

IMPACT OF THROMBOLYSIS & RESCUE PCI STRATEGY IN ACS PATIENTS DURING COVID PANDEMIC

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Abstract

Background: Coronavirus Disease 2019 (COVID-19) characterizes as a severe acute respiratory syndrome due to coronavirus-2 (SARS-CoV-2) first emerged in Wuhan, China in December 2019 , and subsequently spread rapidly worldwide.

Methods: This retrospective study was based on a single Tertiary care hospital registry of ACS in Coimbatore Medical College & Hospital . The study protocol was approved by the Institutional Ethical Committee . Informed consent from patients was not necessary given the registered nature of the study, nonetheless all patient records/information were anonymous prior to analysis.

Conclusion: The worst outcomes did not differ in occurrence between the COVID & pre – COVID group, which suggested that the newly adopted thrombolysis with or without rescue PCI strategy which emphasized nearby treatment.

Keywords: pci, sars-cov-2, diabetes mellitus, myocardial infarction.

Introduction

Coronavirus Disease 2019 (COVID-19) characterizes as a severe acute respiratory syndrome due to coronavirus-2 (SARS-CoV-2) first emerged in Wuhan, China in December 2019 , and subsequently spread rapidly worldwide. Several reports across India and other countries have demonstrated a substantial drop in the number of patients attending emergency departments with acute coronary syndromes (ACS), and concurrent increases in ACS mortality and complications during the COVID-19 pandemic. In addition to the reluctance to seek medical attention by patients out of fear of contracting COVID-19, other potential explanations for the lower rate of STEMI activations during the pandemic include a shift to pharmacologic reperfusion to minimize operator exposure, changes in standard of care, including personal protective equipment, emergency medical services (EMSs), rapid testing and hospital beds, and a shift in resources to care for COVID-19 patients. Several studies across the world

shows reductions in cardiac catheterization activations during this period[4,9,17,18] . It is unlikely that the reduction in STEMI represents reduced incidence related to less physical and work-related stress owing to strict lockdown. The increased numbers of cardiac arrests and late complications of STEMI would suggest lack of optimal care for ACS during COVID-19 pandemic. The cornerstone of therapy for ST-segment–elevation myocardial infarction (STEMI) is to achieve early, complete epicardial, and microvascular reperfusion to minimize infarct size. European and US guidelines currently recommend primary percutaneous coronary intervention (pPCI) as the preferred reperfusion method. Notably, the strategy of reperfusion is determined according to the ischemia duration and medical resources, especially during the COVID-19 pandemic. Mechanical reperfusion with pPCI should be performed by an experienced team, including not only interventional cardiologists but also skilled support staff. However, as the pandemic of COVID-19 seriously overwhelmed the clinical workforce and medical supplies, the delivery of pPCI for patients with STEMI presented numerous challenges. The optimal therapeutic approach for STEMI care during the COVID-19 pandemic was a question of debate. Cardiovascular societies in different countries have come out with guidelines in regard. In a study in China by nan wang et al [1] , fibrinolytic therapy is recommended as the primary therapeutic option for treating patients with STEMI although globally, the prevailing preference remains continuing a pPCI approach. In a study by Pedro Engel Gonzalez et al [14] , Pharmacoinvasive strategy after thrombolysis was protocol followed to improve outcomes and ACS care during pandemic . Till now , there is no available evidence regarding the management of reperfusion strategies in the face of an ongoing infectious disease pandemic. In this retrospective analysis, we aimed to compare the outcomes of two separate groups, patients who underwent fibrinolysis and a pPCI strategy during pre – COVID and during the COVID-19 pandemic waves respectively , to investigate the optimized reperfusion strategy in STEMI care during pandemic . Also there is an need to evaluate whether the newly adopted management strategies has any effect on clinical outcomes.

Material and Method

This retrospective study was based on a single Tertiary care hospital registry of ACS in Coimbatore Medical College & Hospital . The study protocol was approved by the Institutional Ethical Committee . Informed consent from patients was not necessary given the registered nature of the study, nonetheless all patient records/information were anonymous prior to analysis.

Patients

The analytical cohort for this study consisted of adults (aged ≥ 18 years old) admitted to our Hospital data records. To compare the trends before and during the COVID-19 pandemic waves , patients admitted between March to August 2020 & 2021 were defined as the ‘COVID-19’ 1st wave and 2nd wave period group respectively , whereas a comparative group of patients hospitalised during the same period (march to august 2019) were grouped as the ‘pre-COVID-19’ group. As further investigation was required to evaluate whether the newly adopted management strategies improved the clinical outcomes in patients with ACS, patients without an established diagnosis of STE- ACS like NSTEMI – ACS & Unstable angina cases from our Hospital were excluded. Patients positive for COVID-19 were also excluded.

Management

All patients diagnosed with STE- ACS, with clinical symptoms & ECG criteria dual antiplatelet (aspirin of 300 mg and clopidogrel of 600 mg with loading dose) treatment was

given according to standard guidelines, unless the risk of bleeding was high. If within reperfusion time, and no contraindications for thrombolysis, the patients suspected or diagnosed with positive COVID were isolated and began thrombolytic therapy immediately. The outcomes of thrombolysis and the plan for elective angiogram/ PCI were reassessed afterwards. All patients symptomatic or asymptomatic were screened for COVID – 19 with COVID – 19 RT- PCR test and CT chest was subsequently taken. Patients whose clinical symptoms didn't improve after thrombolysis or ECG showing persistent ST elevation & < 50% of resolution of ST elevation – Failed lysis subsets of patients were subsequently taken for coronary interventions. All baseline characteristics including age / sex / risk factors , prior CVD events like MI, stroke was collected .

Results

1. unchanged admission trends during covid pandemic (table 2, graph 1)

Between March to August 2019 (Pre- COVID) , total number of admissions for Acute coronary syndrome was 667, during the same time frame in 2020 (First COVID wave) total admissions were 542 , between march to august 2021 total admissions were 545 . p value based on proportions was found to be 0.612 (NON SIGNIFICANT). This shows there is no decline in admission rates for ACS during covid pandemic period.

2. the baseline characteristics of the acs patients within the study (table 1)

The baseline characteristics of the ACS patients are presented in Table 1. There were no significant differences relating to age (p = 0.789), gender (p= 0.176), BMI p= 0.652), blood pressure, history of smoking(0.922), prevalence of hypertension (p= 0.284), diabetic mellitus (p=0.735), previous MI/ previous (PCI=0.465), cerebrovascular disease between the three groups (Table 1). Non significant baseline characteristics trends were noted between the three groups with predominance of male gender with smoking history .

3. covid positivity rates covid pandemic in acs patients.(table-3, Graph -2)

Out of 542 patients admitted for ACS during 2021 (First COVID wave) , 58 patients were positive for COVID ,with predominant of those were asymptomatic detected with COVID RT- PCR test, with positivity rates upto 10.70 % . During 2021 (second wave) , out of 545 patients admitted for ACS 137 patients were positive for COVID with majority of them were symptomatic, detected through CT chest (CORADS score)-78 .COVID positivity rates during 2021 was significantly higher than in 2020 (25.2%) COVID positivity rate was significantly higher during second pandemic wave (p < 0.05).

4. decline in angiographic rates during pandemic (table4/ graph -3,3a)

As the COVID pandemic has deleterious impact on health care system , shortage of manpower and resources , most of patients admitted during pandemic with ACS were thrombolysed with Fibrinolytic agents , followed by rescue / pharmacoinvasive PCI for fibrinolysis failed patients. Hence there was abrupt decline in angiographic rates . During 2019 , out of 667 patients 590(88.45)undergone angiography , most of them were taken up for PRIMARY PCI (223) . As our hospital is tertiary referral centre 335 were taken for pharmacoinvasive strategy as they were thrombolysed elsewhere during pre COVID (2019) period. There was abrupt decline in angiographic rates during first COVID wave -35.23% & 19.44% during second COVID wave. The decline in angiographic rates were significant as p<0.001 , found by applying Kruskal wallis test. Almost >90% cases undergone PCI during pandemic were those who had failed Thrombolysis and hence managed with RESCUE PCI (2020 – 181, 2021 – 102).

5. **impact of management strategies on mortality & outcomes of acs during covid pandemic.** (table 5, graph-4)

Death rates noted during pandemic waves were 4.79% (2020), 6.60% (2021) as compared to 4.76% during pre COVID control group . Also the death rates in ACS during study period by following thrombolysis and rescue PCI strategy were not statistically significant as p value - 0.297 by applying Kruskal wallis test.

BASELINE CHARACTERISTICS

Table 1:

BASELINE CHARACTERISTICS		2019	2020	2021	P VALUE
AGE IN YEARS		57±13.1	56±13.5	52±14.5	0.789
GENDER	MALE	561	445	436	0.176
	FEMALE	106	97	109	
BMI		24.5±3.2	26±3.5	26±3.1	0.652
SHT	PRESENT	336	291	298	0.284
	ABSENT	331	251	247	
T2DM	PRESENT	141	123	114	0.735
	ABSENT	526	419	431	
SMOKING	PRESENT	440	362	358	0.922
	ABSENT	227	180	187	
PRIOR HISTORY OF MI	PRESENT	31	19	27	0.465
	ABSENT	636	523	518	

ADMISSION TRENDS

Table 2:

ADMISSIONS	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	TOTAL
2019	118	112	106	89	112	130	667
2020	104	61	101	100	92	84	542
2021	122	105	77	73	98	70	545

P VALUE – BASED ON PROPORTIONS – 0.612, NON SIGNIFICAN COVID POSITIVITY

Table 3:

	2020	2021
RT - PCR	44	59
CT CHEST CORADS	14	78
BOTH	4	12
TOTAL	58	137
TOTAL ADMISSIONS	542	545
POSITIVITY RATE	10.70%	25%

ANGIOGRAPHIC RATES

Table 4:

ANGIOGRAPHY	2019	2020	2021
PCCI	223	6	4
PIT/ RESCUE PCI	335	181	102

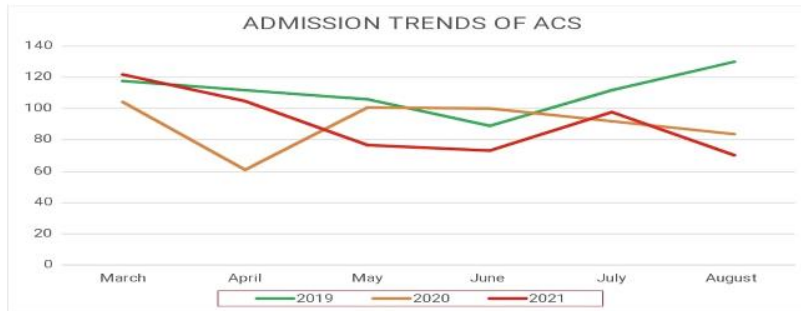
COMPLEX/ ELECTIVE PCI	32	4	0
ANGIOGRAPHIC RATES	88.45	35.23	19.44

ANGIOGRAPHY	YEAR 2019	YEAR 2020	YEAR 2021
DONE	590	191	106
NOT DONE	77	351	439
KRUSKAL WALLIS TEST			
P VALUE -0.001			
SIGNIFICANT			
MORTALITY RATES			

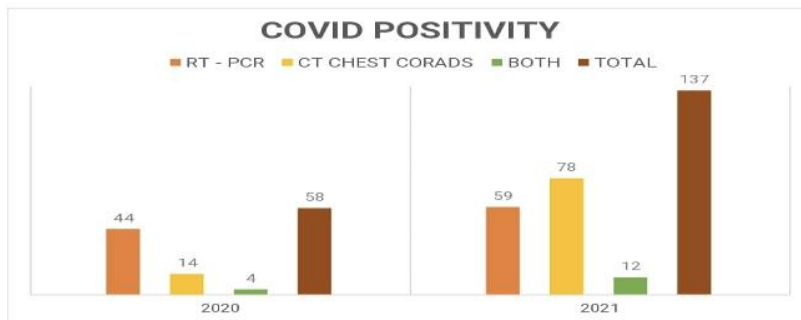
Table 5:

DEATH	2019	2020	2021
RATE	4.79%	4.79%	6.60%
CARDIOGENIC SHOCK	25	19	29
VT/VF	5	7	6
PROCEDURE RELATED	2	0	1

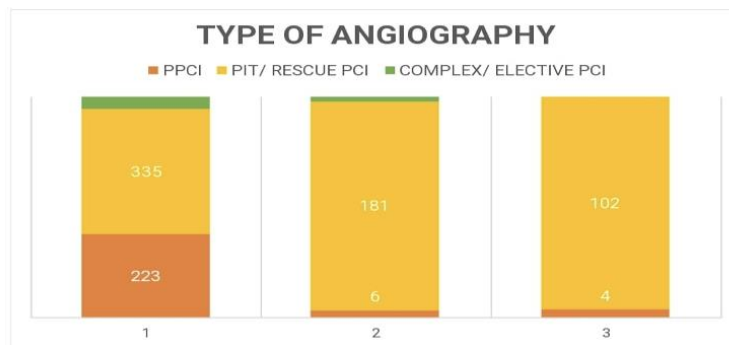
DEATH	YEAR 2019	YEAR 2020	YEAR 2021
YES	32	26	36
NO	635	516	509
KRUSKAL WALLIS TEST			
P VALUE -0.297			
NON SIGNIFICANT			



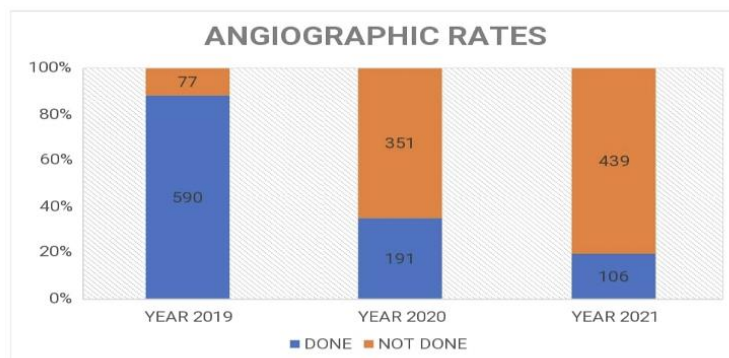
Graph -1

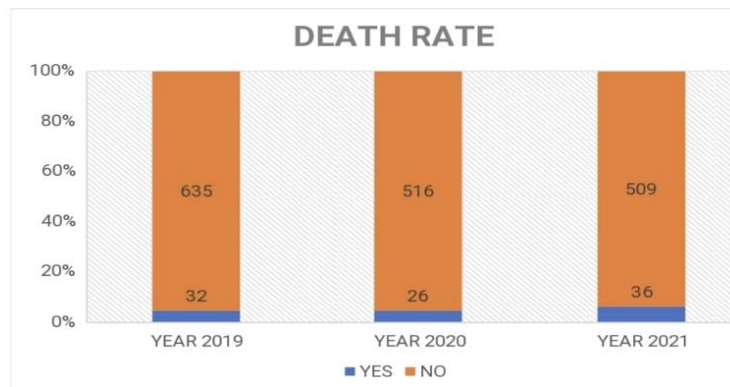


Graph-2



Graph -3





Graph- 4

Discussion

Our study shows a nondecreasing trend in ACS admission during pandemic period, while data from other studies [1,3] across various countries shows decreasing trend in ACS during pandemic. Decline in angiographic rates and cath lab activation was significantly lower during pandemic period, which is consistent across various studies in different parts of the world [4,7]. According to the Sichuan Provincial People's Hospital proposed recommendations in China and following Peking Union Medical College Hospital recommendations, thrombolytic therapy was recommended over primary PCI if Covid-19 was confirmed or could not be excluded within a short time[1]. Our study showed that a greater proportion of ACS patients received immediate thrombolysis during the pandemic. Undoubtedly, thrombolytic therapy should not be the standard of care strategy[8,13]. However potential factors like lack of skilled manpower, inadequate resources, infectivity risk, PCI could not be done for ACS patients during pandemic period [4,9,17,18]. Hence thrombolysis might be the best compromise for prompt reperfusion for the patient. Moreover, a recent systematic review found that the administration of thrombolytic drugs, followed by immediate transfer to a PCI-capable hospital significantly decreased short-term mortality [2,14]. Our study shows non inferiority in mortality rates by following Thrombolysis → RESCUE PCI strategy for ACS patients during the pandemic study period.

Several limitations must be considered in this study, such as future studies with larger sample sizes, and longer follow-up periods. Since this study had a retrospective design, there might be some bias and heterogeneity between the two groups. The sample size was relatively small and some important factors were not included, it may now represent the power needed to detect the potential related risk factors, more studies on the more important risk factors for the outcomes are therefore needed in the future. Finally, the long-term follow-up outcomes conducted were limited. Future research should investigate the long-term effect of the pandemic on the outcomes in ACS patients.

Conclusions

The worst outcomes did not differ in occurrence between the COVID & pre – COVID group, which suggested that the newly adopted thrombolysis with or without rescue PCI strategy which emphasized nearby treatment, safety, protection improved the clinical outcomes and provided optimal care for ACS patients during the early stage of COVID-19 pandemic

Statistical analysis

All of the statistical analyses were performed using SPSS19.0 (SPSS Inc., Chicago, USA). Between-group comparisons were done using the Student's t test for continuous variables and Pearson's chi-square test or Fisher's exact test for categorical variables. Univariable and multivariable logistic regression analysis was performed in order to identify independent factors associated with adverse outcomes. Hazard ratio (HR) with 95% confidence intervals (95% CIs) were calculated. We examined the effect of the newly adopted strategy on adverse outcomes by adjusting for traditional confounders. The multivariable logistic regression model included variables such as time to worsen symptoms prior to entry, route of presentation (transfer hospital or direct) during the COVID-19 outbreak, as well as traditional factors in ACS patients. As such, the following important covariates were included: age, gender, time to worsen symptoms prior to entry, previous MI, proportion of FMC within 2h, Group (COVID-19 /pre-COVID-19), proportion of door to balloon time within 90 min and route of presentation (transfer or direct), which had a p value < 0.2 when univariate analysis first. A two-sided p value of < 0.05 was considered statistically significant.

Conflict of interest – None

Abbreviations

Acs – acute coronary syndrome

Covid – corona virus disease

Pci – percutaneous coronary intervention

Ppci – primary percutaneous coronary intervention

Pit – pharmacoinvasive therapy

ct – computed tomography

Rt- pcr- real time polymerase chain reaction

Mi – myocardial infarction

Sht – systemic hypertension

Dm – diabetes mellitus

Vt- ventricular tachycardia

Vf – ventricular fibrillation

Ecg – electrocardiogram

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