Fibrinolysis versus Primary Percutaneous Coronary Intervention in Covid-19 Patients Admitted with ST-Elevation Myocardial Infarction: Outcome and Predictors of In-hospital Mortality

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ABSTRACT

Objectives: The pandemic of coronavirus disease 2019 (COVID-19) put high pressure on the health care system worldwide. Morbidity and Mortality rate of acute coronary syndrome increased during COVID-19 pandemic era. So we aimed to evaluate the efficacy of Fibrinolysis versus Primary Percutaneous Coronary Intervention (PPCI) in Covid-19 Patients Admitted with ST-Elevation Myocardial Infarction (STEMI).

Study design: We enrolled 73 patients (57 males, 16 females; mean age (SD) 57.58 (12.46) years with acute STEMI and divided into two groups, Group (1) positive COVID-19 patients, Group (2) negative COVID-19 patients and both groups had reperfusion therapy either by fibrinolysis or PPCI according to the recommended guidelines.

Results: There was high prevalence of risk factors [Dyslipidemia, Diabetes mellitus, Hypertension, +ve family history for coronary artery disease (CAD), and prior CABG] among Positive Covid-19 patients who received PPCI but with no statistically significant difference among groups according to baseline characteristics of patients. The pain-to-FMC time increased among +ve Covid-19 patients who received reperfusion therapy either by fibrinolysis or PPCI and this may be attributed to the fear and anxiety of patients from hospital admission during this pandemic. Regarding PCI procedure characteristics, FMC-to-wire crossing time (P-value <0.001), Pain-to-FMC time, and TIMI flow before PCI (P-value <0.05) had a significant predictor for different PPCI outcome.

The mortality rate was high in +ve Covid-19 Patients who had reperfusion therapy (3 out of 19 patients who received fibrinolysis) and (2 out of 18 patients who had PPCI) and morbidities increased but with no statistically significant difference comparing with –ve Covid-19 Patients who had reperfusion therapy either by Fibrinolysis or PPCI, also the discharge time was high in +ve Covid-19 Patients with no statistically significant difference comparing with –ve Covid-19 Patients.

Conclusions: Coronary reperfusion by fibrinolysis in +ve COVID-19 patients presented with STEMI was associated with a lower rate of ischemic time but with increased morbidities with no significant difference with those patients who had PPCI. Further studies are required to confirm this observation

Keywords: *COVID-19; percutaneous coronary; fibrinolysis; myocardial infarction; hospital mortality; safety.*

Abbreviations, acronyms& symbols	
COVID-19	Coronairus Disease 2019
PPCI	Primary Percutaneous Coronary Intervention
STEMI	ST-segment elevation myocardial infarction
CAD	Coronary artery disease
CABG	Coronary artery bypass grafting
FMC	First medical contact
TIMI	Thrombolysis in myocardial infarction
MACE	Major adverse cardiovascular events
ACS	Acute coronary syndrome
PPE	Personal protective equipment
TVR	Target vessel revascularization
CIN	Contrast-induced nephropathy

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) was considered as a pandemic by WHO and caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [(1)], with a mortality rate of about 2% to 5% of all patients [(2)].

Nowadays the healthcare systems are facing high pressure in coping with the increased demand for medical resources, and not only the patients with chronic cardiac conditions are affected, but patients with acute conditions are also compromised during this pandemic.

ST-segment elevation myocardial infarction (STEMI) is one of the most life-threatening acute cardiovascular diseases with high mortality and morbidity worldwide. And need urgent care to restore patency of the infarct-related artery (IRA) for minimizing the major adverse cardiovascular events (MACE). The restoring patency can be done by reperfusion strategies either by fibrinolytic therapy or PPCI for patients with symptoms of ischemia of 12 hours duration and persistent ST-segment elevation [(3)].

It is well known that the increase in myocardial demand triggered by infection (type II myocardial infarction) or coagulopathy could increase the incidence of acute myocardial infarction among COVID-19 patients [(4)]. So MACE could be occurred by the effect of SARS-CoV-2 infection in the form of myocarditis, arrhythmias, acute coronary syndrome, and heart failure [(5)].

Previous studies have shown that ACS and major adverse cardiovascular events are increased during influenza seasons [(6)], or after acute infection and this may be related to increased inflammation that leads to destabilization of vulnerable coronary atherosclerotic plaques with a high incidence of acute myocardial infarction and this could be explained by increased wall stress and tachycardia, mainly due to hypoxemia [(7)].

Primary percutaneous coronary interventions are the preferred treatment over fibrinolytic therapy in the recommended guidelines for the treatment of ST-segment elevation myocardial infarction and are effective in opening the infarct- related artery [(8)].

But there is debate about the optimal reperfusion strategy for STEMI management during the COVID-19 pandemic. As guidelines in most countries during the COVID-19 pandemic era recommended the priority of fibrinolytic therapy use in treating patients with STEMI for restoring the coronary blood flow with lowering the rate of ischemic time with decreasing the incidence of adverse events [(9)].

PATIENTS AND METHODS

Patient population:

This prospective descriptive study was done between November 2020 to February 2021, a total of 73 consecutive patients who were presented to National Heart Institute (NHI) with the diagnosis of STEMI and divided into two groups, Group (1) positive COVID-19 patients, Group (2) negative COVID-19 patients and both groups had reperfusion therapy either by fibrinolysis or PPCI according to the recommended guidelines.

Primary PCI was done according to the existing STEMI management guidelines and Fibrinolysis (streptokinase) was given for patients presenting at the hospital ≤ 12 hours after symptom onset.

They were 57 males, 16 females. All patients underwent COVID-19 screening tests like complete blood count, chest computed tomography (CT) scan, and/or rapid test.

Diagnosis of STEMI was done by assessing the levels of cardiac biomarkers (preferred troponin I) with at least one of the following [(10)]:

a) Symptoms of ischemia.

b) ECG changes of new ischemia (ST elevation or LBBB).

c) Presence of pathological Q waves.

d) Non-invasive testing of new loss of viable myocardium.

The time from the FMC to ECG and STEMI diagnosis should be ≤ 10 minutes [(3)].

Exclusion criteria:

Patients with non-STEMI, unstable or stable angina, Patients with cardiogenic shock due to other causes rather than acute MI (Cardiomyopathy, Dysrhythmias, Cardiac tamponade, Severe valvular dysfunction, Acute pulmonary embolism, Tension pneumothorax, Papillary muscle rupture, and Ventricular septal rupture as mechanical complications to acute MI, Aortic dissection, Myocarditis, Endocarditis, Drug overdose, Cardiac or chest trauma) were all excluded.

Data analysis:

Data were collected after obtaining informed consent from the patients. Demographic characteristics of the patients, risk factors (smoking, dyslipidemia, diabetes mellitus, and hypertension). Daily blood sample results of all the patients on admission and thereafter were recorded. Information about the type of STEMI was obtained from records of the

electrocardiogram performed on admission. Left ventricular function (assessed by echocardiography).

Timing variables were computed, including pain-to-FMC, FMC-to-ECG, STEMI diagnosis, FMC-to-wire crossing time, and coronary angiography procedure details were recorded. Use of parenteral inotropic agents and glycoprotein [GP] IIb/IIIa inhibitors), procedural success (defined as achievement of coronary residual stenosis <30% with TIMI III flow), and in-hospital mortality and morbidity were also recorded.

Staff protection measures:

All health care providers should take all the precautions of dealing with the patients with using effective personal protective equipment (PPE) which includes a disposable surgical cap, N95 mask, disposable isolation gown, protection suit, protective eyewear, full face shield, double medical gloves, disposable shoe covers, and rapid hand disinfection solution.

Disinfection of all pieces of equipment in the catheterization laboratory was done between each procedure to reduce the rate of SARS-CoV-2 transmission.

In-hospital management:

All patients received aspirin (300 mg loading then 150 mg daily), Un-fractionated heparin (UFH) (70 IU/ kg) & clopidogrel (600mg as a loading dose and 75mg once daily as a maintenance dose) in addition to conventional treatment (Beta-blocker, ACEI, and statin). Vasopressors were used to set a systolic blood pressure >90mmHg and were mentioned.

Fibrinolytic therapy:

Fibrinolysis therapy was given in the emergency department using streptokinase after excluding contraindications and informed consent was obtained. streptokinase was administered as follow: (Intravenous infusion 1,500,000 IU in 50 ml of 0.9% Normal Saline over 60 min) in combination with unfractionated heparin (bolus 60 U/kg to ≤ 4000 U followed by 12 U/kg/h to ≤1000 U/h for approximately 48 h with a target aPTT 60–80s), Resting ECG was done serially every 30 min after the start of fibrinolysis. Patients were referred for rescue PCI if fibrinolysis failed which was defined with persistent ST-segment elevation (<50% ST-segment resolution at 90 min after the start of streptokinase), and hemodynamic instability, Otherwise, medical treatment was continued and routine coronary angiography was performed electively later.

Coronary angiography, primary angioplasty, and stent implantation:

All patients received a loading dose of clopidogrel 600 and aspirin 300 mg before the procedure. Angiographic data were assessed. Coronary angiography and PPCI were performed through the femoral artery. A bolus of heparin (80-100 IU/kg) was administered intravenously to all patients after femoral artery puncture. Flow in the IRA was evaluated according to the TIMI classification. The use of glycoprotein IIb/IIIa inhibitor, parenteral inotropes was at the discretion of the operators. A thrombus aspiration catheter was utilized as indicated in case of the presence of a heavy thrombus burden.

All of the patients were sent to the designated infectious ward for further follow-up and –ve COVID-19 patients were transferred to Coronary Intensive Care Unit following primary PCI with follow-up by evaluating clinical symptoms and signs, doing serial ECGs, measuring serial cardiac enzymes (CK-MB, troponin I).

Clinical follow up of MACE:-

a) Cardiovascular mortality: - defined as unexpected sudden death or death related to acute MI, heart failure, or arrhythmia.

b) Morbidity:-

- Hospital re-admission as for (major arrhythmias, heart failure or others).
- Re-infarction was considered by the following:
  - ST-elevation ≥0.1 mv or new pathognomonic Q waves appeared, in at least two contiguous leads, with a renewed increase in cardiac enzymes particularly when associated with ischemic symptoms for ≥ 20 min. An immediate measurement of cTn and a second sample should be obtained 3–6 h later with ≥20% increase of the cTn value in the second sample.
  - CK-MB (or CK, if MB is not available) > 3 times the upper limit of normal and ≥ 50 % greater than the previous value [(11)].
- TVR (target vessel revascularization):-
  Defined as repeated PCI or CABG due to stenosis or occlusion in the IRA.
- Bleeding was assessed according to TIMI scale of bleeding into Major, Moderate, or Minor [(12)].
- Contrast-induced nephropathy:

Contrast-induced nephropathy (CIN) is defined as renal function by 25% increase in serum creatinine from baseline or 0.5 mg/dL (44 μmol/L) increase in absolute value, within 48-72 hours of intravenous contrast media administration [13].

STATISTICAL ANALYSIS:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- A one-way analysis of variance (ANOVA) when comparing between more than two means.
- Post Hoc test: Least Significant Difference (LSD) was used for multiple comparisons between different variables.
- Independent-samples t-test of significance was used when comparing between two means.
- Chi-square (x^2) test of significance was used to compare proportions between qualitative parameters.
- Binary logistic regression: was used to predict the outcome of the categorical variables based on one or more predictor variables.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the P-value was considered significant if $\leq$0.05, P-value $\leq$0.001 was considered highly significant and P-value >0.05 was considered insignificant.

Results

Regarding Baseline characteristics of patients, the mean age (SD) of enrolled patients was 57.58 (12.46) years, there was a high prevalence of risk factors (Dyslipidemia, Diabetes mellitus, Hypertension, +ve family history for CAD, prior CAD, and prior CABG) among +ve Covid-19 patients who received PPCI but with no statistically significant difference among groups according to baseline characteristics of patients.

Also, Pain-to-FMC time increased among +ve Covid-19 patients who received reperfusion therapy either by fibrinolysis or PPCI (5.64±4.39 hrs. and 5.79±4.26 respectively) as shown in

table (1) and this may be attributed to the fear of patient from entering the hospitals during the Covid-19 pandemic era.

Table (1): Comparison between groups according to baseline characteristics of patients

Baseline characteristics of patients	Positive Covid-19 Patients.		Negative Covid-19 patients had PPCI *(n=36)*	Test	p-value
	Fibrinolysis *(n=19)*	PPCI *(n=18)*			
Demographic data:					
Age (years)	58.79±11.42	59.02±13.94	54.94±12.03	F=0.937	0.397
Sex [Male/Female]	16/3	14/4	27/9	x2=0.618	0.734
Cardiovascular risk factors:					
Smoking	8 (42.1%)	11 (61.1%)	23 (63.9%)	x2=2.541	0.281
Dyslipidemia	6 (31.6%)	9 (50.0%)	12 (33.3%)	x2=1.752	0.416
DM	12 (63.2%)	14 (77.8%)	26 (72.2%)	x2=0.998	0.607
HTN	13 (68.4%)	15 (83.3%)	19 (52.8%)	x2=5.068	0.079
Positive FH for CAD	4 (21.1%)	7 (38.9%)	6 (16.7%)	x2=3.389	0.184
Prior CAD	2 (10.5%)	5 (27.8%)	8 (22.2%)	x2=1.807	0.405
Prior PCI	4 (21.1%)	9 (50.0%)	15 (41.7%)	x2=3.605	0.165
Prior CABG	1 (5.3%)	2 (11.1%)	2 (5.6%)	x2=0.682	0.711
Clinical characteristics					
Basal HR (b/min)	82.36±21.62	86.91±20.51	83.21±15.63	F=0.327	0.722
Systolic BP (mmHg)	129.52±24.90	122.61±24.78	124.84±19.94	F=0.466	0.629
Diastolic BP (mmHg)	80.84±13.64	79.46±16.22	78.96±10.84	F=0.130	0.878
Pain-to-FMC time (hrs.)	5.64±4.39	5.79±4.26	3.86±2.21	F=2.662	0.077
FMC to needle time (min)	76.79±31.90	--	--		
Type of STEMI					
Anterior	9 (47.4%)	11 (61.1%)	14 (38.9%)	x2=2.388	0.303
Anterior + inferior	2 (10.5%)	1 (5.6%)	5 (13.9%)	x2=0.859	0.651
Inferior	4 (21.1%)	5 (27.8%)	10 (27.8%)	x2=0.330	0.848
Others	4 (21.1%)	1 (5.6%)	6 (16.7%)	x2=1.876	0.391
Echocardiographic findings					
LVEF% on admission	47.32±7.42	43.82±6.94	43.37±7.62	F=1.871	0.162
LV EDD	49.46±5.04	48.61±7.84	45.79±6.87	F=2.221	0.116

Using: F-One Way Analysis of Variance; x^2: Chi-square test
P-value>0.05 NS

Table (2): Comparison between positive Covid-19 Patients who received Fibrinolysis and PPCI according to In-hospital outcome

In hospital outcome	Positive Covid-19 Patients.		Chi-square test	p-value
	Fibrinolysis *(n=19)*	PPCI *(n=18)*		
In hospital mortality	3 (15.8%)	2 (11.1%)	0.170	0.680
Morbidity				
Re-infarction	3 (15.8%)	2 (11.1%)	0.170	0.680
Re-admission	2 (10.5%)	1 (5.6%)	0.290	0.591
TVR	2 (10.5%)	1 (5.6%)	0.290	0.591
CIN	0 (0.0%)	3 (16.7%)	3.360	0.067
Bleeding (major)	0 (0.0%)	1 (5.6%)	1.064	0.302
Discharge time (days)				
3 days	3 (15.8%)	6 (33.3%)	1.497	0.221
4 days	7 (36.8%)	5 (27.8%)	0.332	0.564
≥5 days	9 (47.4%)	7 (38.9%)	0.265	0.607
Mean±SD	4.79±1.29	4.44±1.20	t=0.853	0.399

Using: x^2: Chi-square test; t-Independent Sample t-test
P-value>0.05 NS

Positive Covid-19 Patients who received fibrinolysis shows an increase in mortality rate (3 out of 19 patients) and morbidity as Re-infarction (3 out of 19 patients), hospital re-admission (2 out of 19 patients), and TVR (2 out of 19 patients) but with no statistically significant difference between positive Covid-19 Patients received Fibrinolysis and those had PPCI.

CIN occurred in 3 out of 18 +ve Covid-19 Patients who had PPCI and major bleeding occurred in one patient in the same previous group. The discharge time was high in +ve Covid-19 Patients who received Fibrinolysis but there is no statistically significant difference between +ve Covid-19 Patients who received Fibrinolysis and those who had PPCI according to their in-hospital outcome regarding in-hospital mortality, morbidity, discharge time as shown in table (2).

Mortality rate increased in +ve Covid-19 patients who had PPCI (2 out of 18 patients) but with no statistically significant difference among patients who had PPCI either was +ve covid-19 or – ve covid-19.

There is a high prevalence of re-infarction (2 patients), hospital re-admission (one patient), CIN (3 patients), and one patient had major bleeding in +ve Covid-19 patients who PPCI but with no statistically significant difference between both groups.

The discharge time was high in positive Covid-19 Patients who had PPCI (Mean±SD was 4.44±1.20) with no significant difference statistically between both groups (P-value =0.15) as shown in table (3).

Table (3): Comparison between groups according to +ve Covid-19 and -ve Covid-19 who had PPCI according to in hospital outcome

In hospital outcome	+ve Covid-19 patients had PPCI *(n=18)*	-ve Covid-19 patients had PPCI *(n=36)*	Chi-square test	p-value
In hospital mortality	2 (11.1%)	2 (5.6%)	0.518	0.472
Morbidity				
Re-infarction	2 (11.1%)	2 (5.6%)	0.518	0.472
Re-admission	1 (5.6%)	1 (2.8%)	0.257	0.612
TVR	1 (5.6%)	2 (5.6%)	0.000	1.000
CIN	3 (16.7%)	2 (5.6%)	1.720	0.189
Bleeding (major)	1 (5.6%)	1 (2.8%)	0.257	0.612
Discharge time (days)				
3 days	6 (33.3%)	17 (47.2%)	0.931	0.335
4 days	5 (27.8%)	11 (30.6%)	0.004	0.833
≥5 days	7 (38.9%)	8 (22.2%)	1.638	0.201
Mean±SD	4.44±1.20	3.97±1.07	t=1.461	0.150

Using: x^2: Chi-square test; t-Independent Sample t-test; p-value>0.05 NS

According to PCI procedure characteristics, the FMC-to-wire crossing time and Pain-to-FMC time were high in +ve Covid-19 patients who had PPCI with statistically significant difference between both groups of patients who had PPCI (P-value <0.001).

Also, TIMI flow before PCI was low in +ve Covid-19 patients who had PPCI with a statistically significant difference between both groups of patients who had PPCI (P-value *<0.05)* and TIMI flow after PCI was high in -ve Covid-19 patients who had PPCI with no statistically significant difference between both groups as shown in table (4) and fig.(1,2,3).

Table (4): Comparison between groups according to +ve Covid-19 had PPCI and -ve Covid-19 had PPCI according to PCI procedure characteristics

PCI procedure characteristics	+ve Covid-19 had PPCI *(n=18)*	-ve Covid-19 had PPCI *(n=36)*	Test	p-value
FMC-to-wire crossing time (min)	171.00±29.64	109.17±26.82	t=7.721	<0.001**
Pain-to-FMC time (hrs.)	6.32±2.31	2.87±1.29	t=7.061	<0.001**
Tirofiban use	11 (61.1%)	16 (44.4%)	x2=1.314	0.252
Culprit vessel				
LAD	12 (66.7%)	19 (52.8%)	x2=0.931	0.335
LCX	2 (11.1%)	11 (30.6%)	x2=2.448	0.118
RCA	5 (27.8%)	10 (27.8%)	x2=0.000	1.000
Total revascularization	2 (11.1%)	3 (8.3%)	x2=0.110	0.740
TIMI flow before PCI				
Grade 0	13 (72.2%)	11 (30.6%)	x2=8.254	0.004*
Grade I	5 (27.8%)	25 (69.4%)	x2=8.254	0.004*
TIMI flow after PCI				
Grade I	3 (16.7%)	2 (5.6%)	x2=1.720	0.189
Grade II	11 (61.1%)	16 (44.4%)	x2=1.314	0.252
Grade III	4 (22.2%)	18 (50.0%)	x2=3.770	0.052
Procedure success	17 (94.4%)	33 (91.7%)	x2=0.125	0.723
PCI duration (min)	82.50±10.61	85.34±17.68	t=0.626	0.534
Contrast volume (ml)	199.50±65.76	221.50±33.23	t=1.641	0.107

Using: x^2: Chi-square test; t-Independent Sample t-test;
*P-value>0.05 NS; *p-value <0.05 S; **p-value <0.001 HS*

DISCUSSION

It is well known now that the COVID-19 pandemic affected the health system and the care of the chronic, non-emergent diseases were affected based on the international recommendation, including elective coronary angiography, but patients with acute coronary syndrome need more attention as of high mortality rate and morbidities if not treated inappropriate time, and we tried to find the best protocol of reperfusion strategy to minimize the mortality rate and incidence of morbidities during COVID-19 pandemic, and also the way that keeps the health care providers from infection with SAR-CoV2, it was noticeable that there was a delay in transforming the patients to catheter laboratory for reasons that will be discussed later. So we had to find a suitable reperfusion strategy that achieves early coronary revascularization.

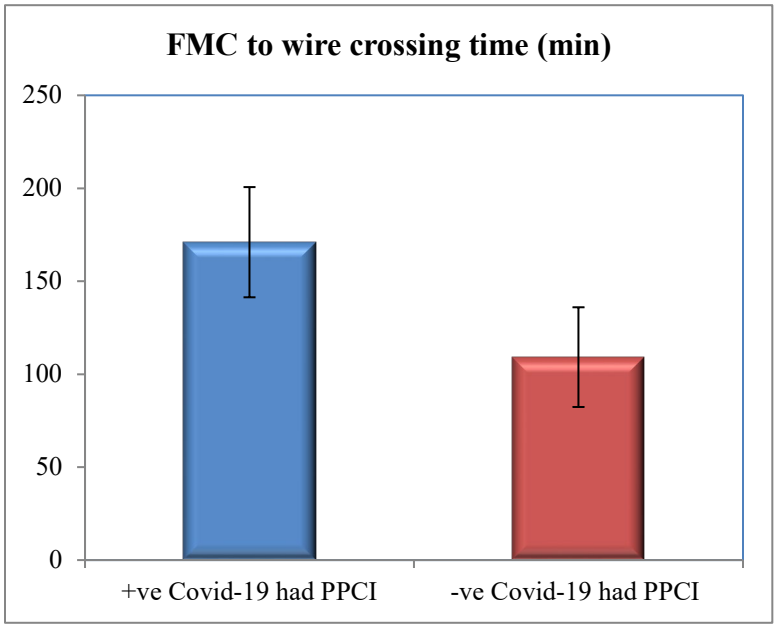

Fig. (1): Bar chart between +ve Covid-19 patients had PPCI and -ve Covid-19 patients had PPCI regarding FMC-to-wire crossing time (min).

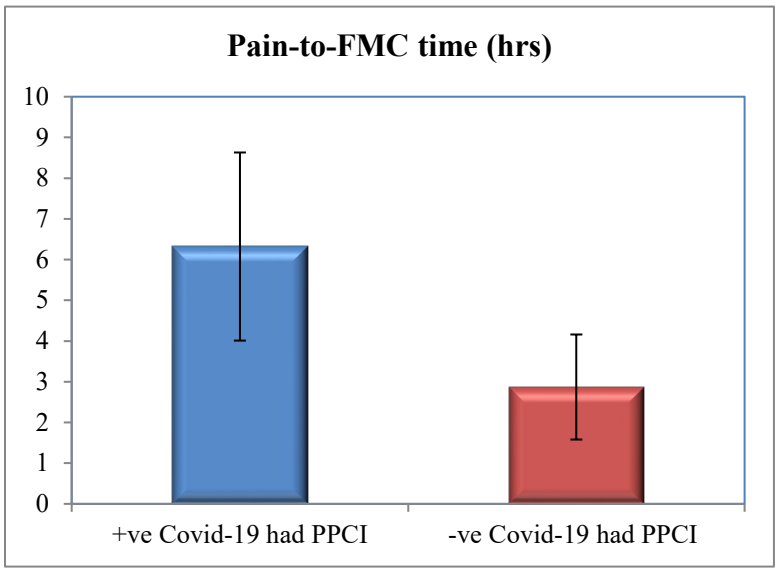

Fig. (2): Bar chart between to +ve Covid-19 patients had PPCI and -ve Covid-19 patients had PPCI regarding pain-to-FMC time (hrs.).

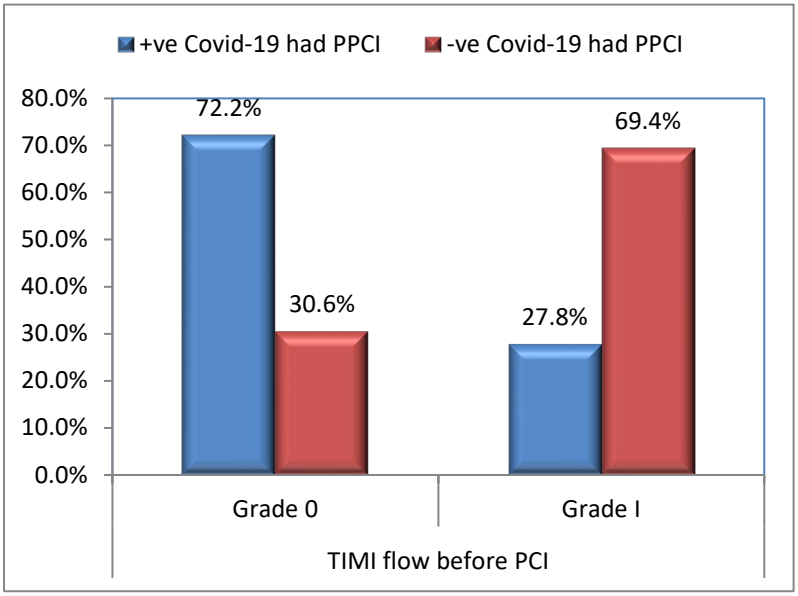

Fig. (3): Bar chart between +ve Covid-19 patients had PPCI and -ve Covid-19 patients had PPCI according to TIMI flow before PCI.

Table (5): Multivariate analysis of SAR-COV2 as a predictor for different PPCI outcomes

Factors	Regression	Sig.	Odds ratio		
			OR	Lower	Upper
FMC-to-wire crossing time (min)	-0.676	<0.001**	1.907	0.686	3.508
Pain-to-FMC time (hrs.)	-0.526	0.019*	2.027	0.730	3.729
TIMI flow before PCI	-0.334	0.032*	2.207	0.794	4.060

This table shows that FMC-to-wire crossing time (P-value <0.001), Pain-to-FMC time, and TIMI flow before PCI (P-value <*0.05*) were significant predictors for different PPCI outcomes.

Our study assessed 73 STEMI patient either had covid-19 or not and had a reperfusion strategy (fibrinolysis or PPCI according to the recommended guidelines. Their mean age (SD) was 57.58 (12.46) years, 57 patients (78.1%) were men, 42 patients (57.5%) were smokers, 52 patients (71.2%) had DM, 27 patients (37%) had dyslipidemia, 47 patients (64.4%) were hypertensive, and 17 patients (23.3%) had +ve family history of CAD.

In our study we performed a prospective analysis of STEMI patients who received reperfusion therapy at National Heart Institute and it is one of the biggest hospitals that received STEMI cases for reperfusion therapy, and we noticed a decrease in volume of those patients as this may be attributed to the curfew decision was taken with a stay at home with less unnecessary social activities and healthy lifestyle, all of these lead to decrease stress, and also fear of patients from going to hospitals lead to decreasing of STEMI patients volume at hospitals during COVID-19 pandemic era, And these findings coincide with other previous studies who showed also decrease in some STEMI patients admitted to their hospitals **(14, 15, 16)**.

The Pain-to-FMC time increased among Positive Covid-19 patients who received reperfusion therapy (5.64±4.39 hrs in Positive Covid-19 Patients who received fibrinolysis and 5.79±4.26 hrs in Positive Covid-19 Patients who had PPCI), And our results are close to those of Dingcheng X et al., (2020) who showed that the mean of Pain-to-FMC time during the COVID-19 outbreak period was 6.75h and this may be attributed to the fear of patients from hospital admission during the COVID-19 pandemic (15).

Also, our findings agreed with Grégoire R et al., (2020) Who found that the "symptom onset-FMC" delay in patients who presented directly to the ED was significantly longer in the lockdown group (450 minutes vs 238 minutes; P=0.04) **(14)**.

Our data showed that Positive Covid-19 Patients who received fibrinolysis had an increase in mortality rate (3 out of 19 patients) and morbidity as Re-infarction (3 out of 19 patients), hospital Re-admission (2 out of 19 patients), and TVR (2 out of 19 patients) but with no statistically significant difference between positive Covid-19 Patients received Fibrinolysis and those had PPCI. Also, we found that mortality rate increased in +ve Covid-19 patients who had PPCI (2 out of 18 patients) but with no statistically significant difference among patients who had PPCI either +ve covid-19 or –ve covid-19 regarding the in-hospital outcome.

So the benefits of PPCI was decreased due to the time delay before catheter laboratory compared to fibrinolytic which could be done in a suitable time. And these findings coincide

with Grégoire R et al., (2020) who found that the rate of in-hospital composite outcomes was higher in the lockdown group (7.7%, P = 0.06) and the mortality rate was high (8.2%, P = 0.1) but with no statistically significant difference comparing with the pre-lockdown group [14].

Also, we agreed with Dingcheng X et al., (2020) who showed that the rate of in-hospital mortality and hospital re-admission increased from 4.6% to 7.3% at the COVID-19 outbreak period [15].

Regarding PCI procedure characteristics, we found that TIMI flow before PCI was significantly low in +ve Covid-19 patients who had PPCI (P-value <0.05).

Also, our data showed that the discharge time was high in +ve Covid-19 Patients who received Fibrinolysis but there is no statistically significant difference among +ve Covid-19 Patients who received Fibrinolysis and those who had PPCI according to their in-hospital outcome. Also, the discharge time was high in positive Covid-19 Patients who had PPCI (Mean±SD was 4.44±1.20) comparing with -ve Covid-19 patients who had PPCI (Mean±SD was 3.97±1.07). this may be explained by the adverse effects of infection with SAR-CO….on the heart with increasing incidence of MACE. And these findings are close to those of Wen-XL et al., (2021) Who assessed 164 acute STEMI patients with age (Mean±SD 63.13 ± 13.26) and the hospital stay of STEMI patients was longer in the covid-19 pandemic era (mean± SD 13.0 ± 8.8) with an increase in the incidence of adverse events in patients in covid-19 pandemic [17].

Our results showed that the FMC to wire crossing time and Pain to FMC time were significantly high in +ve Covid-19 patients who had PPCI (P-value <0.001) And this was agreed with Oriol R, et al., (2020) who found that STEMI +ve COVID-19 patients treated with PPCI during the COVID-19 pandemic had a longer ischemic time before restoring coronary blood flow at the catheter laboratory, and this is maybe related to The curfew decision that was applied and the system delay in PPCI as many steps should be done before PCI procedure like taking history and the investigation needed to diagnose infection with SAR-CoV2 and also the time needed to use PPE before dealing with the patients **[16,18]**.

So we found FMC to wire crossing time, Pain to FMC time, and TIMI flow before PCI have a significant predictor for different PPCI outcome.

CONCLUSION

We conducted an observational study to assess the value of Fibrinolysis versus Primary Percutaneous Coronary Intervention in Covid-19 Patients Admitted with ST-Elevation Myocardial Infarction

73 patients presented with acute STEMI and divided into two groups, Group (1) positive COVID-19 patients, Group (2) negative COVID-19 patients, and both groups had reperfusion therapy either by fibrinolysis or PPCI according to the recommended guidelines.

There is a high prevalence of risk factors (Dyslipidemia, Diabetes mellitus, Hypertension, +ve family history for CAD, prior CAD, and prior CABG) among Positive Covid-19 patients who received PPCI but with no statistically significant difference comparing with other groups according to baseline characteristics of patients.

The Pain-to-FMC time increased among Positive Covid-19 patients who received reperfusion therapy either by fibrinolysis or PPCI and this may be attributed to the fear of patients from hospital admission during this pandemic.

The mortality rate was high in Positive Covid-19 Patients who had reperfusion therapy (3 out of 19 patients who received fibrinolysis) and (2 out of 18 patients who had PPCI) and morbidities had an increase but with no statistically significant difference with –ve Covid-19 Patients who had reperfusion therapy either by Fibrinolysis or PPCI, also the discharge time was high in positive Covid-19 Patients with no statistically significant difference comparing with –ve Covid-19 Patients.

Regarding PCI procedure characteristics, FMC-to-wire crossing time (P-value <0.001), Pain-to-FMC time (P-value <0.05), and TIMI flow before PCI (P-value <0.05) have a significant predictor for different PPCI outcome.

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