)	0.537
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
Dyslipidemia	Yes	25 (16.9%)	123 (83.1%)	148 (45.8%)	
	No	29 (16.6%)	146 (83.4%)	175 (54.2%)	0.528
Total		54 (16.7%)	269 (83.3%)	323 (100%)	
BMI Groups	Underweight	1 (5.6%)	17 (94.5%)	18 (5.6%)	
	Normal	22 (13.8%)	138 (86.3%)	160 (49.5%)	
	Overweight	25 (23.4%)	82 (76.6%)	107 (33.1%)	0.110
	Obese	6 (15.8%)	32 (84.2%)	38 (11.8%)	
Total		54 (16.7%)	269 (83.3%)	323 (100%)	

Table-III shows the frequency of new onset atrial fibrillation (AF) in relation to the type of ST-elevation myocardial infarction (STEMI). Among the 323 patients, AF occurred most frequently in those with inferior wall MI (20.4%), followed by high lateral wall MI (18.6%), anterior wall MI (15.9%), and least in posterior wall MI (11.0%). However, the difference in AF occurrence among the different STEMI types was not statistically significant (p = 0.364), indicating no strong association between the infarct location and the development of AF within 24 hours.

Table III

Frequency of atrial fibrillation in different types of STEMI (n=323)

Type of Myocardial Infarction	Atrial Fibrillation		p-Value
	Yes	No	
Anterior Wall MI	10 (15.9%)	53 (84.1%)	0.364
Inferior Wall MI	22 (20.4%)	86 (79.6%)	
Posterior Wall MI	9 (11.0%)	73 (89.0%)	
High Lateral Wall MI	13 (18.6%)	57 (81.4%)	

DISCUSSION

Evaluation of the clinical characteristics in patients with ST-segment elevation myocardial infarction (STEMI) reveals that factors such as advanced age, the extent of coronary artery involvement, hemodynamic instability, and inadequate reperfusion following thrombolytic therapy or primary percutaneous coronary intervention (PCI) are key determinants influencing patient outcomes.

According to our study out of total 323 STEMI patients, AF was developed in only 54 (16.7%) patients. These results were similar to the study by Nielsen *et al.*,[12] and Gordon *et al.*,[13] who found the prevalence of AF at 16% and 13.8% respectively. Other studies by Werf *et al.*,[14] and Majid *et al.*,[15] found AF prevalence at 7.9% and 9% respectively. This reduced incidence could be attributed to timely intervention and revascularization, particularly through primary percutaneous coronary intervention (PCI).

Similarly, there was high prevalence of development of AF at old age and hypertensive people with the p value of 0.022 and 0.015 respectively in our research study. These results could be explained by the fact that, in advanced age, significant myocardial damage can lead to disrupted electrical activity and conduction pathways. Consistent with our study, a study by Majid *et al.*,[15] also found a high prevalence of new onset of AF in older and hypertensive patients with p value of <0.034 and 0.097 respectively. Another study by Gordon *et al.*,[13] also showed similar results with high prevalence at old age(p=0.001)and in hypertensive people (p=<0.001). These results were also consistent with the results found by the Feinberg *et al.*[16]

Another finding of our study was that the frequency of AF development was little higher in male patients as compare to the female patients (17.0% vs 16.2%) with an insignificant value of p=0.498 which is similar to previous research study by Gordon *et al.*,[13] and Majid *et al.*,[15]. A higher frequency of development of AF in male patients may be due to the elevated heart rate, diastolic blood pressure and a higher Killip class.

A study identified several contributing factors for atrial fibrillation, including high blood pressure, excess body weight, alcohol consumption, diabetes mellitus, and obstructive sleep apnea.[17] While certain researches have indicated that diabetes mellitus (DM) may act as an independent predictor of AF, this finding has not been consistently observed across all research. The possible link between DM and the development of AF has been suggested for many years through various epidemiological investigations.[18, 19]

In our study, newly developed atrial fibrillation was observed less frequently among smokers compared to non-smokers, though the difference was not statistically significant (p = 0.537). The higher occurrence in non-

smokers may be associated with advanced age and the nature of the myocardial infarction. Comparable findings were reported in earlier studies, where a greater prevalence of AF was noted in non-smokers than in smokers.[12, 15] Notably, the smoker group was approximately 10 years younger than their non-smoking counterparts. Additionally, our study found a higher incidence of AF in individuals with dyslipidemia, although this was not statistically significant (p = 0.528), aligning with previous research.[15, 20] Atrial fibrillation also appeared more frequently in participants with elevated body mass index, yet again without statistical significance (p = 0.110). Furthermore, AF was most commonly associated with inferior wall infarction (20.4%), though this too lacked statistical significance (p = 0.364).

Limitations of the Study

This study had several limitations. It focused solely on patients with ST-segment elevation myocardial infarction (STEMI), without including comparisons to those with non-ST-segment elevation myocardial infarction (NSTEMI), pre-existing ischemic heart disease with newly developed atrial fibrillation, or cases involving valvular heart conditions. The assessment was based on the detection of new-onset atrial fibrillation rather than its actual incidence, though this still offers valuable insight. Additionally, the sample size was relatively small, and the study did not account for other potential confounding variables. Future research should aim to explore a broader spectrum of contributing risk factors through larger, more comprehensive studies.

CONCLUSIONS

The findings of this study revealed that atrial fibrillation is a frequent complication associated with ST-elevation myocardial infarction. It also demonstrated a higher occurrence of atrial fibrillation among male patients, individuals with inferior wall myocardial infarction, those with hypertension, and older age groups.

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