

Covid 19 Era and Cardiovascular Short Term & Long Term Complications

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Abstract

We are facing the worst pandemic of this 21st century in form of corona virus disease or COVID 19. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), initially presented as respiratory system disorders, but later on COVID-19 has been revealed to adversely related the cardiovascular system resulting to myocardial injury and dysfunction of endothelium mainly via the angiotensin converting enzyme 2 (ACE-2) receptor.¹ COVID-19 affects the cardiovascular system in manner of both the short term by acute injury and long term by the chronic consequences. Seasonally the new variant of COVID 19 are recognizing globally since December 2019.² Recently new variant like Omicron variant found with multiple mutant spikes which may be highly toxic or virulent. We are going to review our focus, scanning and realizing to update acute and chronic cardiovascular complications of COVID 19. Emergence of new variants and time being delay until herd immunity will be alarming for managing consequences of acute viral infection, however many vaccines are available, and mostly population are vaccinated for protection from different variants for future survival.³ Approach of an integrated health system with COVID 19 behaviour, integrated yoga approach for better immunity and vaccines are hopeful weapons to fight COVID 19 era followed by gene therapy or stem cell therapy for good future to avoid long term cardio vascular complications.^{4,5}

Keywords: COVID 19 and Variants, Cardiovascular disorders.

INTRODUCTION

SARS Cov2 infection showed earlier in first wave mostly severe respiratory distress like symptoms and clinical features like fever with cough and shortness of breath, loss of taste and smell. Mostly general physician and pulmonologist

were involved to manage and lead that situation but later on some where few cardiologists came to closer as corona warrior to manage as cardiac emergency or acute cardiac illness. Literature showed the link exist between COVID 19 and cardiovascular risk or increase risk of COVID 19 with CV risk patients like diabetes, hypertension, dyslipidaemia, hypothyroidism and smoker.^{6,7}

During second wave of new mutant variants of COVID 19 presented as severe inflammatory syndrome with multi organ involvement leading to failure and death across the globe.^{7,8} As per cardiovascular aspect we received both acute and chronic cardiovascular illness like acute myocardial injury, fulminant myocarditis, myocardial infarction, cardiac arrhythmia, coronary and arterial thrombosis, acute pulmonary thrombosis,

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right and left ventricular failure, cardiogenic shock and stroke.⁸ Data suggest that more mortality found in young patients rather than children and old age group. Studies revealed metabolic syndrome, smoking, stress of economy, lack of physical activity and fear due to lockdown during first wave of COVID 19 which could raise the risk of cardiovascular complications. During second wave of

SARS Cov2 infection with mutant newly variant which was more virulent and lethal as compare to initial one. Data suggest that more insulin resistance with hyperglycaemia, dyslipidaemia, high value of inflammatory markers and cardiac bio markers lead to raised cardio vascular morbidity and mortality. (Fig. 1)

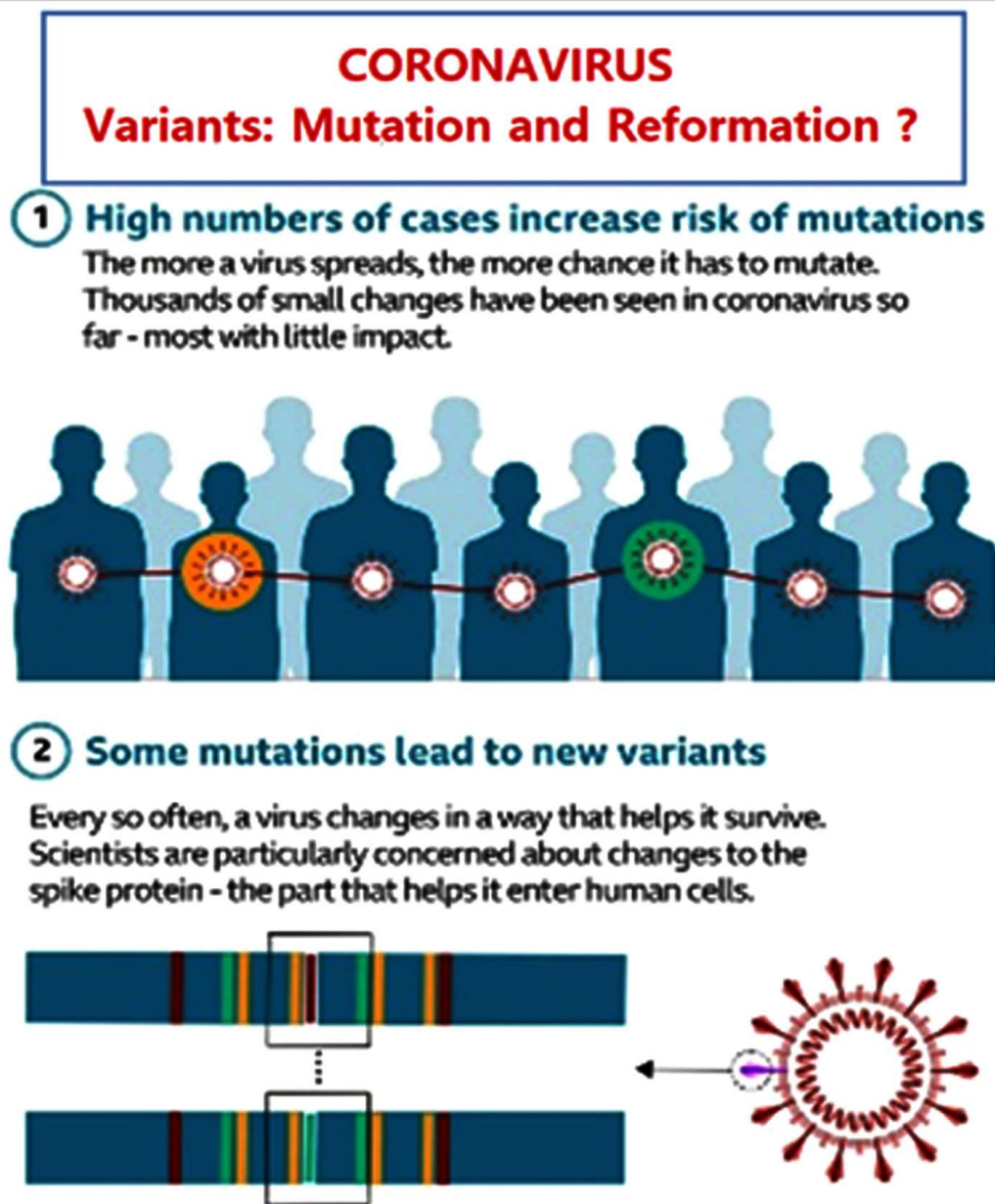


Fig. 1 a: Corona virus variants and mutation

Source: Centers for Diseases Control and Prevention, BBC research

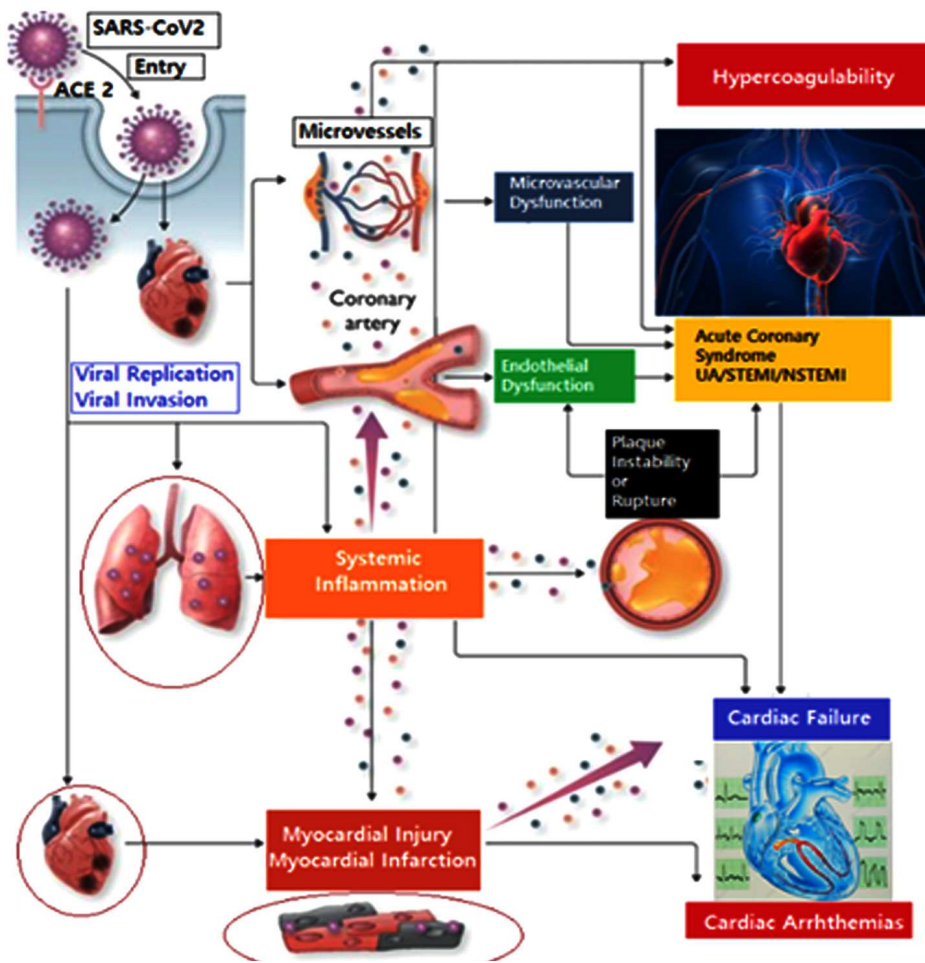


Fig. 1 b: Systemic inflammation and cardiovascular complications. Source: Provided by author

SARS COV2 AND CARDIOVASCULAR CONNECTION

As simple as that SARS CoV2 is connected to the heart and cardio vascular system by the ACE 2

receptor initially which become a part of journey through cell entry and start genomic replication leading to increase in viral load. SARS CoV2 is responsible for endothelial dysfunction, pro-inflammation, pro-proliferation and pro-fibrosis

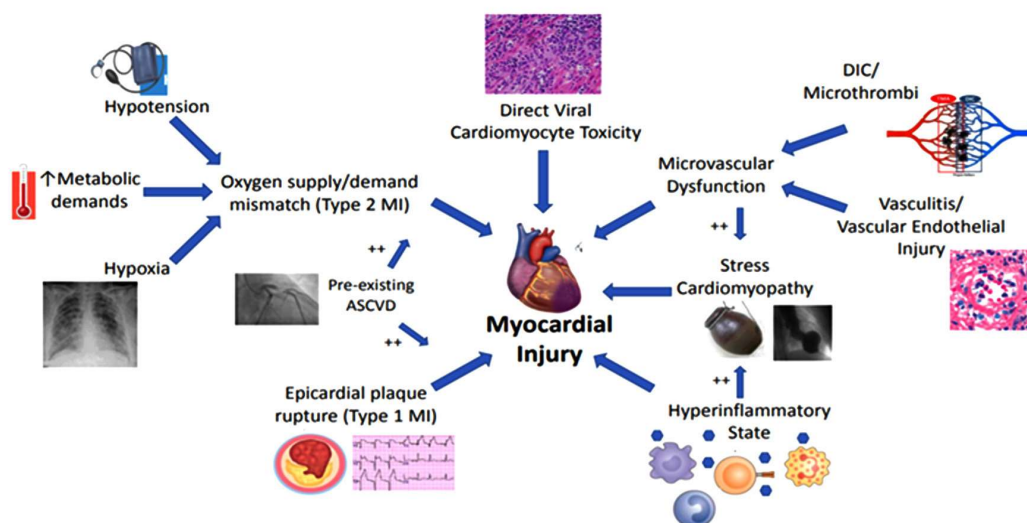


Fig. 2: Viral Cardiomyocyte Toxicity and Myocardial Injury. Source: Provided by author

by vigorously affecting on immune system to reach up to cytokine storm. It can cause change in platelet volume, counts, aggregation and involve in coagulation, thrombosis. SARS CoV2 presented cardiovascular consequences like myocarditis, pericarditis, myocardial injury, coronary thrombosis and infarction. (Figure 2)

Ventricular remodeling and raise ventricular volume with impaired function, changes in cardiac electrophysiology which leads to rise in QT interval and arrhythmias like atrial fibrillation, ventricular tachycardia or fibrillation. Data suggest that more variables were found in second wave as compare to first wave like inflammatory markers, CRP, IL-1, IL-2, IL-6, IL-8, IL-10 and cardiac bio marker like high-sensitive troponin value. Studies revealed that high value of D-dimer, Neutrophil: Lymphocyte ratio, Procalcitonin, Calcitonin, C-peptide, LDL, Triglyceride value as compared to first wave.

SHORT TERM COMPLICATIONS

Data suggest about SARS Cov2 pandemic has been shown acute cardiovascular complication through direct or indirect way of endothelium dysfunction, myocardial inflammation, injury, micro & macro vascular thrombosis leads to acute coronary syndrome presenting myocardial injury, myocardial infarction, left ventricular failure, intracavity thrombus in ventricles, intramyocardial thrombus or rupture followed by hematoma, ventricular arrhythmias or sudden cardiac death.

Apart from that deep vein thrombosis, pulmonary thrombo-embolism, acute cerebral infarct or stroke cases are reported through out the world. Reasons are behind of these adverse consequence like diabetes, hypertension, smoking, obesity, dyslipidemia, hypothyroidism, rheumatoid arthritis, ulcerative colitis, H Pylori infection, vitamin D-deficiency, electrolytes imbalances, stress and fear. Pandemic showed the horrible scenario in cardiac emergency department or intensive care unit at the level of severe morbidity with high major adverse cardiovascular events (MACE) rate and death during second wave of COVID 19, specially in young Indian patients.

LONG TERM COMPLICATIONS

As per data and personal experience about connection between cardiovascular system and COVID 19 is not transient phase or short-term adverse consequences or we can say that RT PCR is negative for SARS Cov2 and infected individual

became safe for their peaceful future environment. In reality we access the numbers of COVID 19 patients in our daily routine practice and we can discuss with global evidence based studies or data suggest that long term complications of chronic adverse consequences are here in challenging COVID 19 era.

Chronic inflammation with weak immune system represents and leads toward of permanent changes in endothelium, pericardium, myocardial fiber and microvascular or macro vascular proliferation and fibrotic changes which are responsible for stiffness. We can easily understand about pathophysiology for chronic or long term consequences which may be like insufficiency of both atrium and ventricles, cardiomyopathy, constrictive pericarditis or restrictive pericardium, scarred endocardium with subendocardial ischemia and microvascular myocardial ischemia.

Diastolic dysfunction, exertional dyspnea, exertional microvascular angina, decrease exercise tolerance or decrease cardio-pulmonary functional capacity. Stiffness of cardiovascular system with pulmonary fibrosis along with thickness of carotid intima media and insulin resistance are responsible for long term expected adverse event related to cardiovascular system like uncontrolled diabetes, hypertension, chronic kidney disease, chronic pulmonary insufficiency disease and heart failure may be disturbing the daily quality of life or reduce the expectancy of life longevity.

CONSIDERABLE TREATMENT GUIDELINE

Cardiovascular concerns	Treatment considerations
STEMI and NSTEMI*	Primary PCI vs thrombolytics
Myocardial injury	Worse prognosis, monitoring rising trends
Hypercoagulable state	Thromboprophylaxis
ACE-I or Angiotensin II receptor blockers use	Continue treatment currently, await further studies
Hydroxychloroquine, chloroquine and/or azithromycin use	QTc monitoring, avoid other QTc prolonging drugs
Immunosuppression/ Immunomodulation	May be helpful in selected patients with cytokine storm
Mechanical circulatory support devices	Intra-aortic balloon pump (IABP) and Veno-arterial- Extra corporeal membranous oxygenator (VA-ECMO) might be used for support in Cardiogenic shock

LEADERSHIP

Perfect leadership is required to lead the pandemic and to prevent the community transmission of SARS Cov2 at mass level. Proper scanning, screening, focusing and consistency towards mission and vision of concerned project. Organizing structure, teambuilding, resources, financial boost, good governance, proper guidelines, health equipment & tools, working manpower, social & digital media are mandatory to create a good leadership to handle the situations. Social media, virtual educational program, telemedicine, mass health education with COVID behavior and health kit supply are required to be send at mass level for example like school, college, various professional departments, society and home doors.

MANAGEMENT

Integration of systems, religions, politics and administration with private business, non-government organizations & industries may be a golden weapon to quit and control of pandemic timely at international level. Better supply, best quality control, optimum supply, integrity, loyalty, monitoring, evaluation, data resources & analysis are responsible factors for better management to control the epidemic with prevent mortality and reduce the socio-economic burden across the world.

AT A Glance

- Appropriate COVID 19 Behaviors.
- Mass Home care, Society care, Hospital care Protocols.
- Governance, Government or Non-Government participation.
- Medical and Economical Ethics.
- Successful Vaccination.
- Virtual Education.
- Telemedicine/ Telecardiology.
- Yoga/ Meditation.

Future aspect

- Immunization (9)
- Immunity boosting (9)

- Yoga/ meditation (9)
- Health education (9)
- Health policy and ethics (9)
- System and governance or government (9)
- Stem cells therapy (5)
- Gene therapy (9)

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