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To Study the Cardiac Complications in COVID-19 Infected Patients

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Abstract

With the emergence of pandemic of Covid -19 infection leading to significant mortality, can be reduced only if effect of virus on multiple organ system is detected in early stages. Hence impact of virus on cardiac system needs to be focused on. It is a prospective study is conducted to look for cardiac complications in COVID19 patients. 48 such cases were taken which were admitted in our hospital. It was concluded that maximum patients had deterioration of existing cardiac disease although some had new onset cardiac ailments.

Keywords: COVID19 infection, multi organ system, cardiac complications

Introduction

The emergence of novel coronavirus, officially known as severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2), has presented an unprecedented challenge for the healthcare community across the world. High infectivity, ability to get transmitted even during asymptomatic phase and relatively low virulence have resulted in rapid transmission of this virus beyond geographic regions, leading to a pandemic. Respiratory involvement, presenting as mild flulike illness to potentially lethal acute respiratory distress syndrome or fulminant pneumonia, is the dominant clinical manifestation of COVID-19. However, much like any other respiratory tract infection, pre-existing cardiovascular disease (CVD) and CV risk factors enhance vulnerability to COVID-19. Further, COVID-19 can worsen underlying CVD and even precipitate de novo cardiac complications (1).

Material And Methods

Patients admitted at Bharati Hospital in Isolation units were taken and covid positive cases were followed for complications in cardiac system. The patients need to have clinical evidence of COVID-19 infections with signs and symptoms. We will compare the severity of infection with various imaging techniques and laboratory reports. Finally, we will compare the outcome of patients with post infection and complications they developed.

Study Design: Prospective cohort study.

Study Place: Bharati Vidyapeeth Deemed University Medical College and Hospital

Study Duration: 2 months.

Study Population: Patients with COVID-19 positive status who come to Bharati Vidyapeeth Deemed University Medical College and Hospital during my study period for follow up.

Study Subjects: COVID-19 patients above 18 years of age.

Inclusion Criteria:

1. All patients admitted in COVID ICU/Wards & are in hospital till discharge or death.
2. Those patients who showed positive cardiac biomarkers/ECG/ECHO findings suggestive of fresh cardiac events.

Exclusion Criteria: Pediatric Patients.

Study Variables: CBC, LFT, RFT, S. Electrolyte, Blood Sugar level- random, HbA1c, D-Dimer,

S. Ferritin, IL-6, CRP, CPK MB, TROP I& ECG.

Sample Size: Patient admitted in Bharati Hospital during study period

Sampling Technique: Convenient Sampling

Study Tools: Proforma and Laboratory Investigations along with ECG and ECHO

Plan For Analysis: Result will be analyzed with the help of biostatician using appropriate statistical test.

Risk Involved: NIL

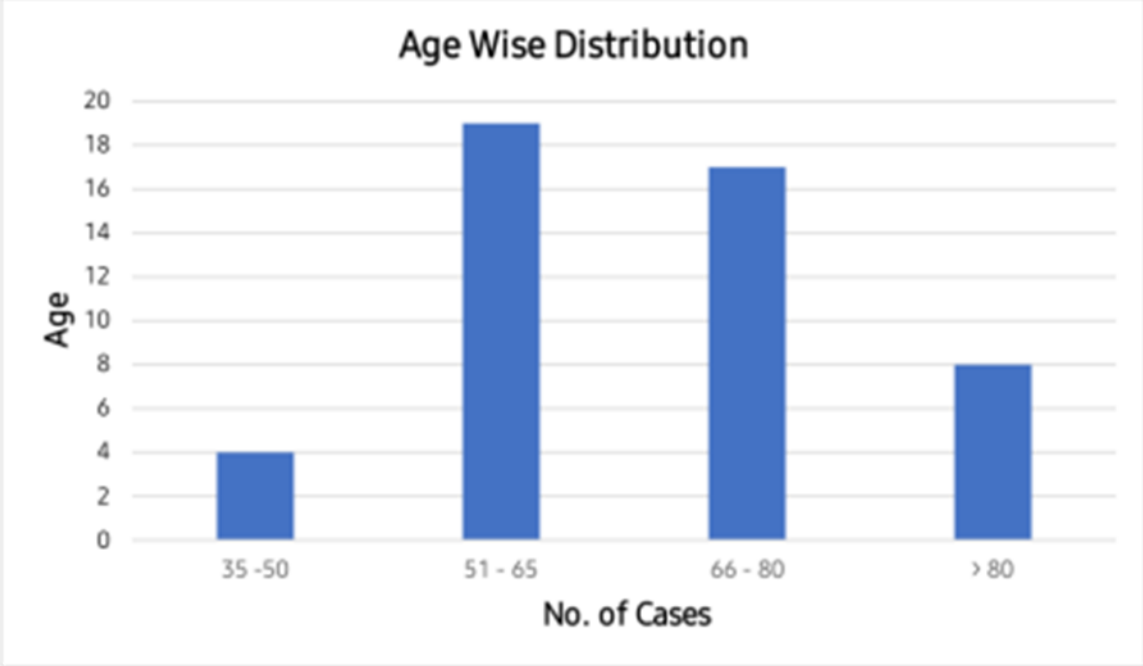
Expected Result: After analyzing the clinical profile and doing the laboratory investigation along with ECG and ECHO I expect to find: The patients admitted to COVID ICU/Wards will be evaluated with reference to cardiac biomarkers/ ECG, ECHO. With history & previous reports it will be interpreted as a fresh onset cardiac injury/ deterioration in pre-existing cardiac disease.

Results

Table 1: Distribution of Cases According to Age

Age (in years)	No of Cases	Percentage (%)
35 - 50	4	8.33
51 - 65	19	39.58
66 - 80	17	35.42
> 80	8	16.67
Total	**48**	**100**

Figure 3: Distribution of Cases According to Age



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In a Case study with n=48 maximum no of cases (19) was reported between age group of 51-65 years, 17 cases were in age group of 66-80 years while 8 subjects had age more than 80 years.

Table 2: CPKMB Levels

CPKMB	No of Cases	Percentage (%)
≥ 25U/L	45	93.75
< 25	3	6.25
Total	**48**	**100**

In a case study with n=48 when we measured cardiac biomarkers like CPK-MB levels it was found that I was raised in 93% cases showing significant association of cardiac injury in COVID- 19 patients.

Table 3: Association of known Case of Cardiac Disease with COVID-19 Infection

Known - Case of IHD	No of Cases	Percentage (%)
YES	38 {deteriorated}	79.17
No	10	20.83
Total	**48**	**100**

In a case study with n=48, 79% cases were already known cases of ischemic heart disease and following which they had contracted COVID-19 infection.

Table 4: Correlation between Covid Positive Patients with ECG changes

Symptoms	No. of Subjects	Percentage (%)
T-Wave Inversion	13	27.08
Myocardial Infarction	18	37.5
Sinus Tachycardia	13	27.08
Old Ischemic Changes	4	8.34
TOTAL	**48**	**100**

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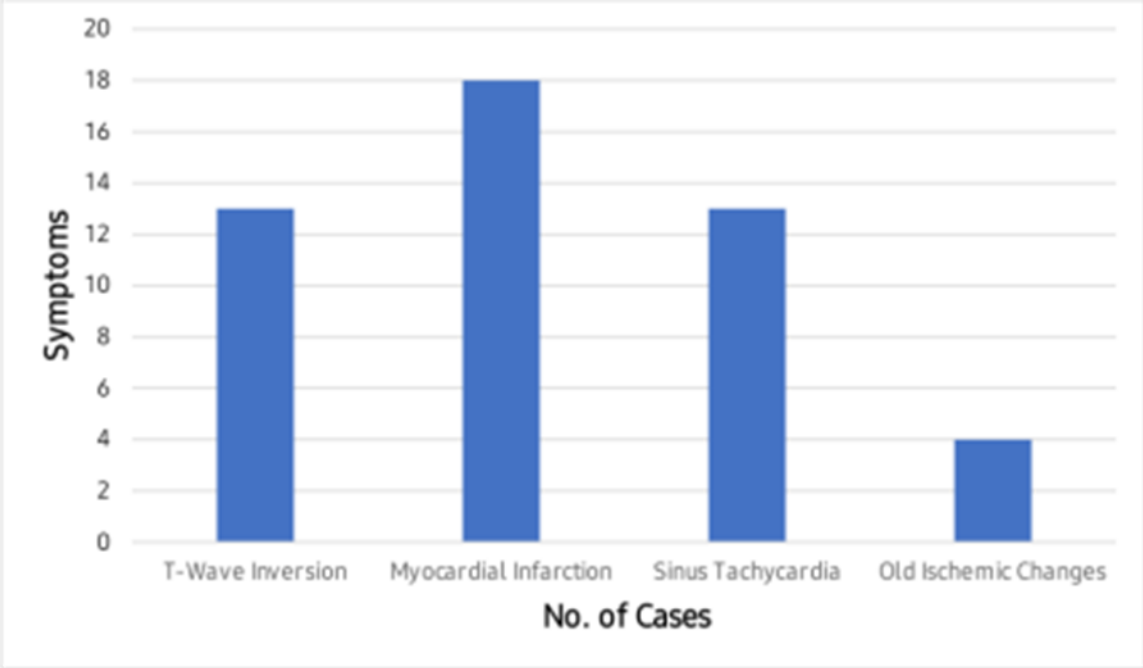
Figure 4: Correlation between Covid Positive Patients with ECG changes



In a case study with n=48, 18 subjects were found to have acute myocardial infarction i.e., 37%, while 13% cases had developed sinus tachycardia.

This has strong positive co-relation i.e., COVID 19 infected patients may land up into cardiac complications.

Table 5: Correlation between COVID Patients & its impact on Cardiac Status

Category	No of Cases	Percentage (%)
Deterioration of Cardiac Status	38 {deteriorated}	79.17
Fresh Cardiac Injury	10	20.83
Total	**48**	**100**

In a case study with n=48, 79% cases showed deterioration of cardiac status while 20% cases developed fresh cardiac injury post COVID 19 infection.

Discussion

Pathophysiology and Clinical Features

SARS-CoV-2 is an enveloped, non-segmented, single-stranded, positive-sense RNA virus. Angiotensin-converting enzyme 2 (ACE2) is a protein found on the surface of lung alveolar epithelial cells and enterocytes of the small intestine, which has been proposed as the entry site for SARS-CoV-2 [10]. ACE2 breaks down angiotensin II, a proinflammatory factor in the lung. Inhibition of ACE2 may be another factor in lung injury, as well as the cause of the systemic inflammation with cytokine release that can result in acute respiratory distress syndrome (ARDS) and multiorgan dysfunction (2).

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Figure 1: Pathogenesis and Development of Complications

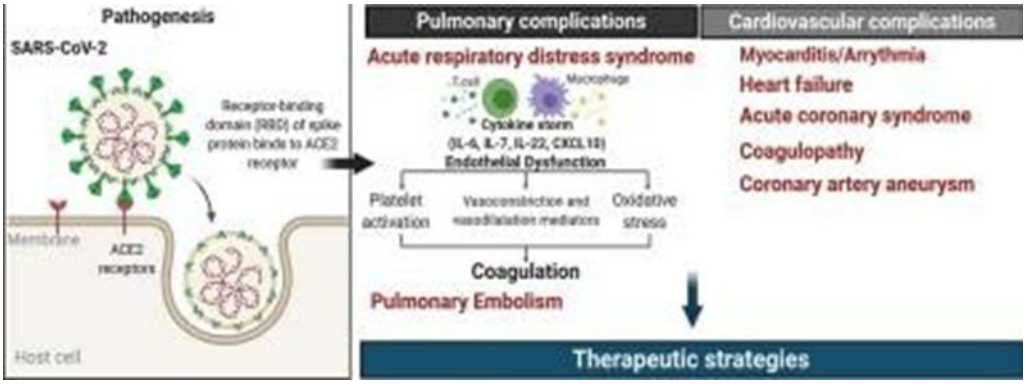
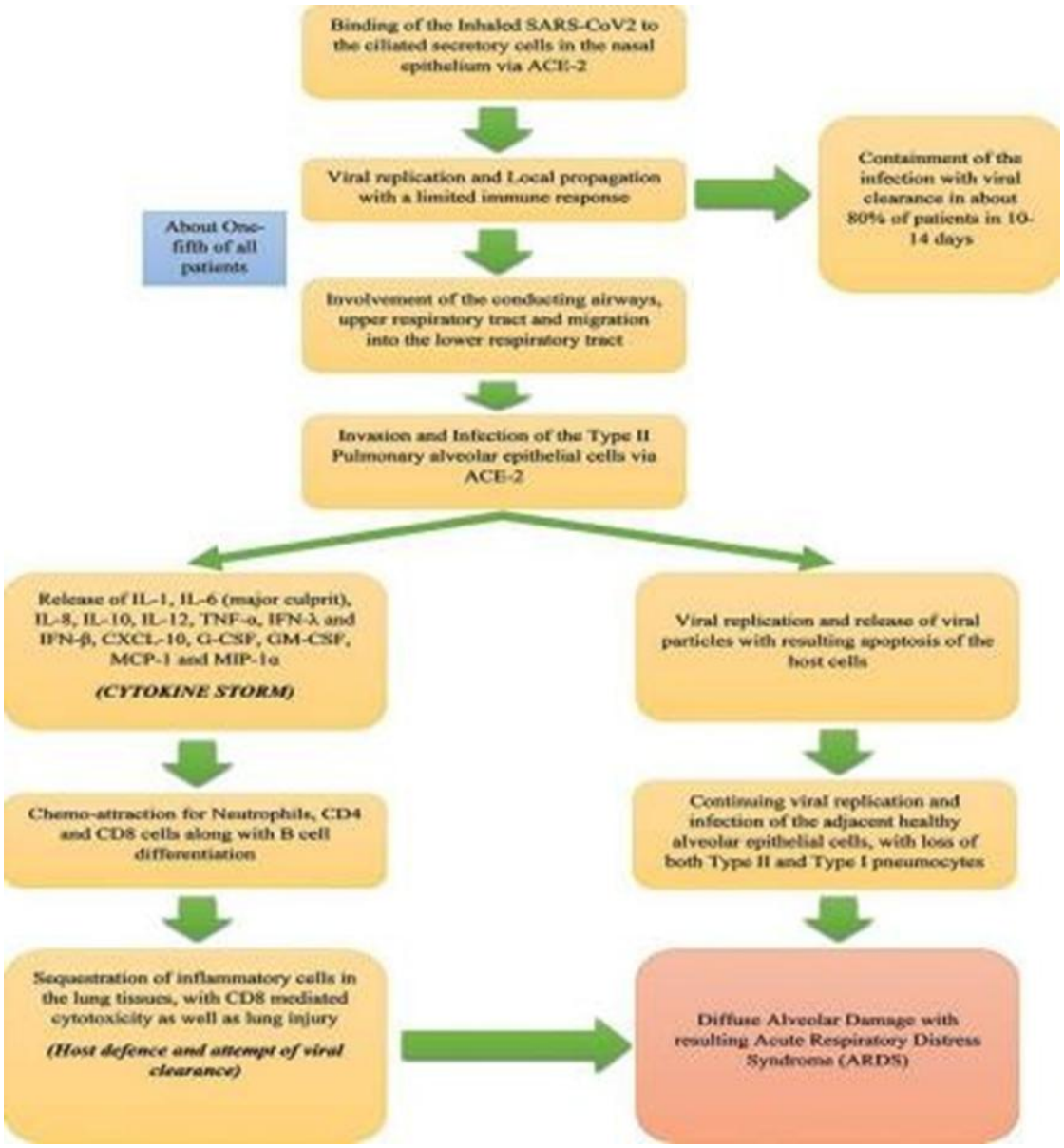


Figure 2: Pathophysiology and Pathogenesis of COVID-19 Infection



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Disruption in immune system regulation, increased metabolic demand, and procoagulant activity likely account for some of the increased risk of adverse outcomes in those with COVID-19- related cardiovascular disease (CVD) (2).

Severe or critical cases account for less than 20% of patients with COVID-19. Patients with critical illness may present with pneumonia, ARDS, multiorgan dysfunction, and hemodynamic instability, as well as several cardiovascular complications. Cardiogenic shock is the most severe cardiac complication and may occur in those with critical illness.

Cardiovascular Complications Associated with COVID-19 Infection

Acute Myocardial Infarction

Severe systemic inflammation increases the risk of atherosclerotic plaque disruption and hypercoagulability, which predisposes individuals to AMI. It is associated with rise in cardiac enzymes and electrocardiographic abnormalities (1).

Heart Failure and Cardiomyopathy

Acute heart failure can be the primary presenting manifestation of COVID-19 infection. Many patients will not have any symptoms pointing towards cardiomyopathy still landing up to such complications (3).

Venous Thromboembolic Event

Systemic inflammation, abnormal coagulation status, multiorgan dysfunction, and critical illness are all potential contributing factors to the increased risk of VTE detected by levels of D-dimer. Treatment with low molecular weight heparin, may be associated with reduced mortality in severe COVID-19 infections (3).

Arrhythmias

Most frequently, sinus tachycardia is seen in such patients, which can be attributable to hypoxia, metabolic disarray, or neurohormonal stress in the setting of viral infection (4). Differentials of myocardial injury, acute myocarditis, and ACS, to be considered if associated with raised serum troponin.

Myocardial Injury and Myocarditis

Patients with COVID-19 can present with chest pain, dyspnea, dysrhythmia, and acute left ventricular dysfunction [5-9]. The ECG abnormalities include non-specific ST segment-T wave abnormalities, T wave inversion, and PR segment and ST segment deviations (depression and elevation). Echocardiographic evaluation is more likely to demonstrate a focal wall motion abnormality with active, significant ACS while severe forms of COVID-19-related myocarditis will show either no wall motion defects or global wall motion dysfunction.

Conclusion

COVID-19 is associated with a number of cardiovascular complications, including acute myocardial infarction, myocardial injury and myocarditis, heart failure, dysrhythmias, and VTE. These complications are more common in patients who are already known cases of cardiac ischemic events. Some of the medications utilized to treat COVID-19 also have potential cardiac complications. It is important for the emergency clinicians to be aware of these complications when treating the COVID-19 patient.

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