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ANGIOGRAPHIC CHARACTERISTICS, IN-HOSPITAL, THIRTY-DAY, AND ONE-YEAR OUTCOMES IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION, UNDERGOING PRIMARY PERCUTANEOUS CORONARY INTERVENTION

Amanj Waysi Abdullah [1]* and Rafid Fayadh Al-Aqeedi [2]

[1] MBChB, Cardiology Trainee, Erbil Cardiac Center, Kurdistan Region, Iraq.
*Corresponding Author Email: amanjwaysi5@gmail.com
[2] MD, MRCP, DM Int.Card., FACC, FESC, Erbil Cardiac Center, Kurdistan Region, Iraq.

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Abstract

Acute MI is a significant factor in morbidity and mortality worldwide. The use of percutaneous coronary intervention (PCI), antithrombotic medication and secondary cardiac preventive techniques are some other factors that contribute to lowering the death rate following a heart attack by ST-elevation myocardial infarction (STEMI). **Objectives:** to assess the primary demographics and clinical characteristics, angiographic determinants both in-hospital and short-term results in individuals with STEMI who had primary PCI. **Methods:** Patients previously confirmed with STEMI and receiving a primary PCI were eligible in this retrospective observational study. The researcher examined the medical documentation of patients previously diagnosed with STEMI at Erbil Cardiac Centre to assess their compliance with regulatory requirements. Patients then retrospectively monitored immediately after the surgery and again one year from June 2022 to June 2023 to assess prospective clinical outcomes. **Results:** The majority of those diagnosed with STEMI had both obesity and history of smoking, the primary symptom is chest discomfort, the most common risk factors observed among those with STEMI were smoking and hypertension. The patient's ECG results indicated that rise of ST was mainly seen in the inferior pattern with other occurrences in the extended anterior anteroseptal, lateral, epicardium poster and anterolateral patterns. The research revealed that 23.58% had diminished EF prior and following PCI, the angiographic results of patients with STEMI showed that the majority (77.9%) had right dominance, (20.4%) had left dominance and (1.7%) co-dominance. The most culprit coronary shown to be responsible for STEMI in angiographic results is the proximal segment (LAD). Most patients (62.26%) had grade 0 of TIMI following level 3. The research showed 9.43% of participants had a progressive restenosis of a past-treated coronary artery narrowing using a stent. In-stent restenosis. The lesions had size more than 20 mm following by 10 to 20 mm and less than 10 mm, that generally no angulated and have shapes that were irregular. The research found that 39.62% showed mild calcification whereas 24.53% showed moderate and 6.60% severe and majority of them had entire occlusion. Overall, the patients have mild complications, 4 patients passed away and one patient did not respond to PCI. Patients who were older and those with lower ejection fractions had a greater risk of developing heart failure in comparison to younger age groups. **Conclusions:** A study showed that primary PCI had a small risk of complications in individuals with STEMI. The mortality and failure rates are limited. However, older patients, those with various comorbidities, and smokers were more likely to experience complications following PCI.

Keywords: STEMI, Percutaneous Coronary Intervention, PCI.

INTRODUCTION

Globally, Acute MI is a significant cause of morbidity and mortality. Despite commendable progress in infarction management, there is still significant scope for improving patients' outcomes (1). STEMI is the main reason for emergency hospitalization and cardiovascular mortality. Both developing and undeveloped countries healthcare systems are severely impacted by this disease issue. According to the most recent data worldwide STEMI is responsible for around 25% to 40% of heart attack, beyond the high occurrence of heart attacks the survival rate of acute STEMI has increased due to the difference of factors such as clinicians ease in

identifying symptom, earlier diagnosis and efficient time reperfusion. A greater rate of PCI antithrombotic treatment and secondary cardiovascular preventive techniques are some other factors that contribute to lowering death rate following the heart attack by STEMI (2). The current gold standard approach for reperfusion in therapy of STEMI is primary-PCI, the rates of morbidity and mortality among STEMI patients have a significant reduction due to time efficiencies in admission and PCI (3). Meta-analysis of forty-six randomized trials indicates PCI decreases mortality and aids patients with unstable CAD in avoiding death, cardiac death, MI. However, there is no evidence to suggest that PCI influences any of these findings in patients with stable CAD. In patients with CAD, PCI has been found to reduce MI by 26% (10%-38%; P=0.002) and cardiac death by 31% (10%-47%; P=0.007) (4). A study was conducted on 8665 individuals with STEMI. The study contains a random group of patients who obtained PPCI (n=6623) and non-PPCI (nPPCI); where PPCI interventions were not available alternative therapies (n=2042) were used. nPPCI included PCI techniques after fibrinolysis and a PCI performed without fibrinolysis. A comparison was made between the clinical results of the PPCI and nPPCI classes.

The research findings indicated that patients undergoing (nPPCI) had a longer duration of the start of symptoms and hospital (347.5 mins vs. 195.0 mins, the door to balloon period, 108 & 75 min). In addition, they had a lower probability of undergoing surgery for a coronary stent (89.4% & 95%) and being sent to cardiac rehab (20.2% vs. 24.2%). The research group didn't show significant differences in terms of in hospital and one-month major adverse cardiac event (MACE), No data is available on PCI and its related factors in region. while identifying the factors that predict STEMI and its related clinical and angiographic events can lead to modifications in therapy (5). Therefore, the goal of this study was to assess the clinical and angiographic features plus the outcomes during hospitalization (in-hospital) and in the short term in patients who presented with Acute STEMI and received PPCI.

PATIENTS AND METHODS

Study design and sampling

This observational research included those with eligibility individuals who get diagnosis for STEMI and had PCI. The researcher evaluated the medical set of patients diagnosed with STEMI at Erbil Cardiac Centre to ensure compliance with legal norms and criteria. Patients were monitored both immediately after the procedure and 1 year later to assess possible clinical outcomes, this analysis covered patients of both genders who were 18 years or older regardless of socio-demographic characteristics.

The research did not include the following patients, non-STEMI, unstable angina, those who had good angiography, patients who did not have coronary intervention (which includes patients transferred to emergency and urgent CABG), and those with inadequate info. The target population consisted of patients documented at Erbil Cardiac Centre from June 2022 to June 2023.

Measurement and outcomes

The data were obtained from the patients at medical records of the center. The following parts of the pre-designed questionnaire were used to record the patient information. First part of the questionnaire inquired for general info about the patients. The details provided are contain age, gender and BMI. The next section lists the symptoms of patients with STEMI. The symptoms were shoulder pain, chest

discomfort, back and jaw pain, syncope, SOB, sweating, nausea, vomit, epigastric pain, arrest, and VT. A separate section contained the risk factors, smoking, hypertension, DM, abnormal lipid levels and a hereditary of CAD (parents or siblings with confirmed atherosclerosis before age 55 for men and 65 for women or older for both genders), as well as previous cases of atherosclerotic disease (stroke/TIA, MI, prior coronary artery bypass grafting or PCI. CKD, chemotherapy and RA were identified as risk factors. In our research we characterized typical chest pain as pain in the precordium or retrosternum lasting for more than 20 minutes It also includes pressure or pain in the chest.

The abnormal symptom was characterized by presence of sweating, abdominal pain, dyspnea, pain in the back and jaw, syncope, nausea or vomit. The act of smoking was classified into three categories: active smoking, cessation from smoking <6 month with nonsmoker. The center conducted a 12-lead ECG along with V3-R, V4-R, V7 and V8 leads, to assess inferior infarction, this assessment was done at the admission of hospital and again 30-60 minutes following the procedure.

The medical diagnosis of STEMI was determined according to the fourth international MI guideline, the center made a diagnosis of STEMI when they observed new or suspected new elevated ST segments of at least one mm, ≥ 2 mm in V1 - V3, in 2 or more adjacent lead or when they identified left new bundles block branch in index. The classification and site of MI were established using the ECG results. The occurrence was categorized as anterior (anterior, anterolateral, anteroseptal, and extended anterior) or epicardium (inferior, lateral and posterior). The term door-to-balloon duration refers to the period from admission to the hospital until a lesion is crossed using a predictive balloon, hand thrombus aspiration tube or stent. Angiographic success described as achieving PCI with a decrease of target stenosis to less than 20% diameter, while preserving or restoring typical ante-grade flow (Thrombolysis in MI - TIMI level 3).

During the first entry the culprit artery was treated and for patients with the multi vessel disease (MVD) a planned second phased PCI was scheduled. The complications categorised as follow, a- problems occurring in PCI contained cardiac arrest, low flow or no reflow, perforations, embolisation, myocardial dissection, myocardial perforation and cardiac tamponade; b- over entry included vascular-related problems, cardiac infarction, arrhythmic issues, extra cardiac difficulties and dying; and c- occurring at next assessment. Those problems were documented in the next assessment: AMI, new PCI, stroke, hospitalisation, cardiac infarction (NYHA I, II, III, or IV), systemic embolism, pulmonary embolism and mortality. The cardiologists usually collect this data in accordance with the center's protocol, the 1 month clinical result in this trial was categorised as hospitalisation of any other reason, MI, new PPCI, cardiovascular mortality and death from all causes.

The echocardiography was performed using the GE VIVID 5 diagnostic cardiac ultrasound equipment. The echocardiogram parameters assessed were the ejection fraction which indicates either compromised LV function (EF<50%) or normal (EF>/50%). Coronary angiograms have been obtained using PHILIPS CATH LAB for all patients. ACS, initial PCI is performed for those who eligible. The STEMI group's coronary angiograms were examined for the following characteristics; Number of engaged vessels, complexity of the lesion is determined by the % size stenosis of the affected artery relative to standard section.

Lesions are classed as severe "critical" if there is a 70% or greater diameter stenosis in the LAD, LCX, RCA and 50% or greater size stenosis in the LMCA. The precise place of the lesion inside the affected artery. The length of the lesion and the classification of lesions into types A, B1, B2 and C are important factors to consider (6).

Statistical Methods

The essential data of patients in STEMI who had initial PCI were given using mean and standard deviation or the numbers and %. The study evaluated risk factors and symptoms and for those thru STEMI which underwent initial or primary PCI presenting the results in both numerical values and percent. The average and SD, numbers and percentage were used for assessing the ECG and angiographic results, laboratory outcomes, PCI findings and complications. The variables related with heart failure were analysed using Pearson chi-squared analyses. The threshold of statistical significance was established with a p-value below 0.050, JMP pro 14.3.0 was used to the statistical calculating.

Ethical views

The study was conducted according to Helsinki ethical guidelines and approved by the local Ethical Committee of the Kurdistan Board for Medical Specialties. We assure the privacy and confidentiality of the personal information of the patients who were included in this study.

RESULTS

The study showed the average age of the patients included from 37 - 78 years with a mean age of 57.69. The majority of patients including 85.85% between 41 to 70 years old, and 83.02% of the patients were males. The STEMI patients mean BMI were 29.54 (17.53 to 41.44) majority of them were obese (48.11%) or over weight (33.02%), 54.72% were smoker (Table 1).

Table 1: General information of the studied group (n=244)

Characteristics	No. (%)
Age (year)	
31-40	10 (4.1%)
41-50	47 (19.3%)
51-60	96 (39.1%)
61-70	67 (27.5%)
71-80	24 (9.8%)
Sex	
Male	204 (83.6%)
Female	40 (16.4%)
BMI	
Underweight	3 (1.2%)
Normal weight	59 (24.2)
Overweight	138 (56.6%)
Obese	44 (18%)
Smoking	
Current smoker	154 (63.1%)
Ex-smoker	32 (13.1%)
Non-smoker	58 (23.7%)

The patients' ECG results indicated that the majority of ST elevations were observed in the epicardium pattern (21.1%), followed by extended anterior (17.66%), anteroseptal (8.3%), inferior-poster (8.49%), and anterolateral (4.55%) patterns. Table 2.

Table 2: ECG and clinical findings of the studied group (N=244)

Findings		No. (%)
Site of infarction		
Inferior		51 (20.9%)
Extensive anterior		43 (17.6%)
Lateral		25 (10.2%)
inferior-posterior		21 (8.6%)
Antero-septal		20 (8.2%)
Anterolateral		11 (7.5%)
High lateral		4 (1.6%)
Posterior		2 (0.8%)
Anterior + posterior		1 (0.4%)
New presumed new LBBB		5 (2.0%)
Cardiogenic shock		2 (0.8%)
Intubation		2 (0.8%)
Pre PCI EF	Preserved	186 (76.2%)
	Impaired	58 (23.8%)
Post PCI EF	Preserved	186 (76.2%)
	Impaired	58 (23.8%)

The angiographic findings of STEMI patients are shown in (Tables 3 and 4) considering the dominance description, the right dominance reported in (77.9%) left dominate (20.5%) and co-dominant in (1.6%).

Type B1 lesion was the least frequent, contributed for 5.7%, B2 reported in 20.9% and the more frequent lesion was typing C in (73.8%). The culprit coronary artery distribution was RAMUS (0.8%), RCA (34.8%), LAD (48.0%), OM (3.7%), LCX (11.5%), diagonal (2.0%), and PLV (0.8%). The majority of individuals had grade 0 TIMI flow (62.3%), grade 3 (29.1%). The least frequent was grade 2 and grade 1, contributed for (7.4%) and (0.8%), respectively.

The proximal segment of culprit coronary artery myocardial territories affected in (55.7%) followed by MID (32.0%), distal (10.2%), and ostium (2.0%).

The research revealed 9.4% of the patients experienced the restenosis of a stented cardiac lesion. The majority of the lesions had a length > 20 mm (72.5%), were mainly non-angulated (81.1%), and had an irregular shape (87.7%).

Calcifying was present in 39.8% at mild level, 24.6% at moderate level, and 6.6% at severe. Total occlusion was found in 61.3% of the STEMI patients, subtotal in (34%), and critical in 3.7% while only two patients had intermediate occlusion.

Among the studied group, 37.7% had ostial lesions and the most branch of 93.4% of the patients was involved. Thrombosis was of grade 0 in (16.3%), grade 1 (14.3%), grade 2 (9.4%), grade 3 (15.2%), grade 4 (28.3%), and of grade 5 in (16.0%).

We demonstrated that 34.8% had bifurcation lesions and 21.7% had tortuosity, 4.9% had major side branches. Severe vessel disease (VD) reported in (29.1%), double VD in (45.1%, three VD (23.8%) and three plus left main were involved in (2.0%).

Table 3: Angiographic findings of the studied group

Findings		No.
Dominancy	Right	190 (77.9%)
	Left	50 (20.5%)
	Co-dominant	4 (1.6%)
Type of lesion	B1	14 (5.7%)
	B2	51 (20.9%)
	C	180 (73.8%)
Culprit vessel	LAD	117 (48.0%)
	LCX	28 (11.5%)
	RCA	85 (34.8%)
	Diagonal	5 (2.0%)
	OM	9 (3.7%)
	RAMUS	2 (0.8%)
	PLV	2 (0.8%)
Graft	No graft	239 (98.0%)
	Graft (LIMA)	2 (0.8%)
	Graft(SVG)	2 (0.8%)
TIMI-Flow	0	152 (62.3%)
	1	2 (0.8%)
	2	18 (7.4%)
	3	71 (29.1%)
Segments	Distal	25 (10.2%)
	MID	78 (32.0%)
	Ostium	5 (2.0%)
	Proximal	136 (55.7%)
ISR		23 (9.4%)
Stent thrombosis	Stent thrombosis	2 (0.8%)
DE novo injury	DE novo injury	18 (7.4%)
Slow flow	Slow flow	61 (25.0%)
Length of lesion	<10 mm	7 (24.6%)
	10-20 mm	60 (24.6%)
	>20 mm	177 (72.5%)
Angle	Non-angulated	198 (81.1%)
	Moderately angulated	46 (18.9%)
Contour	Irregular contour	214 (87.7%)
	Smooth contour	30 (12.3%)

Table 4: Other angiographic findings of the studied group

Findings		No. (%)
Calcification	None	71 (29.1%)
	Mild	97 (39.8%)
	Moderate	60 (24.6%)
	Severe	16 (6.6%)
Occlusion	Intermediate	2 (0.8%)
	Critical	9 (3.7%)
	Sub-total	83 (34.0%)
Ostial lesion		92 (37.7%)
Major branch involvement		228 (93.4%)
TIMI TG	0	41 (16.3%)
	1	35 (14.3%)
	2	23 (9.4%)
	3	37 (15.2%)
	4	69 (28.3%)
	5	39 (16.0%)
Bifurcation lesion		85 (34.8%)
Tortuosity		53 (21.7%)
Major side branch		12 (4.9%)
Vein graft		5 (2.0%)
Vessels disease (VD)	Severe VD	71 (29.1%)
	Double VD	110 (45.1%)
	Three VD	58 (23.8%)
	Three VD and left main	5 (2.0%)

The Primary PCI findings of the studied group are summarized in (Table 5);

Where Femoral access used in most of cases, (95.5%). Balloon PCI angioplasty was utilized in (8.6%), balloon passing via (2.0%), stent direct implantations (29.9%), and stenting post dilation in (59.4%). No stent used in 13 patients (5.3%), one stent in (75.8%) and two stents in (18.9%). Out of the 244 patients, 4.1% had PCI to non-culprit lesions in PPCI. Unfortunately, PCI failed in one (0.4%) patient (Table 5).

Table 5: Primary PCI findings of the studied group

Finding		No. (%)
Access route	Femoral	233 (95.5%)
	Radial	11 (4.5%)
PCI type	Balloon angioplasty	21 (8.6%)
	Balloon passing through	5 (2.0%)
	Direct stent implantation	73 (29.9%)
	Stenting post-dilation	145 (59.4%)
No. of Stent	0	13 (5.3%)
	1	185 (75.8%)
	2	46 (18.9%)
Non-culprit	Yes	10 (4.1%)
	No	234 (95.9%)
PCI result	Failed	1 (0.4%)
	Successful	24 (9.8%)
Medication	None	215 (88.1%)
	GPIIB/IIIA	29 (11.9%)

The PCI complications are demonstrated in (Table 6) in descending order, the more frequent complications were slow flow, embolization and new PCI which were found in 29.1%, 20.9% and 15.2%, respectively, followed by other complications (as shown in table 6) in rates ranged between 0.8% to 5.7%. Heart failure of different stages was occurred in 90 patients contributed for 36.9% of the studied group. Furthermore, 82% of the patients hospitalized for less than 24 hours. A total of four patients died due to their conditions with two deaths occurring within the hospital and two occurring outside the hospital.

Table 6: Presents the complications faced by those with STEMI following primary PCI) within hospital (n=244)

Complications	No.
Slow flow	71 (29.1%)
Embolization	51 (20.9%)
New PCI	37 (15.2%)
Dissection	14 (5.7%)
No reflow	14 (5.7%)
Arrhythmia	14 (5.7%)
Contrast nephropathy	12 (4.9%)
New MI	12 (4.9%)
Cardiogenic shock	9 (3.7%)
Inotropes	9 (3.7%)
Referred for CABG	9 (3.7%)
Cardiac arrest	7 (2.9%)
Stent thrombosis	5 (2.0%)
IABP	2 (0.8%)
Temporary PM	2 (0.8%)
Dialysis	2 (0.8%)
Stroke	2 (0.8%)

Heart failure	
None	154 (63.1%)
I	27 (11.1%)
II	39 (16.0%)
III	12 (4.9%)
IV	12 (4.9%)
Hematoma	
None	184 (75.4%)
< 10 cm	51 (20.9%)
≥ 10 cm	9 (3.7%)
Hospitalization	
< 24 h.	200 (82.0%)
≥ 24 h.	44 (18.0%)
Outcomes	
Survived	234 (95.9%)
In-hospital death	5 (2.0%)
Out-hospital death	5 (2.0%)

DISCUSSION

Most of the patients in this study with STEMI had obesity and they are smoking, the patients showed chest pain as most common symptom whereas smoking and hypertensive were identified as the most common risk factors. Studies carried out in this region provided results similar to our study, e.g., one research was carried out in Duhok, Kurdistan, Iraq. to investigate the attributes and 6-week results of STEMI patients who had PPCI, according to their report one-third of the patients showed increased levels of cardiac troponin (cTn). Patients showing elevated levels of cTn had a greater prevalence of previous CABG and other comorbidities, the study did not focus on effect of cTn but it demonstrated a correlation between high levels of hsTn and increased incidence of heart failure following PPCI.

Yet, this study (7) agree with the findings that mild myocardial injury is frequently observed after PCI and is associated with the complexity of the procedure, it identifies patients who are at higher risk of experiencing a worse prognosis. Obese patients and smokers had a higher chance to develop cardiac failure following PPCI, also encountered several minor complications following PPCI such as dissection, embolization, low flow, reflow, stent thrombosis, cardiac arrhythmia, arrest and shock, IABP insertion, brief pm, dialysis, contrast nephropathy, mechanical ventilation, inotropes, LMD, new MI, new PCI, referral for CABG, stroke and hospitalisation. The frequency of those complications is limited and primarily linked to presence of other medical conditions and previous cardiac treatments. However, the essential one was that mortality was low (just 4 patients), despite the majority of patients having severe lesion and complete blockages only one patient suffered a failed PCI, these patients also had a greater prevalence of other medical conditions and other risk factors.

Along with present research Mohammad et al. found that the majority of patients diagnosed with STEMI are of older age and mainly male. Most of patients included in our study, age range from 41 to 70 years old. Further, the participants had a higher chance of experiencing additional problems, heart failure reported in this study. Systematic reviews have confirmed that although PCI is an efficient and secure way of improving myocardial perfusion, older patients are susceptible to developing vascular complications and have a higher risk of ACD. (8).

Bauer & Zeymer (2010) shown that the risk of death during or after a PCI procedure is linked with age in a curved manner. Greater rates of mortality appear in elderly patients. However, the level of risk associated with the mortality rate is based on other variables including angiographic and procedural parameters.

The total death rate among patients with STEMI was little lower at 3.78%, compared to the reported rate of 5% by Mohammad et al. The disparity may be attributed to various medic, epidemiology and clinical aspects. Their results were determined to be expected by the form and place of MI, the artery responsible for TIMI flow after PCI and period of hospitalization. The examination of linked factors to mortality was not conducted in this research due to inadequate number of dead patients to facilitate statistical analysis.

Research aimed to investigate the clinical and perioperative features of patients ≥ 75 receiving PCI, the goal was to investigate the risk factors associated with short term mortality after PCI (9). They classified 1,035 patients receiving PCI between 2011 - 2013 into different age groups. The age categories are (1) patients ≥ 75 years old with stable angina (SA), (2) patients < 75 years with SA, (3) patients aged ≥ 75 with ACS, (4) patients younger than 75 years with ACS.

According to their findings those who were 75 years or older had a higher rate of hypertension, history with stroke, COPD, PVD, cardiogenic shock and malignant arrhythmia compared to those who were younger. They had a greater possibility of hospitalization with slightly lower weight, haemoglobin, albumin, triglyceride, as well as higher creatinine, uric acid, urea nitrogen and pro-BNP.

Also, older patients had a higher likelihood of left main artery lesions, calcified lesions, multi-vessel and chronic complete blockage, the univariate analysis found that many characteristics are linked to higher risk of 6 month death in older patients ≥ 75 who had PCI, these risks include cardiac shock or severe arrhythmia upon admission, emergency PCI, previous stroke, and chronic renal disorder (9). However, it is essential to note that systematic studies (10). conducting PCI on elders. Research showed that the role of ageing is associated with a rise in CVD and a decline in cardiac reserve similarly (11).

Overall, PCI is a useful safe therapy for patients with STEMI across all genders and age groups. Also, this research demonstrated the effectiveness and safety of the therapy for individuals with STEMI who had more severe medical problems such as blockage, blood flow and other angiography outcomes. (12).

LIMITATIONS OF THE STUDY

We tried to include as much as possible the related characteristics to the outcomes in patients with STEMI in this study. But we could not include a large sample size in this study due to not having sufficient time and some technical issues.

CONCLUSIONS

This study demonstrated that patients with STEMI who receive primary PCI experience low rates of problems, it possesses a low mortality and failing rate. However the incidence was higher among elderly patients and smokers following PCI compilations.

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