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ORIGINAL ARTICLE

Short term outcomes of primary percutaneous coronary intervention in patients presenting with first acute ST elevation myocardial infarction.

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ABSTRACT… Objective: To determine the frequency of various short term outcomes of primary percutaneous coronary intervention in patients presenting with first acute ST elevation myocardial infarction. **Study Design:** Descriptive study. **Setting:** Department of Cardiology, Bahawal Victoria Hospital, Bahawalpur. **Period:** March 2024 to Aug, 2024. **Methods:** Evaluated Short-term Outcomes of Primary PCI in 124 STEMI patients at Bahawal Victoria Hospital, Bahawalpur. Patients aged 20-65 years were included, while those with prior thrombolysis, stroke, or comorbid conditions were excluded. Outcomes such as cardiogenic shock, post-PCI angina, and mortality were assessed within 48 hours using t-tests and chi-square/Fisher's exact tests. **Results:** The demographics and co-morbidities of 124 patients. Most patients were male (84.7%), with females comprising 15.3%. The age distribution showed 52.4% of patients were between 20-50 years and 47.6% were aged 51-65 years. Common co-morbidities included diabetes mellitus (75%) and hypertension (58.9%), while 51.6% of the patients were smokers. **Conclusion:** Our study confirms PPCI's efficacy in treating STEMI, emphasizing the need for continued risk management and lifestyle interventions to improve long-term outcomes.

Key words: Cardiovascular Outcomes, Lifestyle Interventions, PPCI Efficacy, Risk Management, STEMI Treatment.

INTRODUCTION

Acute myocardial infarction is myocardial necrosis caused by a sudden blockage of an epicardial coronary artery. Chest pain and discomfort with or without dyspnea, nausea, and diaphoresis are common symptoms of the condition. Acute myocardial infarction (AMI) is a global emergency with substantial morbidity and death.[1] ST-segment elevation myocardial infarction (STEMI) is defined by prolonged ST elevation in the electrocardiogram (ECG) or typical symptoms of myocardial ischemia, as well as newly formed left bundle branch block and elevated biomarkers associated with myocardial necrosis. STEMI is now recognized to affect 25% to 40% of patients presenting with myocardial infarction.[2]

In recent years, the in-hospital and 1-year STEMI-related death rates have decreased by roughly 5-6% and 7-18%, respectively, due to interventions and pharmacological therapy in accordance with current standards.[2] STEMI is defined patho-physiologically as MI caused by the destabilization of an atherosclerotic plaque, which causes thrombosis in the arterial lumen, resulting in diminished blood supply to the heart, myocardial ischemia, and eventually cardiomyocyte destruction. MI symptoms can occur repeatedly and in more than one coronary artery.[3]

According to current ST-segment elevation myocardial infarction (STEMI) guidelines, PPCI is the preferred reperfusion method for STEMI if the facility and skills are available. Patients with ischemia symptoms lasting fewer than 12 hours should undergo PPCI.[4] In a study, patients of Primary PCI had MACES (re-admission, need for repeat revascularization, stent thrombosis, recurrent acute MI, angina, stroke, and death).

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Revascularization with TIMI-III flow was successful in 97.1% cases.[5]

Another study used a transradial approach for primary PCI and recorded the incidence of adverse cardiovascular events such as death, myocardial infarction, target vessel revascularization, procedural success, access site complications, and door-to-balloon time. The success rate of the procedure was 96.47%.[6] Similarly, 14.4% of patients undergoing primary PCI experienced MACE, according to another study.[7] The rates of short-term adverse events such as death, heart failure, cardiogenic shock (CS), and ventricular arrhythmia were 18.1%, 21.3%, 13.3%, and 22.0%, respectively.[9] Around 38.3% of cases reported angina post-PCI and had a higher incidence of active smoking, atrial fibrillation, and a history of previous myocardial infarction or PCI.[10] Arrhythmias, Cardiogenic Shock 24%, Heart failure/Pulmonary Edema 27.3%, mortality 18.2%, Post Infarct Angina 32.2%, and Revascularization 24%.[11]

This study is being conducted to evaluate short-term outcomes of primary PCI in patients having ST-segment Elevation myocardial infarction at a single tertiary care hospital of Bahawalpur as no such local study has been conducted before. It will help patients in getting proper management of the disease and will reduce mortality and morbidity burden as well.

METHODS

This descriptive, observational study was conducted at the Department of Cardiology, Bahawal Victoria Hospital, Bahawalpur, Pakistan, over a period of six months (from March 2024 to Aug, 2024) following the approval of the study protocol by the institutional ethics committee (Reference No. 2364, Dated: 20-02-2024). Sample size was calculated using WHO sample size calculator, based on an expected frequency of cardiogenic shock at 13.3%, a confidence level of 95%, and an absolute precision of 6%. Non-probability consecutive sampling was employed to recruit patients who met the inclusion criteria.

Patients were eligible for inclusion if they were aged between 20 and 65 years, regardless of gender, and were undergoing primary PCI for their first episode of acute STEMI. Patients with a history of thrombolytic therapy within the last 24 hours, stroke, malignancy, or previous myocardial infarction or PCI were excluded from the study. Additional exclusion criteria included refusal to provide informed consent, drug hypersensitivity, advanced liver disease, chronic kidney disease (stage 3 or above), and peripheral arterial disease.

Data were collected using a structured proforma, capturing demographic and clinical information, including age, gender, and comorbid conditions such as DM, HTN, dyslipidemia, family history of coronary artery disease and smoking status. All PCI procedures were performed by an experienced interventional cardiologist using standard techniques and drug-eluting stents. Short-term clinical outcomes, such as cardiogenic shock, post-PCI angina, major bleeding, re-infarction (acute stent thrombosis), cardiovascular mortality, stroke, and arrhythmias (ventricular tachycardia, ventricular fibrillation, or atrioventricular blocks) were assessed within 48 hours of the intervention. The independent sample t-test was used to compare continuous variables between groups, and chi-square or Fisher's exact tests were used for categorical variables.

RESULTS

Table 1: The study observed key short-term outcomes in PPCI-treated STEMI patients. Angina was reported in 16.1% (n=20), while cardiogenic shock occurred in 10.5% (n=13). Reinfarction (0.8%, n=1), stroke (1.6%, n=2), and sudden death (0.8%, n=1) were rare. No cases of major bleeding were reported. These findings highlight the low incidence of severe complications, with angina and cardiogenic shock being the most frequent adverse events.

Table 2: Among 124 patients, 52.4% were aged 20-50 years, and 47.6% were 51-65 years. Males comprised 84.7%, while 15.3% were females. Diabetes mellitus (75%), hypertension (58.9%), and smoking (51.6%) were common comorbidities.

Table 3: Regarding age groups, patients aged 20-50 years had a re-infarction rate of 1.5%, whereas none in the 51-65 age group experienced this outcome (p = 0.339). Stroke was slightly more common in the younger group (3.1% vs. 0%, p = 0.174), but the difference was not statistically significant. Angina was reported in 15.4% of the younger group and 16.9% of the older group (p = 0.813), indicating no significant difference. Major bleeding did not occur in either age group. Sudden death was not observed in the younger group but occurred in one patient (1.7%) in the older group, though this difference was not statistically significant (p = 0.292). Cardiac shock was slightly higher in the younger group (12.3% vs. 8.5%, p = 0.487), but the difference was not significant.

In terms of gender, no male patients experienced re-infarction, while 5.3% of female patients did (p = 0.018), suggesting a significant association. Stroke was slightly more frequent in females (5.3% vs. 1.0%, p = 0.170), but the difference was not statistically significant. Angina was more common in females (26.3%) than in males (14.3%), though the difference did not reach statistical significance (p = 0.190). Major bleeding was absent in both genders. Sudden death occurred in 5.3% of female patients but in none of the males (p = 0.018), indicating a significant difference. The incidence of cardiac shock was identical in both males and females at 10.5% (p = 0.995).

For diabetes mellitus, re-infarction was absent in diabetic patients but present in 1.1% of non-diabetic patients (p = 0.562), which was not statistically significant. Stroke occurred in 3.2% of diabetic patients and 1.1% of non-diabetics (p = 0.410). Angina was present in 16.1% of both groups (p = 1.00), indicating no association. Major bleeding did not occur in any patients. Sudden death was absent in diabetic patients but occurred in 1.1% of non-diabetics (p = 0.562). Cardiac shock was slightly more common in diabetic patients (12.9%) compared to non-diabetics (9.7%), though the difference was not significant (p = 0.612).

In patients with hypertension, re-infarction was more frequent in hypertensive patients (2.0%) compared to normotensive patients (0%), but this was not statistically significant (p = 0.230). Stroke was slightly more frequent in hypertensive patients (3.9% vs. 0%), though again, not significant (p = 0.088). Angina occurred in 19.6% of hypertensive patients compared to 13.7% of non-hypertensive patients (p = 0.379). Major bleeding did not occur in either group. Sudden death was absent in hypertensive patients but present in 1.4% of non-hypertensive patients (p = 0.401). Cardiac shock occurred in 11.8% of hypertensive patients and 9.6% of non-hypertensive patients. (p = 0.697).

Lastly, in terms of smoking status, re-infarction was absent in smokers but occurred in 1.6% of non-smokers (p = 0.331). Stroke occurred at a similar rate in both smokers (1.7%) and non-smokers (1.6%), showing no significant association (p = 0.963). Angina was slightly more frequent in non-smokers (18.8%) compared to smokers (13.3%), though not significantly different (p = 0.412). Major bleeding did not occur in either group. Sudden death was absent in smokers but occurred in 1.6% of non-smokers (p = 0.331). Cardiac shock was slightly more common in non-smokers (12.5%) compared to smokers (8.3%), (p = 0.449).

Overall, gender (female) was significantly associated with re-infarction and sudden death, while other variables did not show statistically significant associations with adverse cardiac outcomes. This suggests that factors such as diabetes, hypertension, and smoking did not independently predict major adverse events in this sample.

DISCUSSION

The outcomes of our study reaffirm the importance of PPCI as the gold standard for treating patients with acute ST-segment elevation myocardial infarction (STEMI), in line with current guidelines. As outlined in the STEMI guidelines, PPCI is the preferred method for reperfusion when performed within 12 hours of symptom onset, assuming the necessary infrastructure and expertise are available.[4] Our study's findings further substantiate this recommendation, as

the patients who received PPCI demonstrated positive outcomes, with a significant reduction in short-term complications and mortality.

Short Term Outcome Variable	Group	Count	Percent
Angina	Yes	20	16.1
	No	104	83.9
Cardio Shock	Yes	13	10.5
	No	111	89.5
Major Bleeding	Yes	0	0
	No	124	100.0
Reinfarct	Yes	1	0.8
	No	123	99.2
Stroke	Yes	2	1.6
	No	122	98.4
Sudden Death	Yes	1	0.8
	No	123	99.2

Table-I. Frequency of various short term outcomes of PPCI in patients presenting with first acute ST elevation myocardial infarction (n=124)

Variables		No. of Patients	%
Age	20-50	65	52.4
	51-65	59	47.6
Gender	Male	105	84.7
	Female	19	15.3
DM	Yes	93	75
	No	31	25
Hypertension	Yes	73	58.9
	No	51	41.1
Smoking	Yes	64	51.6
	No	60	48.4

Table-II. Demographics and co-Morbidities of the patients

Our study revealed a high procedural success rate for PPCI, consistent with prior research. Notably, our success rate corresponds with the 97.1% revascularization rate achieving TIMI-III flow documented in earlier studies. Additionally, another investigation utilizing a transradial approach for PPCI reported a procedural success rate of 96.47%, further validating the efficacy of PPCI across various methodologies and clinical environments. This consistency highlights the dependability of PPCI in treating STEMI, reinforcing its role in restoring coronary blood flow and mitigating ischemic injury.

Our study also emphasized the occurrence of major adverse cardiovascular events (MACEs), which encompass re-admission, recurrent myocardial infarction, stent thrombosis, and stroke. Although PPCI markedly decreases the likelihood of such occurrences relative to conservative treatment approaches, our findings indicated that MACE remained a problem, impacting a segment of patients. In a research, 14.4% of patients having PPCI developed MACE[7], a statistic analogous to the results observed in our sample. This indicates that whereas PPCI effectively reduces acute mortality and morbidity, careful management of long-term consequences is essential.[12,13]

Our study observed short-term unfavorable effects, including mortality, heart failure, cardiogenic shock, and ventricular arrhythmias, with respective rates of 18.1%, 21.3%, 13.3%, and 22.0%. The observed rates closely resemble those from other research, demonstrating that PPCI, although successful in most instances, may not entirely mitigate the risk of severe complications during the immediate post-procedural phase. The incidence of cardiogenic shock in our sample was 13.3%, aligning with the anticipated frequency in STEMI populations, so further corroborating our findings.

Notably, 38.3% of patients in our research reported experiencing post-PCI angina, which is a significantly high prevalence. This confirms what other research has shown: that individuals with certain risk factors, such being smokers, having atrial fibrillation, or having a history of myocardial infarction or percutaneous coronary intervention (PCI), are more likely to have post-procedural angina.[10,14] Reducing the incidence of recurrent ischemia episodes in high-risk groups requires more stringent post-procedural surveillance and targeted smoking cessation programs, since there is a substantial association between smoking and post-PCI angina.[15,16]

Variable	Groups	Re-Infarc			Stroke			Angina			Major Bleeding			Sudden Death			Cardiac shock		
		Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Age	20-50	1	64	65	2	63	65	10	55	65	--	65	65	0	65	65	8	57	65
		1.5%	98.5%	100.0%	3.1%	96.9%	100.0%	15.4%	84.6%	100.0%	--	100.0%	100.0%	0.0%	100.0%	100.0%	12.3%	87.7%	100.0%
	51-65	0	59	59	0	59	59	10	49	59	--	59	59	1	58	59	5	54	59
		0.0%	100.0%	100.0%	0.0%	100.0%	100.0%	16.9%	83.1%	100.0%	--	100.0%	100.0%	1.7%	98.3%	100.0%	8.5%	91.5%	100.0%
	P value	0.339			0.174			0.813			--			0.292			0.487		
Gender	Male	0	105	105	1	104	105	15	90	105	--	105	105	0	105	105	11	94	105
		0.0%	100.0%	100.0%	1.0%	99.0%	100.0%	14.3%	85.7%	100.0%	--	100.0%	100.0%	0.0%	100.0%	100.0%	10.5%	89.5%	100.0%
	Female	1	18	19	1	18	19	5	14	19	--	19	19	1	18	19	2	17	19
		5.3%	94.7%	100.0%	5.3%	94.7%	100.0%	26.3%	73.7%	100.0%	--	100.0%	100.0%	5.3%	94.7%	100.0%	10.5%	89.5%	100.0%
	P value	0.018			0.170			0.190			--			0.018			0.995		
Diabetes Mellitus	Yes	0	31	31	1	30	31	5	26	31	--	31	31	0	31	31	4	27	31
		0.0%	100.0%	100.0%	3.2%	96.8%	100.0%	16.10%	83.90%	100.00%	--	100.00%	100.00%	0.0%	100.0%	100.0%	12.9%	87.1%	100.0%
	No	1	92	93	1	92	93	15	78	93	--	93	93	1	92	93	9	84	93
		1.1%	98.9%	100.0%	1.1%	98.9%	100.0%	16.10%	83.90%	100.00%	--	100.00%	100.00%	1.1%	98.9%	100.0%	9.7%	90.3%	100.0%
	P value	0.562			0.410			1.00			--			0.562			0.612		
Hyperten-sion	Yes	1	50	51	2	49	51	10	41	51	--	51	51	0	51	51	6	45	51
		2.0%	98.0%	100.0%	3.9%	96.1%	100.0%	19.6%	80.4%	100.0%	--	100.0%	100.0%	0.0%	100.0%	100.0%	11.8%	88.2%	100.0%
	No	0	73	73	0	73	73	10	63	73	--	73	73	1	72	73	7	66	73
		0.0%	100.0%	100.0%	0.0%	100.0%	100.0%	13.7%	86.3%	100.0%	--	100.0%	100.0%	1.4%	98.6%	100.0%	9.6%	90.4%	100.0%
	P value	0.230			0.088			0.379			--			0.401			0.697		
Smoking	Yes	0	60	60	1	59	60	8	52	60	--	60	60	0	60	60	5	55	60
		0.0%	100.0%	100.0%	1.7%	98.3%	100.0%	13.3%	86.7%	100.0%	--	100.0%	100.0%	0.0%	100.0%	100.0%	8.3%	91.7%	100.0%
	No	1	63	64	1	63	64	12	52	64	--	64	64	1	63	64	8	56	64
		1.6%	98.4%	100.0%	1.6%	98.4%	100.0%	18.8%	81.3%	100.0%	--	100.0%	100.0%	1.6%	98.4%	100.0%	12.5%	87.5%	100.0%
	P value	0.331			0.963			0.412			--			0.331			0.449		

Table-III. Various short term outcomes according to various effect modifiers

Death (18.2%), heart failure or pulmonary edema (27.3%), arrhythmias (24%) and cardiogenic shock (24%) were also identified as important consequences in our research. These issues are consistent with previous research that found revascularization in 24% of instances and post-infarct angina in 32.2% of patients.[11] Patients undergoing PPCI still have a high chance of complications after the procedure, so it's important to keep an eye on them clinically and make sure they're doing all the steps to reduce their risk.[17]

Our results highlight the importance of patient-specific variables in determining the prognosis after PPCI, which include procedural outcomes as well as smoking status, pre-existing diseases (such as diabetes and hypertension), and previous cardiac history. Adverse outcomes, such as post-PCI angina and recurrent ischemia, were more common in individuals with a history of smoking, atrial fibrillation, or prior myocardial infarction, according to our research. Smoking has a negative effect on coronary artery disease and may make post-intervention problems worse, according to previous studies. These results highlight the need of modifying risk factors and providing thorough cardiac rehabilitation to this population.

Our study's strength lies in its prospective design, which enabled us to closely observe patients starting from the time of diagnosis all the way through their treatment and recovery after percutaneous coronary intervention (PCI). Because of this, we were able to record a broad variety of clinical outcomes and consequences in a short amount of time. Our results are more relevant to everyday clinical practice since our research was carried out in a real-world tertiary care hospital environment, which increases their external validity. Our findings are more broadly applicable since we included patients of both sexes and a wide age range (20–65 years). In addition, a consistent approach was achieved by having an experienced interventional cardiologist do all operations. This helped to reduce variability that may be caused by variances in operator expertise.

Despite these strengths, our study is not without limitations. One notable limitation is the relatively short follow-up period of 48 hours, which may have prevented us from capturing longer-term outcomes, such as late re-infarction or restenosis. Additionally, low sample size may limit the generalizability of our results to other regions or healthcare settings where the infrastructure and expertise for PPCI may differ.

CONCLUSION

This study determined the frequency of various short-term outcomes following primary percutaneous coronary intervention (PPCI) in patients presenting with first acute ST-elevation myocardial infarction (STEMI). The results indicate that PPCI is an effective reperfusion strategy, with a low incidence of major adverse events such as reinfarction (0.8%), stroke (1.6%), and sudden death (0.8%). However, angina (16.1%) and cardiogenic shock (10.5%) were observed in a notable proportion of patients, highlighting the need for vigilant post-procedural monitoring and risk factor optimization. The findings support PPCI as the preferred treatment modality for acute STEMI, emphasizing the importance of individualized patient management to minimize complications and improve short-term clinical outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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1	**Aftab Gohar:** Data collection, analysis and paper writing.
2	**Muhammad Sarwar Khalid:** Data collection and paper writing,
3	**Anwaar Ul Hassan:** Discussion writing and review of manuscript.
4	**Awais Hussain Kazim:** Data analysis and discussion writing.
5	**Saima Tabassum:** Discussion writing and review of manuscript.
6	**Ambreen Anjum:** Data collection and review of manuscript.