Original
ISSN 2413-0516

Outcomes of Primary Percutaneous Coronary Intervention in ST-Segment Elevation Myocardial Infarction in Kurdistan Region of Iraq

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(Submitted: 16 December 2021 – Revised version received: 10 January 2022 – Accepted: 27 January 2022 – Published online: 26 April 2022)

Abstract

Objectives: This registry aims to clarify the characteristics and 6-weeks outcomes of patients with STEMI after PPCI in the region.

Methods: Data from a total of 151 STEMI patients undergoing PPCI at Duhok heart center, Iraq from 2020 to 2021 was collected. Patient's demographic, clinical and PPCI profiles were recorded. The major adverse cardiac events (MACE) and left ventricle ejection fraction (LVEF%) outcomes for 6 weeks period was registered.

Results: Of the 151 consecutive patients with STEMI who underwent PPCI, 46 (30.4%) were <50 years old. Majority of patients were males and have clusters of cardiometabolic risk factors. 64% of cases attained Cath lab within first hour of initial chest pain. Almost 90% of STEMI cases were treated with stenting with TIMI3 in (94%). 80% of PPCI cases discharged home within 24 hours uneventfully. 6-weeks LVEF was preserved within normal range in 55% of cases. 36% had MACEs including impaired LVEF. All cause-mortality happened in 5%. 4% were Censored from follow up. The predictors of 6-weeks outcomes were depend on type/location of myocardial infarction, the culprit artery, TIMI flow post PCI and length of hospital stay.

Conclusion: This registry has shown feasibility in doing PPCI with reasonable outcomes in the Region. Networking of capable centers of PPCI in the country is essential for augmenting the cardiac services and sharing the knowledge among cardiologists and people for better STEMI outcomes.

Keywords: STEMI, primary PCI, Iraq

Introduction

The cardiovascular diseases coming at the top of the list of the disease-related death in Iraq.[1] The incidence of STEMI in the area is rapidly over happening particularly in young people.[2] According to international medical guidelines the best approach to STEMI patient is the PPCI.[3] The PPCI services are generally new in our area. Since long time the main modality of reperfusion in STEMI was thrombolytics. In the last decade the interventional cardiology services and Cath lab facilities entered to the field in our area, nevertheless, the systematic PPCI per 24 hours/7 days per 365 days was relatively a new approach in our area. Given the fact that the services of PPCI are relatively recent in the area and the data about STEMI and the feasibility of PPCI are sparse. Hence, this study was conducted in order to clarify the characters and 6-weeks outcomes of patients with STEMI after primary percutaneous coronary intervention (PPCI) in the region.

Methods

Belongs to Azadi teaching tertiary hospital Duhok heart center is a specialized center with a history of than 15 years. In regards to STEMI, the center provided PPCI services 24 hours/7 days per week in the last 4 years. The center has three equipped Cath Lab with continuous back up surgery and intensive care unit. The center has more than 12 interventional cardiologists with a group of cardiac surgeons and intensives, besides a large group of paramedics and staffs in the Cath lab.

In this prospective follow up study patients who presented with diagnosis of STEMI from Duhok and its districts and referred to Duhok heart center inside Azadi hospital for potential primary percutaneous coronary intervention were enrolled during the period of 2020 to 2021. The patients were given guideline directed medical therapy in from of loading doses of dual antiplatelets and anti-ischemic drugs. Eligible patients after their acceptance and consent from patients were referred to Cath lab for PPCI. Patients with established STEMI or late presentations (> 12 hours) were excluded and admitted to coronary care unit for optimal medical therapy/ thrombolytics.

During the procedure, the interventional cardiologists perform the procedure through either femoral or radial approach. All the procedural data including angiographic findings with culprit artery lesion and type of PCI (whether stents, ballooning or medical therapy) were documented. Platforms of stents were mentioned. Successfulness of PCI and procedure was based on the TIMI flow scores.

After the procedure all patients were admitted for 24 hours monitoring in the intensive care unit of the center. All complications including mortality, if happened were registered. The estimation of LVEF was performed. Post discharge advices for regular complaint to medications, life style modifications and follow up schedule were given.

Then after patients were followed for a period of 6 weeks. The LVEF (%) were performed for coming cases. In addition to registration of the rates of patient's readmissions to hospital for major acute ischemic events (MACE) like acute stent thrombosis, myocardial infarction and stroke. The cardiac death rate and censored cases for follow up during this period was documented. A detailed demographic, clinical, angiographic profile of all cases were recorded and stored on a file of excel.

Ethical Approval and Patients Consent

The study was approved by the appropriate ethical committee at the Kurdistan board of medical specialization (Erbil, Iraq. The number of order;) and an informed written consent was obtained from all participants, or legal guardians (either parent) as appropriate.

Statistical Analysis

Data from the original Excel file were transferred and analyzed by using Microsoft Office Excel 2007 and SPSS for Windows, version 16.0, Chicago. Continuous variables were calculated as mean ± (SD), and categorical variables were presented as counts and percentages. A chi-square test and fisher exact were used to compare the variables. *P*-value < 0.05 was regarded as significant.

Results

The main findings of patients by age groups are summarized in Table 1. The patients were predominately males. 30% were young (<50 years). The fast majority of PPCI was performed within first 6 hours of onset of chest pain. Risk factors were clustered among both young and old. Anterior (49%) then inferior (40) STEMI was the presentation. Normal coronary lumen angiogram seen in (1.3%). Drug eluting stents deployed in 92% of cases. Successful result (TIMI3) obtained in 94%. 80% of PPCI discharged home uneventfully with first 24 hours. 6-weeks LVEF preserved in 64%. 36% of cases survived but with MACEs. All-cause mortality was 4.6%. No major differences were seen between different age groups.

In Table 2 the clinical, angiographic and outcomes findings of cases by the sex were summarized. However, the STEMI equivalent presentations were more common among women,

Table 1. **The main findings of patients (*n* = 151), by age groups**

Clinical finding		21–49 years (*n* = 46)		50–90 years (*n* = 105)		Total (*n* = 151)		*P*-value*
		No.	%	No.	%	No.	%	
Sex	Male	41	89.1	84	80.0	125	82.8	0.171
	Female	5	10.9	21	20.0	26	17.2	
Chief complaint	Chest pain	41	89.1	86	81.9	127	84.1	
	SOB	2	4.3	8	7.6	10	6.6	0.626
	Other	3	6.5	11	10.5	14	9.3	
Duration	0.5 hour	8	17.4	27	25.7	35	23.2	
	1 hour	18	39.1	45	42.9	63	41.7	
	2 hours	12	26.1	22	21.0	34	22.5	0.535
	3–6 hours	3	6.5	3	2.9	6	4.0	
	> 6 hours	5	10.9	8	7.6	13	8.6	
DM	Positive	8	17.4	38	36.2	46	30.5	**0.021**
	Negative	38	82.6	67	63.8	105	69.5	
Smoking	Positive	34	73.9	65	61.9	99	65.6	
	Ex-smoker	1	2.2	2	1.9	3	2.0	0.257
	Negative	11	23.9	38	36.2	49	32.5	
Hypertension	Positive	17	37.0	62	59.0	79	52.3	**0.012**
	Negative	29	63.0	43	41.0	72	47.7	
Dyslipidemia	Positive	39	84.8	86	81.9	125	82.8	0.666
	Negative	7	15.2	19	18.1	26	17.2	
Family history	Positive	9	19.6	25	23.8	34	22.5	0.565
	Negative	37	80.4	80	76.2	117	77.5	
Past medical history	IHD	5	10.9	22	21.0	27	17.9	
	Previous stents	1	2.2	3	2.9	4	2.6	0.303
	Negative	40	87.0	80	76.2	120	79.5	
Drugs	Category 1	35	76.1	74	72.5	109	73.6	0.651
	Category 2	11	23.9	28	27.5	39	26.4	
BMI (kg/m^2)	18–24.9	7	15.2	18	17.1	25	16.6	
	25–29.9	34	73.9	82	78.1	116	76.8	0.378
	30–35	5	10.9	5	4.8	10	6.6	

(Continued)

Table 1. **The main findings of patients (*n* = 151), by age groups—Continued**

Clinical finding		21–49 years (*n* = 46)		50–90 years (*n* = 105)		Total (*n* = 151)		*P*-value*
		No.	%	No.	%	No.	%	
Diagnosis	Anterior STEMI	29	63.0	45	42.9	74	49.0	0.205
	Inferior STEMI	15	32.6	46	43.8	61	40.4	
	Posterior STEMI	1	2.2	8	7.6	9	6.0	
	Lateral STEMI	1	2.2	4	3.8	5	3.3	
	STEMI equivalent	0	0.0	2	1.9	2	1.3	
Angiogr. findings	Normal CAG	1	2.2	1	1.0	2	1.3	0.575
	Single v. disease	32	69.6	68	64.8	100	66.2	
	Two v. disease	6	13.0	22	21.0	28	18.5	
	Triple v. disease	7	15.2	14	13.3	21	13.9	
Culprit artery	LAD	28	60.9	47	44.8	75	49.7	0.169
	RCA	11	23.9	45	42.9	56	37.1	
	LCX	4	8.7	9	8.6	13	8.6	
	LMS	2	4.3	3	2.9	5	3.3	
	Normal	1	2.2	1	1.0	2	1.3	
Procedure	Stenting	41	89.1	98	93.3	139	92.1	0.231
	Ballooning	3	6.5	1	1.0	4	2.6	
	Graft stent	0	0.0	1	1.0	1	0.7	
	Surgery	0	0.0	2	1.9	2	1.3	
	Medical Rx	2	4.3	3	2.9	5	3.3	
Result of PCI	TIMI 0 flow	0	0.0	1	1.0	1	0.7	1.000
	TIMI II flow	1	2.2	4	3.8	5	3.3	
	TIMI III flow	45	97.8	98	93.3	143	94.7	
	Surgery	0	0.0	2	1.9	2	1.3	
Length of hospital stay	24 hours	39	84.8	82	78.1	121	80.1	0.343
	> 24 hours	7	15.2	23	21.9	30	19.9	
EF after 6 weeks	50–60	26	56.5	71	67.6	97	64.2	0.190
	20–49	20	43.5	34	32.4	54	35.8	
Six-weeks outcome	Died	0	0.0	7	6.7%	7	4.6	0.137
	Survived with complication**	20	43.5	35	33.3	55	36.4	
	Survived without complications**	25	54.3	58	55.2	83	55.0	
	Censored***	1	2.2	5	4.8	6	4.0	

*Based on Chi-square or Fisher's Exact test. **Stent thrombosis, readmission or EF < 50. ***Not included in the statistical test (missing data). N.B. All the percentages are vertical; therefore, comparisons are to made horizontally, between the two age groups.

the males had more anterior STEMI. We notably not found a statistically significant difference between both gender in other parameters except of some expected risk factors like smoking among males.

The Table 3 showed the relation of cases's characteristics to 6 weeks (EF). The predictors of 6-weeks outcomes and LVEF were depend on type/location of STEMI, the culprit artery, TIMI flow post PCI and length of hospital stay. The impaired EF was observed among anterior STEMI ($P < 0.001$), LAD culprit ($P < 0.001$), less than TIMI3 PCI result ($P < 0.039$). The overall mortality and morbidity (MACEs) and longer length of in-hospitalization time were registered in lower LVEF.

Discussion

This registry showed the feasibility of PPCI with reasonable outcomes in STEMI patients. There were generally no clear differences in characteristics outcomes of STEMI with respect to gender and ages of patients. In the developed countries the CAD is typically aged related with low incidence of the disease among young compared to our area. Almost 30% of cases of STEMI in this study were among young.[5]

Another striking point is the predominate male gender affection by the disease in the current study. The potential explanation of this phenomena is that the males constitute the

Table 2. **Clinical findings of the patients ($n = 151$), by sex**

Clinical finding		Males ($n = 125$)		Females ($n = 26$)		Total		*P*-value
		No.	%	No.	%	No.	%	
Chief complaint	Chest pain	107	85.6	20	76.9	127	84.1	
	SOB	8	6.4	2	7.7	10	6.6	0.449
	Other	10	8.0	4	15.4	14	9.3	
Duration	0.5 hour	27	21.6	8	30.8	35	23.2	
	1 hour	58	46.4	5	19.2	63	41.7	
	2 hours	25	20.0	9	34.6	34	22.5	0.080
	3–6 hours	5	4.0	1	3.8	6	4.0	
	> 6 hours	10	8.0	3	11.5	13	8.6	
DM	Positive	32	25.6	14	53.8	46	30.5	**0.004**
	Negative	93	74.4	12	46.2	105	69.5	
Smoking	Positive	97	77.6	2	7.7	99	65.6	
	Ex-smoker	3	2.4	0	0.0	3	2.0	**<0.001**
	Negative	25	20.0	24	92.3	49	32.5	
Hypertension	Positive	61	48.8	18	69.2	79	52.3	0.058
	Negative	64	51.2	8	30.8	72	47.7	
Dyslipidemia	Positive	104	83.2	21	80.8	125	82.8	0.777
	Negative	21	16.8	5	19.2	26	17.2	
Family history	Negative	95	76.0	22	84.6	117	77.5	0.339
	Positive	30	24.0	4	15.4	34	22.5	
Past medical history	Negative	98	78.4	22	84.6	120	79.5	
	IHD	23	18.4	4	15.4	27	17.9	0.900
	Previous stents	4	3.2	0	0.0	4	2.6	
Drugs	Category 1	92	74.8	17	68.0	109	73.6	0.482
	Category 2	31	25.2	8	32.0	39	26.4	
BMI (kg/m^2)	18–24.9	22	17.6	3	11.5	25	16.6	
	25–29.9	95	76.0	21	80.8	116	76.8	0.731
	30–35	8	6.4	2	7.7	10	6.6	
Diagnosis	Anterior STEMI	65	52.0	9	34.6	74	49.0	
	Inferior STEMI	50	40.0	11	42.3	61	40.4	
	Posterior STEMI	8	6.4	1	3.8	9	6.0	**0.006**
	Lateral STEMI	2	1.6	3	11.5	5	3.3	
	STEMI equivalent	0	0.0	2	7.7	2	1.3	
Angiogr. findings	Normal CAG	1	.8	1	3.8	2	1.3	
	Single v. disease	85	68.0	15	57.7	100	66.2	0.266
	Two v. disease	21	16.8	7	26.9	28	18.5	
	Triple v. disease	18	14.4	3	11.5	21	13.9	
Culprit artery	LAD	65	52.0	10	38.5	75	49.7	
	RCA	45	36.0	11	42.3	56	37.1	
	LCX	12	9.6	1	3.8	13	8.6	0.051
	LMS	2	1.6	3	11.5	5	3.3	
	Normal	1	.8	1	3.8	2	1.3	
Procedure	Stenting	114	91.2	25	96.2	139	92.1	
	Ballooning	4	3.2	0	0.0	4	2.6	
	Graft stent	1	0.8	0	0.0	1	0.7	1.000

(Continued)

Table 2. **Clinical findings of the patients (*n* = 151), by sex—Continued**

Clinical finding		Males (*n* = 125)		Females (*n* = 26)		Total		*P*-value
		No.	%	No.	%	No.	%	
	Surgery	2	1.6	0	0.0	2	1.3	
	Medical Rx	4	3.2	1	3.8	5	3.3	
Result of PCI	TIMI 0 flow	0	0.0	1	3.8	1	0.7	
	TIMI II flow	4	3.2	1	3.8	5	3.3	0.265
	TIMI III flow	119	95.2	24	92.3	143	94.7	
	Surgery	2	1.6	0	0.0	2	1.3	
Length of hospital stay	24 hours	98	78.4	23	88.5	121	80.1	0.242
	> 24 hours	27	21.6	3	11.5	30	19.9	
EF after 6 weeks	50–60	77	61.6	20	76.9	97	64.2	0.138
	20–49	48	38.4	6	23.1	54	35.8	
Six-weeks outcome	Died	5	4.0	2	7.7	7	4.6	
	Survived with complication*	50	40.0	5	19.2	55	36.4	0.114
	Survived (EF ≥50) without compl	65	52.0	18	69.2	83	55.0	
	Censored**	5	4.0	1	3.8	6	4.0	

*Stent thrombosis, readmission or EF < 50. **Not included in the statistical test (missing data). N.B. All the percentages are vertical; therefore, comparisons are to made horizontally, between the two sexes.

Table 3. **Relation clinical findings of the patients (*n* = 151), with their outcome, in terms of Ejection Fraction (EF), after 6 weeks**

Clinical finding		Six-weeks outcome (EF)						*P*-value
		50–60 (*n* = 97)		20–49 (*n* = 54)		Total		
		No.	%	No.	%	No.	%	
Age	21–49 years	26	26.8	20	37.0	46	30.5	0.190
	50–90 years	71	73.2	34	63.0	105	69.5	
Sex	Male	77	79.4	48	88.9	125	82.8	0.138
	Female	20	20.6	6	11.1	26	17.2	
Chief complaint	Chest pain	85	87.6	42	77.8	127	84.1	
	SOB	3	3.1	7	13.0	10	6.6	0.064
	Other	9	9.3	5	9.3	14	9.3	
Duration	0.5 hour	25	25.8	10	18.5	35	23.2	
	1 hour	41	42.3	22	40.7	63	41.7	
	2 hours	23	23.7	11	20.4	34	22.5	0.128
	3–6 hours	1	1.0	5	9.3	6	4.0	
	> 6 hours	7	7.2	6	11.1	13	8.6	
DM	Positive	31	32.0	15	27.8	46	30.5	0.593
	Negative	66	68.0	39	72.2	105	69.5	
Smoking	Positive	60	61.9	39	72.2	99	65.6	
	Ex-smoker	1	1.0	2	3.7	3	2.0	0.137
	Negative	36	37.1	13	24.1	49	32.5	
Hypertension	Positive	50	51.5	29	53.7	79	52.3	0.799
	Negative	47	48.5	25	46.3	72	47.7	
Dyslipidemia	Positive	81	83.5	44	81.5	125	82.8	0.752
	Negative	16	16.5	10	18.5	26	17.2	

(Continued)

Table 3. **Relation clinical findings of the patients ($n = 151$), with their outcome, in terms of Ejection Fraction (EF), after 6 weeks—Continued**

Clinical finding		Six-weeks outcome (EF)						*P*-value
		50–60 ($n = 97$)		20–49 ($n = 54$)		Total		
		No.	%	No.	%	No.	%	
Family history	Negative	77	79.4	40	74.1	117	77.5	0.454
	Positive	20	20.6	14	25.9	34	22.5	
Past medical history	Negative	78	80.4	42	77.8	120	79.5	
	IHD	16	16.5	11	20.4	27	17.9	0.869
	Previous stents	3	3.1	1	1.9	4	2.6	
Drugs	Category 1	71	75.5	38	70.4	109	73.6	0.493
	Category 2	23	24.5	16	29.6	39	26.4	
BMI (kg/m^2)	18–24.9	15	15.5	10	18.5	25	16.6	
	25–29.9	76	78.4	40	74.1	116	76.8	0.837
	30–35	6	6.2	4	7.4	10	6.6	
Diagnosis	Anterior STEMI	31	32.0	43	79.6	74	49.0	
	Inferior STEMI	57	58.8	4	7.4	61	40.4	
	Posterior STEMI	4	4.1	5	9.3	9	6.0	**<0.001**
	Lateral STEMI	3	3.1	2	3.7	5	3.3	
	STEMI equivalent	2	2.1	0	0.0	2	1.3	
Angiogr. findings	Normal CAG	2	2.1	0	0.0	2	1.3	
	Single v. disease	68	70.1	32	59.3	100	66.2	0.369
	Two v. disease	15	15.5	13	24.1	28	18.5	
	Triple v. disease	12	12.4	9	16.7	21	13.9	
Culprit artery	LAD	33	34.0	42	77.8	75	49.7	
	RCA	50	51.5	6	11.1	56	37.1	
	LCX	9	9.3	4	7.4	13	8.6	**<0.001**
	LMS	3	3.1	2	3.7	5	3.3	
	Normal	2	2.1	0	0.0	2	1.3	
Procedure	Stenting	91	93.8	48	88.9	139	92.1	
	Ballooning	2	2.1	2	3.7	4	2.6	
	Graft stent	0	0.0	1	1.9	1	0.7	0.130
	Surgery	0	0.0	2	3.7	2	1.3	
	Medical Rx	4	4.1	1	1.9	5	3.3	
Result of PCI	TIMI 0 flow	0	0.0	1	1.9	1	0.7	
	TIMI II flow	2	2.1	3	5.6	5	3.3	**0.039**
	TIMI III flow	95	97.9	48	88.9	143	94.7	
	Surgery	0	0.0	2	3.7	2	1.3	
Length of hospital stay	24 hours	86	88.7	35	64.8	121	80.1	**<0.001**
	> 24 hours	11	11.3	19	35.2	30	19.9	
Six-weeks outcome	Died	1	1.0	6	11.1	7	4.6	
	Survived with complication**	7	7.2	48	88.9	55	36.4	**<0.001**
	Survived (EF ≥50) without compl.	83	85.6	0	0.0	83	55.0	
	Censored***	6	6.2	0	0.0	6	4.0	

*Stent thrombosis, readmission or EF < 50. **Not included in the statistical test (missing data). N.B. All the percentages are vertical; therefore, comparisons are to made horizontally, between the two EF groups.

bulk of the young premature CAD and the second is the well-known protective effect of estrogen in premenopausal age in females.[6,7]

In term of cardiometabolic risk factors there was clear trend of clustering of risk factors in our patients. And this clustering was the main attributable to STEMI in our region. Hence, the control of such risk factors should be the priority in health agenda as soon as possible. It is recognizable that the traditional risk is more important the genetic polymorphisms in this group of patients according to available data from the area.[5,8]

The fast majority of our cases were presented for first time with CAD with negative past history of coronary disease. Only one fifth of cases had past history of CAD regardless of the original presentation. This highlight the significant increase in the new cases and incidence of the disease in this area.[9]

Compared to previous report from our area the time of presentation of STEMI cases to hospital and emergency department is mildly improved.[10] Since several years ago more than 50% of acute coronary syndrome cases were lately coming to hospital. In this registry the time of presentation was shorter than the time determined by previous report.[10] This reflect some improvement in facilities and health education in the area.

The angiographic profile of patient reflects another fact; the nature of coronary involvement in this study was extensive lesions. More than 30% of cases had more than one vessel diseased. And this point should raise the awareness about the silent CAD before the STEMI presentation.[11] Depend on some national reports the nature of coronary lesion among our patients has two characters: more extensive lesions and more calcification. This point needs a particular attention by the community of cardiology in the area.[12]

The feasibility of the primary PCI procedure was achievable. Almost more than 90% cases underwent successful stenting with drug eluting platforms of the culprit artery with TIMI 3 flow in the culprit artery. The adopted policy for discharging cases post successful PPCI was within first 24 hours in 80% of cases and only 20% were stayed hospitalized for longer duration. This early discharge of stable cases after PPCI will preserve the economic and health facilities for those with critical cases.[13]

In terms of 6 weeks follow up, the LVEF were preserved in 65%. The remaining percent were presented with different level of impaired LVEF especially among the more vulnerable patients. Probably the stunning and particularly the hibernation of the myocardium is one of the expected causalities beyond the impaired LVEF.[14] In addition to different degree of heart failure and LV dysfunction there was higher rate OF MACE in this study compared to others.[15] The predictors of 6-weeks adverse outcomes were depending mainly on type/location of myocardial infarction, the culprit artery, TIMI flow post PPCI and length of hospital stay.

Conclusion

This study indicated that the 24 hours/7 days of week/365 days of year's PPCI is feasible procedure in our area with acceptable outcomes. Within the accumulation of experiences in treating STEMI and PPCI among our health personnel and staff we do expect better outcomes in the near future particularly if these experiences come in line with the health awareness of STEMI and chest pain among people. The implementation of recent STEMI management protocols like CODESTEMI or STEMI Alert in our area will add an additional step toward improving the STEMI outcomes and cathlab services.[16,17]

Conflicts of Interest

None.

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