



SPECTRUM OF CARDIAC COMPLICATIONS IN COVID 19 DEATHS- A RETROSPECTIVE CASE RECORD ANALYSIS AT A DEDICATED COVID CARE HOSPITAL IN CENTRAL INDIA

Cardiology

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ABSTRACT

Background: Limited studies are there regarding adverse cardiac events found in patients of COVID 19, especially in India. This study aims to find the spectrum of cardiac complications in COVID 19. **Methods:** Data from May 1 to 12th October, 2020 collected retrospectively from medical records department and analysed for demography, comorbidities and spectrum of cardiac events in COVID 19 deceased. **Results:** 300 COVID-19 positive patients died during this period. 24% had cardiac complications during hospital stay. Most of the complications developed within 1-3 days of admission. Out of them, 57.14% had raised troponin levels. NSTEMI (36%) was the most common adverse cardiac event, followed by STEMI (27.7 %) & Cardiac Ischemia. Apart from Influenza like illness, only 6 had chest pain as presenting complaint. 11 patients without comorbidities had acute coronary syndrome and sudden cardiac deaths. High incidence of cardiac arrhythmia was seen- sinus tachycardia, bundle branch blocks, ectopics, ventricular tachycardia-fibrillation & sinus bradycardia. One case of PSVT and 4 cases of atrial fibrillation were also found. **Conclusion:** This study supports that cardiac complications are seen in this disease in significant number of patients. All spectrum of cardiac complication are seen including STEMI, NSTEMI and sudden cardiac death. There were few patients who had new onset acute coronary syndrome without any comorbidity, which signifies COVID-19 can directly lead to cardiac mortality. Arrhythmia including sinus tachycardia, bradycardia and conduction blocks are also commonly seen.

KEYWORDS

COVID-19, Acute coronary syndrome, Arrhythmia, Sudden cardiac death

INTRODUCTION

The cardiovascular (CV) system appears to have complex interactions with COVID-19. Myocardial damage is mediated by direct cell injury & T lymphocyte mediated cytotoxicity – augmented by cytokine storm syndrome, direct viral invasion, supply-demand imbalance & micro/macro- thrombotic complication (Siripanthong B et al ; 2020, Lala A et al; 2020). Both ischemic and non-ischemic, non-coronary mechanism have been seen. Evidence of myocardial injury in 20–40% of hospitalized cases manifesting as cardiac chest pain, fulminant heart failure, cardiac arrhythmias, and cardiac death is seen (Huang C et al ; 2020). COVID 19 infection is associated with metabolic dysfunction, myocardial inflammation, and activation of the sympathetic nervous system, all of which predispose to cardiac arrhythmia. Further details of these manifestations remain elusive but included atrial fibrillation, conduction block, ventricular tachycardia, and ventricular fibrillation (McFayden JD et al ; 2020). There have been very few studies regarding the adverse cardiac events found in COVID 19 deceased, especially in India. This study aims to find the spectrum of the cardiac events occurring in COVID 19 deceased.

MATERIALS & METHODS

Study design: Retrospective case record analysis

Study area: Gandhi medical college & Hamidia Hospital-a dedicated COVID care tertiary government hospital in Central India.

Study population: All COVID 19 positive deaths from 1st may 2020 to 12th October 2020.

Data collection and analysis

Case records of all the patients admitted in COVID ICU and subsequently died in between the period of 1st may 2020 to 12th October 2020 were analysed for demographic variables, clinical course and complications including acute coronary syndromes, arrhythmias,

sudden cardiac deaths, laboratory values (troponin I) and Electrocardiographic findings.

Ethical clearance: Approval was granted by Institutional Ethics Committee.

RESULTS

Total COVID 19 positive deaths during the study period – 300

Total COVID 19 positive deaths with cardiac complications – 72(24%)

TABLE 1. Demography of 300 COVID-19 deceased patients (including 72 having cardiac events)

	TOTAL PATIENTS (n=300)	PATIENTS WITH CARDIAC EVENTS (n=72)
Age (years)	56.97 ± 3.75	60.22 ± 5.30
RANGE		
≤40	39(13%)	5(6.94%)
41-50	56(18.7%)	12(16.7%)
51-60	75(25%)	18(25%)
61-70	76(25.3%)	20(27.7%)
≥70	54(18%)	17(24.28%)
SEX		
Female	116(38.67%)	23(31.95%)
Male	184(61.3%)	49(68.05%)
Comorbidities		
Hypertension	127(42.3%)	36(50%)
Diabetes mellitus	138(46%)	34(47.2%)
Coronary artery disease	32(10.6%)	12(37.5%)
Hypertension & diabetes	79(26.3 %)	22(30.5%)
Hypertension, diabetes and coronary artery disease	8(2.7%)	2(2.7%)
No comorbidities	45(15%)	11 (15.27%)

TABLE 2. Spectrum of cardiac events and associated findings& time duration of onset of cardiac events

CARDIAC COMPLICATION	NUMBER OF DEATHS AND PERCENTAGE OUT OF TOTAL CARDIAC EVENTS	PERCENTAGE OF TOTAL DEATHS	COMPLAINTS	TROPONIN VALUES (MEDIAN)
STEMI	20(27.7%)	6.66%	Chest pain -2	1.37
NSTEMI	26(36.1%)	8.66%	Chest pain-2	0.59
CARDIAC ISCHEMIA	10(13.88%)	3.33%	Chest pain-2	WNL
VT-VF	17(23.61%)	5.66%	Chest pain-0	2.54
PSVT	1(1.38%)	0.33%		WNL
TOTAL	72	24%		
TIME DURATION FROM ADMISSION TO ONSET OF CARDIAC EVENTS				NUMBER OF CASES
< 1 DAY				9 (12.5 %)
1-3 DAYS				23 (31.94 %)
4-7 DAYS				17 (23.6 %)
>7DAYS				22 (30.55 %)
TIME TAKEN FROM SYMPTOM ONSET TO ONSET OF CARDIAC EVENTS				NUMBER OF CASES
1-3 DAYS				6 (8.33 %)
4-6 DAYS				12 (16.67 %)
7-10 DAYS				20 (27.78 %)
>10 DAYS				35 (48.61 %)

STEMI- ST elevated myocardial infarction, NSTEMI- non ST elevated myocardial infarction, VT-VF – ventricular tachycardia-fibrillation, PSVT- paroxysmal supraventricular tachycardia, WNL-within normal limit

TABLE 3. SPECTRUM OF CARDIAC ARRHYTHMIA

TYPE OF CARDIAC ARRHYTHMIA	NUMBER & PERCENTAGE IN THOSE DEATHS WITH CARDIAC EVENTS	OVERALL
SINUS TACHYCARDIA	47(65.27%)	195(65%)
SINUS BRADYCARDIA	2(2.77%)	13(4.33%)
ATRIAL ECTOPICS	0	2(0.66%)
VENTRICULAR ECTOPICS	6(8.33%)	22(7.33%)
ATRIAL FIBRILLATION	4(5.55%)	4(1.33%)
VT-VF	17(23.61%)	17(5.66%)
SVT(INCLUDING PSVT)	2(2.77%)	4(1.33%)
RBBB	7(9.72%)	30(10%)
LBBB	0	2(0/66%)

VT-VF : ventricular tachycardia-fibrillation, SVT- supraventricular tachycardia, PSVT- paroxysmal supraventricular tachycardia, RBBB- right bundle branch block, LBBB- left bundle branch block

DISCUSSION

COVID-19 is a new disease. Despite pulmonary manifestations being its most common consequence, COVID-19 causes systemic inflammation with varying degree of cardiac involvement (Fried Justin A et al; 2020). Our study also shows cardiovascular involvement along with pulmonary manifestations.

A single centre retrospective cohort study of 416 patients in Wuhan, china reported fever(76%) cough (34.1%) shortness of breath (31.7%) as the commonest symptoms in people having acute cardiac injury while only 13.4% complained of chest pain on admission (Shi S et al ; 2020). In our study breathlessness(90.27 %) was the most common symptom in those having cardiac events, followed by fever(70.83%) and cough(51.38 %), while only 6(8.33 %) complained of chest pain as symptom -which is consistent with observations from other studies. Hence we can see that a majority of patients having systemic illness in lines of COVID-19 may not have specific symptoms pertaining to cardiovascular system.

We found 24 % of the COVID-19 deaths were associated with adverse cardiac events, including – STEMI, NSTEMI, UNSTABLE ANGINA/MYOCARDIAL ISCHEMIA, CARDIAC ARRHYTHMIAS INCLUDING VT/VF,PSVT leading to Sudden cardiac death. NSTEMI was the most common cardiac event observed in our study (26 out of 72) accounting for 8.66% of the total deaths, majority developed it between 1-3 days of admission. Time duration from symptom onset to development of NSTEMI was beyond 10 days in most of the cases.

NSTEMI was closely followed by STEMI (20 OUT OF 72). Few studies have shown that STEMI may represent the first clinical manifestation of COVID 19 (Stefanini GG et al ; 2020). In our study we found 20 deaths having STEMI as a complication, majority (10 out of 20) developing between 7-10 days from symptom onset. 5 patient had developed STEMI within 24 hours of admission whereas majority

developed during 4-6 days of admission. 5 of them had no comorbidities. Youngest case was a male, 24 years, without any comorbidities who developed STEMI on the 13th day of admission.

Cardiac ischemia was found in 10 out of 72 deaths. Majority of the events developed within 4-6 days of symptom onset and within 1-3 days of admission.

A study in Wuhan regarding association of cardiac injury with mortality in COVID 19 patients reported 53.7% were males having acute cardiac injury and 74 years was the median age (Shi S et al ; 2020). We found higher percentage of males with acute cardiac injury- 68.8 % with mean age 64.33 ± 14.03 years.

In a study from New York, it was found that 33.7% had increased troponin concentration after 1st 24 hours of which 24% died (Lala A et al ; 2020). We report 40 cases (57.14 % among cardiac deaths, 13.33% of overall deaths) having rise in troponin after 1st 24 hours of admission. A total of 45 patients had elevated troponin-I levels (15 % of all deaths, 62.5% among deaths with cardiac events)- we see all the patients with raised troponin-I values have experienced cardiac complications in one form or another- 6 of them had VT-VF, rest had either STEMI or NSTEMI.

It is worthwhile to note that only 7 patients had acute coronary syndrome within 1 day of admission, rest 46 out of 72 who had normal ECG and TROPONIN-I values on admission developed acute coronary syndrome during the course of hospitalization. Thus daily ECG monitoring and troponin values is required to identify these complications on time.

In COVID-19, cardiac arrhythmia has been a common occurrence. A retrospective study conducted in Wuhan on 1284 patients reported 25.9% atrial/ventricular arrhythmia, 6 patients having VT/VF and 4 patients having AF (Si D et al ; 2020). We have observed sinus tachycardia, sinus bradycardia, atrial and ventricular ectopics, supraventricular tachycardia (INCLUDING 1 CASE of PSVT) and ventricular tachycardia-fibrillation, 4 cases of atrial fibrillation and significant number of right bundle branch blocks & 2 cases of left bundle branch block. The number of VT-VF we have observed is higher than in any of the studies reported so far- 17 cases, of which 5 had no comorbidities. Most of the cases having VT-VF developed beyond 10 days from symptom onset and between 1-3 days of admission. Sinus tachycardia was the commonest entity among arrhythmias, sinus bradycardia was seen in 13 cases. 1 case of PSVT was seen in a 62 year old diabetic male, who developed it on the 7th day of hospitalization and succumbed shortly.

ACKNOWLEDGEMENT: We acknowledge Dr. BS YADAV, Prof & head, Department of Cardiology, for his immense help in this project. We would also like to thank Dr. Aruna Kumar, Dean, GMC Bhopal for granting permission to undertake this study

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