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COMPARISON OF CLINICAL, ANGIOGRAPHIC CHARACTERISTICS AND IN HOSPITAL OUTCOME OF PATIENTS PRESENTING WITHIN 12 HOURS VS. THOSE PRESENTING AFTER 12 HOURS OF SYMPTOMS WITH ST-SEGMENT ELEVATION MI

Suhail Ahmed[1], Salman Ahmed[2], Ghazanfar Ali Shah[3], Shahzad Khatti[4], Muhammad Zohaib Siddiq[5], Chander Parkash[6], Nand Lal Rathi[7]

[1] Post Fellow, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.
[2] Associate Professor, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.
[3] Associate Professor, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.
[4] Assistant Professor, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.
[5] Post Fellow, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.
[6] Assistant Professor, SICVD, Mithi, Sindh, Pakistan.
[7] Associate Professor, SICVD, Tando Muhammad Khan (TMK), Sindh, Pakistan.

ABSTRACT

Background: Patients with STEMI arriving > 12 hours after symptoms onset have worse long-term outcomes than those coming within 12 hours of symptoms onset. We compared clinical, angiographic characteristic and in-hospital outcome of patients presenting ≤ 12 hours and > 12 hours of symptoms.

Method: The study was a prospective observational study conducted as a part of ACS registry in SICVD satellite center and IMC Hospital in Pakistan over 06 months, from November 2025 to April 2026. All patients with STEMI < 48 hours and age > 18 years were included; patients who did not undergo invasive management for any reason were excluded. Data was entered in a structured Performa and analyzed. Patients were further divided into two groups: those within 12 hours (on time) and those >12 hours (late arrival). Comparison was made for the clinical and angiographic characteristics and in-hospital outcome complications (arrhythmias, access site complications) or mortality.

Results: A total of 627 patients were enrolled, among whom 79% (n=497) arrived within 12 hours and 21% (n=130) arrived late > more than 12 hours. Patients in the early group were younger (<60 years) than those in the Late group (71% vs. 63%. Hypertension (55% vs. 50%) and smoking (40% vs. 35%) were more prevalent as risk factors in the on-time group. More patients in the early group were already on antiplatelet therapy than the late arrivals. Regarding angiographic characteristics, the Incidence of three-vessel disease (26.7 vs. 34.5%) and non-obstructive coronaries (3.0% vs. 1.5%) were, respectively. Access site complication occurred 1.6% in the on-time vs. 0% in the late group, while overall mortality remained the same (3.2% vs. 3.0%).

Conclusion: Despite the difference in clinical and angiographic characteristics, the in-hospital mortality remains the same between patients with STEMI presenting within 12 hours as compared to those presenting > 12 hours of symptoms.

KEYWORDS: Myocardial Infarction, ST Elevation Myocardial Infarction, Time-to-Treatment, Angiography

INTRODUCTION

Acute STEMI is most important and serious condition that has high mortality. Timely reperfusion <12 hours is related to salvageable myocardium and improved LV function and improved mortality [1, 2]. Primary PCI is the preferred treatment of choice if done in timely fashion within 12 hours of onset of symptoms. But still up to 40% present Late after 12 hours of symptoms onset [3]. Thrombolytic therapy has shown no benefits in these patients with symptoms onset beyond 12 hours of duration [4].

Studies have shown that patients with STEMI arriving > 12 hours worse long-term outcome than those arriving within 12 hours of symptoms onset [5, 6]. Multiple factors play role in the in-hospital mortality as patients age, baseline TIMI score and killip class. Also, we know that Total ischemic time in STEMI is an important risk factor for the increase in

hospital and long-term mortality. There is also scarcity of Data for the exact prevalence of Late arrival STEMI in urban and rural population of our country

The objective of our study will be to collect exact prevalence of STEMI patients arriving late 12-48 hours and comparing its demographic, clinical features and in hospital outcome with that of arriving within 12 hours. The result will probably impact our understanding of the characteristics of patients arriving > 12 hours of onset of symptoms and also will encourage us for revascularization in these late arrival patients.

METHODS

The study was conducted as prospective observation study of 06 months at SICVD and IMC hospital in Pakistan. A total of 628 of STEMI patient's data were collected from acute coronary syndrome registry with non-probability consecutive sampling. ST- Segment Elevation MI (STEMI) was defined as persistent ischemia along with new ST elevation at the J point in at least 2 contiguous leads of 2 mm (0.2 mV) in men or 1.5 mm (0.15 mV) in women in leads V2–V3 and/or of 1 mm (0.1mV) in other contiguous chest leads/limb leads or new or presumed new LBBB along with persistent ischemia as per guideline [1].

Late arrival STEMI was defined as patients meeting the criteria of ST segment elevation MI and presenting beyond 12 hours of symptoms. All Patients having ST segment elevation MI with symptoms of ≤ 48 hours, who underwent cardiac catheterization, were included in the study. Patients who were conservatively managed due to excessive co-morbidities or lack of consent were excluded from study. Verbal informed consent was taken from patients or attendants. Data was collected in structured Performa. Patients who were admitted with diagnoses of STEMI having symptoms < 48 hours were included except for patients in whom invasive management was not done due to severe co morbidity and some other reasons. Patients were divided in two groups those arriving within 12 hours of onset of symptoms and those arriving >12 hours of symptoms.

Comparative analysis of DATA will be done like, demographic, clinical and angiographic characteristics and in hospital outcome were compared between two groups. In hospital outcome are defined as mortality or complication that occurred during the hospital course (i.e. access site complications, arrhythmia).

RESULTS

A total number of 627 patients were included from November 2025 to April 2026. The baseline characteristics of both On-time and Late group are shown in table: 01. Patients in early group were younger < 60 years than late group (71% vs. 63%) respectively. There was no gender difference between On-time and late group with male 77.7% male and 22.3% female in both groups respectively. Amongst risk profile between two groups more patients in On-Time group had history of smoking vs. late group (39.8% vs.35.4% P: 0.354) and more hypertension was more prevalent Late group as compared to on –Time group (50.9% vs.55.4% P: 0.363). there was no any significant difference of Diabetes, CKD in both groups. More patients in On-time group had Past history of ischemic heart disease and were on antiplatelet therapy as compared to Late group (8.0% vs. 6.2% p:0.470 for previous ischemic heart disease) and (4.0% vs. 0.8% p:0.181 for Antiplatelet therapy). There was no any significant difference in type of MI and killip class between two groups (table: 1). Majority of patients in both groups underwent cardiac catheterization through radial approach. Among angiographic characteristics the prevalence of three vessel disease and left main was greater in the Late group as compared to On-time group i.e. 26.7% v.35.4% for three vessel disease and 3.4% vs. 3.9% for left main disease respectively. TIMI ≥ II before revascularization was 26% in the On-time group vs. 29.2% in the late arrival group. Arrhythmias including complete heart block, sinus bradycardia and tachyarrhythmia like ventricular tachycardia, ventricular fibrilation were more common in late group as compared to On-Time group. Despite the difference in clinical and angiographic profile the in-hospital mortality in both groups remained same.

Table 1. Baseline Demographics & Clinical Characteristics

Variable		**< 12 hours N (%)**	**> 12 hours N (%)**	**p-value**
Age (years)	<40	27 (5.4)	7 (5.4)	0.060
	40–50	92 (18.5)	26 (20.0)	
	50–60	233 (46.9)	49 (37.7)	
	61–79	122 (24.5)	46 (35.4)	
	≥80	23 (4.6)	2 (1.5)	
Gender	Male	386 (77.7)	101 (77.7)	0.995
	Female	111 (22.3)	29 (22.3)	
Co-morbid	Hypertension	253 (50.9)	72 (55.4)	0.363
	Smoking	198 (39.8)	46 (35.4)	0.354
	Diabetes Mellitus	129 (26.0)	33 (25.4)	0.895

	Ischemic Heart Disease	40 (8.0)	8 (6.2)	0.470
	Chronic Kidney Disease	3 (0.6)	1 (0.8)	0.833
On Antiplatelet Drugs	Aspirin	17 (3.4)	1 (0.8)	0.181
	P2Y12 + Aspirin	3 (0.6)	0 (0.0)	
	No	477 (96.0)	129 (99.2)	
Referral Source	Direct to ER	378 (76.1)	100 (76.9)	0.836
	Referred	119 (23.9)	30 (23.1)	
Type of MI	Anterior	263 (52.9)	67 (51.5)	0.877
	Inferior	125 (25.2)	39 (30.0)	
	Inferior + RV infarction	37 (7.4)	7 (5.4)	
	Infero-posterior	44 (8.9)	10 (7.7)	
	Isolated posterior	9 (1.8)	2 (1.5)	
	Lateral	19 (3.8)	5 (3.8)	
Killip Class	I	432 (86.9)	113 (86.9)	0.930
	II	42 (8.5)	11 (8.5)	
	III	16 (3.2)	5 (3.8)	
	IV	7 (1.4)	1 (0.8)	
Arrhythmia Before Procedure	Ventricular tachycardia	3 (0.6)	2 (1.5)	0.566
	Ventricular fibrillation	4 (0.8)	1 (0.8)	
	None	490 (98.6)	127 (97.7)	
Mechanical Ventilation Before Procedure	Yes	11(2.2)	5(3.8)	0.293
	No	486(97.8)	125(96.2)	
Cardiogenic Shock During Course	Yes	10(2.0)	1(0.8)	0.337
	No	487(98.0)	129(99.2)	
AV Block	Yes	6(1.2)	3(2.3)	0.348
	No	491(98.8)	127(97.7)	
Blood Sugar	High	117(23.5)	36(27.7)	0.338
	Normal	380(76.5)	94(72.3)	
Vasopressor Use	Yes	12(2.4)	2(1.5)	0.547
	No	485(97.6)	128(98.5)	
CPR Before Procedure	Yes	5(1.0)	3(2.3)	0.239
	No	492(99.0)	127(97.7)	

Table 2. Angiographic & Procedural Characteristics

Variable		**< 12 hours N (%)**	**> 12 hours N (%)**	**p-value**
Access Site	Radial	424 (85.3)	108 (83.1)	0.527
	Femoral	73 (14.7)	22 (16.9)	
Dominant Coronary System	Right	465 (93.6)	121 (93.1)	0.180
	Left	14 (2.8)	7 (5.4)	
	Codominant	18 (3.6)	2 (1.5)	
No. of Diseased Vessels	SVD	199 (40.0)	52 (40.0)	0.396
	2VD	150 (30.2)	30 (23.1)	
	3VD	133 (26.7)	46 (35.4)	
	Left main	17 (3.4)	5 (3.9)	
	Non-obstructive	15 (3.0)	2 (1.5)	
Culprit Vessel	LAD	270 (54.3)	66 (50.7)	0.944
	RCA	150 (30.1)	48 (36.9)	
	LCX	60 (12.0)	12 (9.2)	
	Left main stem	6 (1.2)	2 (1.5)	
	Ramus intermediate	1 (0.2)	2 (1.5)	
	None	10 (2.0)	2 (1.5)	

TIMI Flow Before Revascularization	0	305 (61.4)	80 (61.5)	0.556
	1	63 (12.7)	12 (9.2)	
	2	52 (10.5)	18 (13.8)	
	3	77 (15.5)	20 (15.4)	
Stent Thrombosis	Yes	6(1.2%)	0(0.0%)	0.208
	No	491(98.8%)	130(100.0%)	
Arrhythmia During Procedure	Bradyarrhythmia	2 (0.4)	2 (1.5)	0.124
	Ventricular tachycardia	5 (1.0)	2 (1.5)	
	Bradycardia with low BP	1 (0.2)	0 (0.0)	
	Sinus bradycardia	2 (0.4)	2 (1.5)	
	Ventricular fibrillation	0 (0.0)	1 (0.8)	
	None	487 (98.0)	123 (94.6)	
Export Catheter Used	Yes	13(2.6%)	6(4.6%)	0.236
	No	484(97.4%)	124(95.4%)	
If Export Used Result – Unsuccessful		11 (2.2)	6 (4.6)	0.133
TPM Placed	Yes	5(1.0%)	3(2.3%)	0.239
	No	492(99.0%)	127(97.7%)	
IABP Placed	Yes	1(0.2%)	2(1.5%)	0.049
	No	496(99.8%)	128(98.5%)	
Need for Mechanical Ventilation in Cath Lab	Yes	8(1.6%)	2(1.5%)	0.954
	No	489(98.4%)	128(98.5%)	
CPR in Cath Lab	Yes	5(1.0%)	1(0.8%)	0.805
	No	492(99.0%)	129(99.2%)	
Mortality in Lab	Yes	1(0.2%)	0(0.0%)	0.609
	No	496(99.8%)	130(100.0%)	
Left Main Stented	Yes	4(0.8%)	4(3.1%)	0.040
	No	493(99.2%)	126(96.9%)	
Slow Flow / No Reflow	Yes	83(16.7%)	13(10.0%)	0.161
	No	353(71.0%)	101(77.7%)	

Table 3 – In-Hospital Complications & Outcomes

Variable		**< 12 hours N (%)**	**> 12 hours N (%)**	**p-value**
Discharge status	Smooth discharge	474 (95.4%)	125 (96.2%)	0.701
	Complicated course	23 (4.6%)	5 (3.8%)	
Complications	Femoral hematoma	4 (0.8%)	0 (0.0%)	0.583
	Hematuria	1 (0.2%)	1 (0.8%)	
	Radial hematoma	2 (0.4%)	0 (0.0%)	
	Dialysis	2 (0.4%)	0 (0.0%)	
	Cardiac arrest	1 (0.2%)	0 (0.0%)	
	Cardiogenic shock	1 (0.2%)	1 (0.8%)	
	AV nodal block requiring TPM	1 (0.2%)	0 (0.0%)	
	Mortality (expired)	16 (3.2%)	4 (3.0%)	
	Acute MI – re-look angiography	1 (0.2%)	0 (0.0%)	
	Heart failure + cardiogenic shock + mortality	1 (0.2%)	0 (0.0%)	
	Atrial fibrillation	1 (0.2%)	0 (0.0%)	
	None	471 (94.8%)	125 (96.2%)	

	Wire could not cross	2 (0.4%)	1 (0.8%)	
	Normal coronaries	3 (0.6%)	0 (0.0%)	
	Medical management	0 (0.0%)	1 (0.8%)	
	Moderate disease	1 (0.2%)	0 (0.0%)	
	Not applicable	436 (87.7%)	114 (87.7%)	

Values are presented as n (%). TPM = Temporary Pacemaker; MI = Myocardial Infarction.

DISCUSSION

The purpose of study is to compare the risk factors, angiographic results and in-hospital mortality of patients with ST segment MI arriving within 12 hours to that of the arriving >12 hours. Studies have shown that in western population median time of arrival from onset of symptoms is around 2-3 hours with 10% of patients arriving within beyond 12 hours. [5,6] our study showed prevalence of around 23% of STEMI arriving beyond 12 hours. Studies also have shown that patients with STEMI arriving > 12 hours worse long term and In-hospital outcome than those arriving within 12 hours of symptoms onset [7-9]. Our study showed patients arriving within 12 hours have same mortality as compare to patients arriving > 12 hours but arrhythmias during hospital course were greater in late group as compared to On-time group. In one international study patients arriving after 12 hours are older, females and have diabetes and other higher risk factors profile than those arriving within 12 hours of symptoms onset and PCI in these patients have better survival with PCI [10] in another international study late arrival were older and have more prevalent DM and HTN as risk factor and heart failure as presentation [11]. Our study showed that majority of patients in Late group were male also there was no any significant difference in male to female ration between late group and On-time group. There are also few of local studies conducted in our areas mostly to assess the factors associated with late arrival STEMI, while hypertension and smoking was more prevalent risk factor among patients with STEMI arriving > 12 hours. A local study conducted almost a decade ago showed hypertension and Diabetes were most common risk factors in patients arriving 12-48 hours after symptoms onset similar to our study. The in-hospital mortality in Late STEMI patients in that study was 1.7% as compared to 3.0% in our study, the difference in in hospital mortality was possibly due to exclusion of patients that requires immediate revascularization in late group [12]. The Impact of revascularization on STEMI arriving within 48 hours of symptoms led to recommendation of PCI of culprit artery during 48 hours of onset of symptoms by recent European guidelines [13, 14]. The Beyond 12 Hours Reperfusion Alternative Evaluation 2 trial (BRAVE-2) trial was first study that showed decrease infarct size inpatients that underwent PCI between 12- 48 hours of onset of symptoms [15]. 43% of patients in Brave-2 trial undergoing invasive management had baseline TIMI ≥ II flow while our study showed 29% had TIMI ≥ II flow at baseline. Another study conducted by Kyung Hoon Cho and colleagues showed overall equal prevalence of TIMI ≥ II in in patients presenting within 12 hours vs. those presenting 12-48 hours and equal prevalence of Left main stem in both groups [7]. However other study showed difference in TIMI ≥ II flow at baseline in culprit artery which was more prevalent in late group as compared to on-time group. Also Left main significant disease was >3% in both groups with slightly higher prevalence in late groups as compared to early group.

CONCLUSION

Despite the difference in clinical, angiographic characteristics the in-hospital mortality in STEMI patient presenting within 12 hours and those 12-48 hours the in-hospital mortality remain same. Studies focusing on comparing the long-term outcome in our region may be needed in this area.

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Statement indicating approval of research

The ethical approval was obtained prior to study conduction [Reference #IMC/TMK/ERC/ nov. 2022/2 Dated10th november-2022]

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