ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Acute coronary events in SARS-CoV-2 - causal or incidental?

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Submission: 22-01-2023 Revision: 03-04-2023 Publication: 01-05-2023

ABSTRACT

Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus can damage respiratory, cardiovascular system by various mechanism which can lead to increased morbidity and mortality. **Aims and Objectives:** The aim of the study was to assess incidence of acute coronary syndrome (ACS) in moderate to severe cases of infection with SARS-CoV-2. **Materials and Methods:** This was an observational cross-sectional study including 60 patients of age ≥18 years of either gender presenting to GTB Hospital diagnosed as positive for SARS-CoV-2 by RT-PCR and/or Rapid Antigen Test and belonging to moderate and severe category without any prior history of respiratory, cardiac, gastrointestinal, renal illness, long-term corticosteroid, or immunomodulator use. The cardiac involvement was assessed by history, clinical examinations, and investigations. **Results:** Cardiovascular involvement was present in 25% patients. Cardiac involvement included ACS including ST elevation myocardial infarction (STEMI) (3.3%), non-STEMI (10%), unstable angina (1.67%), left ventricular hypertrophy (8.3%), bundle branch block (3.3%), atrial fibrillation (1.67%), and bradycardia (1.67%). Raised cardiac enzyme levels positively correlated with ECG abnormalities. Respiratory involvement was seen in 85% of patients. among which 56.7% patients in severe category, 41.67% patients in moderate category, and 1.67% patients in mild category as per CTSI scoring. There was lung parenchymal involvement with ground glass opacities in bilateral lungs (68.3%), lobar consolidation (6.7%), cavitatory lesion (5%), pulmonary edema (5%), pneumothorax (3.3%), emphysematous changes (3.3%), and bilateral pleural effusion (3.3%). **Conclusion:** ACS occurs frequently in patients with SARS-CoV-2 and it is associated with complications such as congestive heart failure, bundle branch block, atrial fibrillation, bradycardia, and heart block.

Key words: SARS-CoV-2; Acute coronary syndrome; Coronavirus disease

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v14i5.51704

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Coronavirus disease-19 (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in a patient in Wuhan, Hubei Province, China in December 2019 and after that, it rapidly spread throughout the world and was declared a pandemic by the World Health Organization on March 11.[1] The first case of COVID-19 was reported in India on January 30, 2019. As of July 3, 2022 there are over 546 million confirmed cases and over 6.3 million confirmed deaths worldwide.[2] In India active cases as of July 7, 2022, are 119457 and confirmed deaths 525305.[3]

The virus can involve all the systems of the body, the respiratory system being the main one. The respiratory system is affected by both direct infection of the cell and indirectly by the increased cellular inflammatory response. It uses the catalytic domain of the ACE2 receptor on the pneumocytes for binding with its S (spike) high affinity protein.[4] The SARS-CoV-2 that enters the upper respiratory tract by respiratory aerosols attaches to the nasal epithelial cells. Adult nasal epithelial cells have been found to have significant levels of ACE-2, which is the primary host receptor for viral entrance into cells.[5] The virus replicates and spreads locally while also infecting ciliated cells in the conducting airways.[6] There are various mechanisms by

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which SARS-CoV-2 involves the lower respiratory system. Numerous epithelial cell types, including alveolar type II, bronchial secretory, basal goblet, and ciliated cells express ACE2 receptor.[7] In both biopsy and autopsy tests, there was evidence of damage to the lungs and airway system. Both in humans and nonhuman primates, diffuse alveolar damage (DAD) and airway inflammation have been documented.[8] The direct invasion of virus causes damage to epithelial cells, pneumocytes, bronchial secretory and goblet cells, ciliated epithelium. All of this leads to DAD and thus acute respiratory distress syndrome.[7]

The cardiovascular system is also affected by the virus itself or may be indirectly injured by the inflammatory cytokines.[9,10] The complications that occur in cardiovascular system are acute coronary syndrome (ACS), myocarditis, arrhythmias, heart failure, and ultimately all of these can lead to sudden cardiac death. A meta-analysis of 16 studies done by Zou et al.,[11] showed out of 2224 COVID positive patients 24.4% patients had cardiac injury. In COVID-19 most frequent cardiac complications are arrhythmias, myocarditis, ACS, heart failure, cardiogenic shock, and cardiac arrest. Takotsubo syndrome is also seen very rarely.[10] ACS is mainly precipitated by the endothelial dysfunction, hypercoagulable state, cytokine storm leading to plaque formation, and rupture after infection with SARS-CoV-2 virus.[9] Hypoxic injury following lung involvement and increased cardiometabolic demand due to systemic infection can lead to ACS and myocarditis.[12] Direct viral invasion, dyselectrolytemia, and potassium channel blockage by inflammatory cytokines can lead to arrhythmias in patients. All these factors lead to myocardial cell death and ultimately heart failure.[13] There is a retrospective study by Xu et al.,[14] done on 102 laboratory confirmed and hospitalized COVID-19 patients on epidemiological and demographic characteristics, clinical features, laboratory tests, imaging methods, management, and clinical outcome. Among these patients, cardiac involvement was present in 72 patients (70.6%). The abnormality detected was tachycardia (n=20), electrocardiogram (ECG) abnormalities (n=23), echocardiography abnormalities (n=59), elevated myocardial enzymes (n=55), and acute myocardial injury (n=9). A study done by Rashid et al.,[15] showed that patients with ACS with non-ST elevation myocardial infarction (NSTEMI) are more common than STEMI. ACS in SARS-CoV-2 infected patients is more severe compared to non-infected patients with a sixth fold increase in mortality within 30 days in the infected patients.[15]

There is a meta-analysis done in China by Li et al.,[16] where it was seen that cardiovascular disease among the patients of infection with SARS-CoV-2 was 16.4%. There is a study done in China by Wang et al.,[17] on 319 patients who were either severe category or critically ill. About 63% of these patients showed abnormal electrocardiogram (ECG) which involved ST-T changes (32.6%), atrial fibrillation (6.6%), atrial flutter (1.3%), atrial premature beats (4.7%), sinus bradycardia (6%), right bundle branch block (9.7%), left bundle branch block (0.9%), first degree heart block (3.4%), second degree heart block (0.6%), ventricular premature complexes (3.1%), low voltage complexes (1.6%), and left ventricular hypertrophy (6.6%).[17] From India one study is there by Saluja et al.,[18] comprising 406 COVID patients where 32.3% patients had cardiovascular abnormality. There are very few studies in India on cardiac involvement in patients with SARS-CoV-2, thus we planned to do this study. We have evaluated cardiac involvement in respect of ACS in moderate to severe patients of infection with SARS-CoV-2.

Aims and objectives

Assess incidence of Acute Coronary Syndrome (ACS) in Moderate to severe cases of infection with SARS-CoV-2.

MATERIALS AND METHODS

This was an observational cross-sectional study executed between January 2021 and April 2022 in tertiary care hospital in North India which was a COVID dedicated hospital at that time. It included 60 patients of age ≥18 years of either gender. The patients presenting to fever clinic, ward, and ICUs of GTB Hospital diagnosed as COVID-19 positive by RT-PCR and/or Rapid Antigen Test and categorized to moderate to severe category as per guidelines of Government of India Ministry of Health and Family Welfare (MOHFW)[19] were included in the study. Patients with prior history of respiratory, cardiac, gastrointestinal, renal illness, and patients on long-term corticosteroid or immunomodulator were excluded from the study. Before enrollment, written and informed consent and ethical clearance was taken. Thorough clinical examinations including history, general, physical, and systemic examinations were done within 24 h of admission. Those having SpO_2 <94% (range 90–93%) on room air, respiratory rate ≥24 breaths per minute were categorized as moderate category and patients with clinical signs of pneumonia plus respiratory rate more than 30 breaths per minute or severe respiratory distress or SpO_2 <90% on room air was categorized as severe category according to MOHFW guidelines. Investigation and management were done as per MOHFW guidelines.[19] 10 mL blood was withdrawn for testing out of which 5 mL blood in EDTA vial for hemogram and remaining 5 mL in plain vial for serum related investigations was sent. ACS was diagnosed with ECG and cardiac biomarkers. While respiratory assessment was based on clinical evaluation, arterial blood gas parameters, Chest X-ray, and CT scan. Respiratory

involvement was further divided into pleural, parenchymal, bronchial, or vascular involvement.

Statistical analysis

The data were entered into MS-Excel and later imported into SPSS version 20 statistical software for data analysis. Hospital-based prevalence of cardiac and respiratory involvement was calculated. Correlation of cardiac enzymes with ECG findings was calculated. P<0.05 was considered as significant. The prevalence of the diseases was calculated as percentage.

RESULTS

In our study, the mean age of subjects was 53.87±16.38 years. Most affected age group was the middle and older age group. There were 34 (57.7%) male and 26 (43.3%) female patients in our study. 22 patients (36.7%) had history of hypertension. 21 patients (35%) had systolic blood pressure (SBP) more than 140 mm hg and 1 patient (1.67%) had SBP <90 mm hg. 18 patients (20%) had history of diabetes mellitus. 15 patients (25%) had hyperglycemia on presentation. 7 patients (11.7%) had history of smoking and 7 patients (11.7%) had history of alcohol intake.

The symptoms that the patients presented with are summarized in Table 1. Majority of the patients presented with was dyspnea (93.33%), fever (78.33%), cough (73.33%), and sore throat (16.67%).

The vital parameters of the patients are represented in Table 2.

23 patients (38.3%) belonged to moderate category (SpO_2=90-93%) and 37 patients (61.7%) belonged to severe category (SpO_2<90%) based on MOHFW guidelines.[19] 51 patients (85%) had respiratory system abnormality. On chest auscultation, most common finding was crepitations (78.3%) followed by rhonchi (6.67%) and bronchial breath sound (1.67%). The result of arterial blood gas analysis is depicted in Table 3.

On HRCT chest, 1.67% of the patients were in mild category (CTSI <8), 41.67% patients belonged to moderate category (CTSI=9–15), and 56.67% patients belonged to severe category (CTSI=16–25) as per CT severity Index. On further analysis of CT, majority of the patients had ground glass opacities of bilateral lungs (68.3%). Other findings are summarized in Table 4.

Figures 1 and 2 showing the ground glass opacities in CT scan and Chest X-rays of few patients in our study below-

In our study, 15 patients (25%) had cardiovascular abnormality. ACS including STEMI (3.3%), NSTEMI (10%), and unstable angina (1.67%) were detected in 9 patients (15%). Detail of the patients with cardiovascular abnormalities found in ECG is described in Table 5. Among the ACS patients, the type of involvement is described in Table 6.

Table 1: Distribution of cases according to symptoms at presentation (n=60)

Symptoms at presentation	Patients (n=60)	Percentage
Fever	47	78.33
Cough	44	73.33
With expectoration	24	40.00
Without expectoration	20	33.33
Sore throat	10	16.67
Skin lesions	1	1.67
Loose stool	3	5.00
Vomiting	4	6.67
Dysuria	1	1.67
Pain abdomen	4	6.67
Chest pain	4	6.67
Dyspnea	56	93.33
Seizures	1	1.67
Altered sensorium	1	1.67

Table 2: Vital parameters of the study group (n=60)

Parameters	Mean±SD	Range
Pulse rate (per min)	98.81±15.73	64–134
SBP (mm Hg)	133.31±20.23	80–180
DBP (mm Hg)	81.81±10.14	52–105
SpO_2 on room air (%)	81.73±12.41	40–93
SpO_2 on oxygen (%)	96.33±4.04	75–99
Respiratory rate (per min)	23.21±4.6	16–38
Axillary temperature (ºF)	99.31±0.92	98–102
RBS (mg/dL)	191.78±112.75	41–586
Mean arterial pressure (mm Hg)	98.95±12.43	61.3–124

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Arterial blood gas analysis of patients (n=60)

Patients n (%)	Findings
20 (33.3%)	Acute lung injury
14 (23.3%)	Type 1 respiratory failure
8 (13.3%)	Type 2 respiratory failure

Table 4: Distribution of cases according to chest X-ray and CT findings (n=60)

C X-ray and CT scan	Patients (n)	Percentage
B/L ground glass opacities	41	68.3
Lobar consolidation	4	6.7
Pulmonary edema	3	5.0
Cavity	3	5.0
Pleural effusion	2	3.3
Tree in bud appearance	2	3.3
Emphysematous changes	2	3.3
Pneumothorax	2	3.3
Pericardial effusion	1	1.7

Cardiac markers were also done on the day of presentation. Troponin T was positive in 13.3% cases. CK-MB was raised in 10 patients (16.67%). ECG abnormalities correlated with high cardiac enzymes (Table 7).

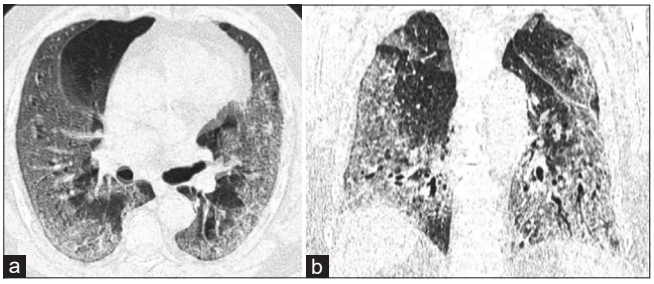

Figure 1: (a and b) Patient having subpleural ground glass opacities on HRCT chest

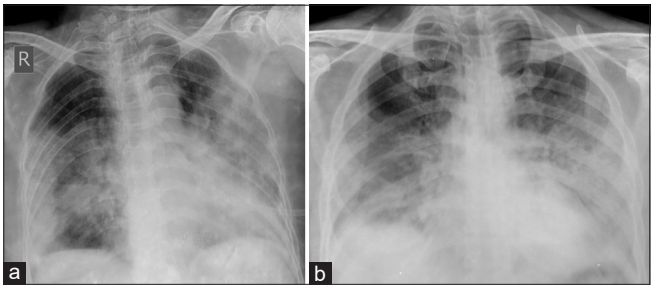

Figure 2: (a and b) Chest X-ray of patients showing bilateral diffuse infiltration

Table 5: Distribution of cases according to abnormal ECG findings (n=60)

ECG findings	Patients (n=60)	Percentage
Left axis deviation	5	8.3
Left ventricular hypertrophy	5	8.3
Bundle branch block	2	3.3
Poor R wave progression	2	3.3
Q waves	1	1.7
NSTEMI	6	10
STEMI	2	3.3
Atrial fibrillation	1	1.7
Bradycardia with QT prolongation	1	1.7

STEMI: ST elevation myocardial infarction, NSTEMI: Non ST elevation myocardial infarction

Table 6: Type of acute coronary event in affected patients (n=9)

Patients	Findings
1	Inferior wall STEMI
1	Antero-septal STEMI with left bundle branch block
2	Inferior wall NSTEMI
2	Antero-septal NSTEMI
2	Lateral wall NSTEMI
1	Unstable angina

STEMI: ST elevation myocardial infarction, NSTEMI: non ST elevation myocardial infarction

Other significant laboratory parameters abnormalities included leukocytosis (31.6%), elevated ALP (10%), and dyselectrolytemia and hypoalbuminemia (23.3%). Details of all investigations are depicted in Table 8.

DISCUSSION

In our study, there was male preponderance than female. In our study, the youngest patient was 21 years old and the oldest was 85 years old. The most affected age group was more than 30 years of age. Hence, it can be said that middle and older age group people are more likely to get infection with SARS-CoV-2. It may be due to the prevalence of nutritional deficiency, comorbidities, and low immune

Table 7: Association of cardiac enzymes with ECG changes (n=60)

Cardiac enzymes	Number of cases (n=60)		P-value
	ECG changes present	ECG changes absent	
CK-MB			
Positive	5	5	P=0.046
Negative	10	40	Correlation=−0.258
Troponin –T			
Positive	8	0	P<0.001
Negative	7	45	Correlation=0.679

Table 8: Mean hematological and biochemical parameters for the study group (n=60)

Parameter	Mean±SD	Range
Hemoglobin (Hb) (g/dL)	11.92±2.05	6.2–16.9
TLC (cells/mm^3)	10388.33±4935.45	2500–26400
DLC (%)		
Granulocyte	79.7±8.07	49–90
Lymphocyte	14.58±7.58	3–40
Monocyte	3.65±2.45	0–12
Platelet (cells/mm^3)	245883.33±121135.6	74000–672000
PCV (%)	37.09±6.28	19.7–51
Total bilirubin (mg/dL)	0.87±0.59	0.2–3.7
Direct bilirubin (mg/dL)	0.32±0.24	0.1–1.6
SGOT (U/L)	48.51±30.21	13–174
SGPT (U/L)	66.15±53.35	17–285
ALP (IU/L)	107.03±51.6	31–351
Total protein (g/dL)	6.82±0.76	5–8.8
Albumin (g/dL)	3.32±0.48	2.3–4.5
A/G ratio	0.95±0.2	0.6–1.9
Urea (mg/dL)	43.75±27.54	12–165
Creatinine (mg/dL)	0.98±0.56	0.4–4
Calcium (mg/dL)	8.77±0.82	4.9–10.4
PT (seconds)	15.12±1.36	13–18.5
INR	1.08±0.15	0.8–1.4
FBS (mg/dL)	159.51±81.01	101–500
Sodium (mEq/L)	137.01±4.56	125–150
Potassium (mEq/L)	4.55±0.73	3.1–6.4
Amylase (U/L)	82.63±31.54	34–172
Lipase (U/L)	63.58±31.12	12–150

ALP: Alkaline phosphatase, DLC: Differential count, TLC: Total leukocyte count

function in the older age group leading to a higher incidence of infection in them. A study done in China by Li et al.,[20] comprising 5319 cases reported mean age of patients as 45.2 years. They also found that older age group was more predisposed to infection by SARS-CoV-2 and associated with a higher mortality rate.

In our study, 22 patients (36.7%) had history of hypertension. 21 patients (35%) had SBP more than 140 mm hg and 1 patient (1.67%) had SBP <90 mm hg. 18 patients (20%) had history of diabetes mellitus. 15 patients (25%) had hyperglycemia on presentation. Diabetes mellitus and hypertension are important risk factors for coronary artery disease due to atherosclerosis. The higher prevalence of hypertension and diabetes mellitus among patients again highlights the fact that these are major risk factors toward infection with SARS-CoV-2. A study that is done in India by Kaliyaperumal et al.,[21] consisted of 315 cases with 81% of patients having cardiac involvement among which 36.8% patients had diabetes mellitus and 30.5% had history of hypertension. In this study, systemic hypertension had significant correlation with ischemic changes in ECG.

The most common clinical presentation of patients in our study was dyspnea (93.3%) followed by fever (78.3%). Cough was also a common feature (73.3%) which was predominantly with expectoration (40%). There was a study in China by Wang et al.,[22] that included 138 patients where the most common symptom at the onset of illness was fever (98.6%), followed by fatigue (69.6%) and cough (59.4%). Dyspnea was seen in 31.2% of patients. A meta-analysis that has been done in India by Singhal et al.,[23] on 46 studies all over the world with 13,624 patients also described the most common symptom to be fever (83%) followed by cough (60%) and dyspnea (42%). Dyspnea being a more common symptom in our study than the others may be the due to the inclusion of only moderate (SpO_2=90–94%) and severe category (SpO_2<90%) patients in our study where the patients have significant amount of hypoxia according to the definition of these categories. As per our study exclusion criteria, we excluded patients with mild category of SARS-CoV-2.

Respiratory system is the first and most common system that is involved in patients of infection with SARS-CoV-2. On clinical examination, we found that the range of SpO_2 on room air was 40–94%. We had 23 patients (38.3%) with SpO_2 between 90 and 94% and 37 patients (61.7%) with SpO_2<90%. The reasons for this decreased saturation may be due to the development of acute lung injury, pneumonia, ventilation-perfusion mismatch, pulmonary embolism, pulmonary fibrosis, and congestive heart failure following cardiovascular injury. During systemic examination, we found 51 patients (85%) had respiratory system abnormality in which most common finding was crepitations (78.3%) followed by rhonchi (6.67%). The higher prevalence of crepitation may be due to the lung involvement due to acute lung injury (33.3%), pneumonia (68.3%), congestive heart failure (1.67%), pulmonary edema (5%), and sepsis. On arterial blood gas analysis, it was found that 14 patients (23.3%) were in type 1 respiratory failure, 8 patients (13.3%) in type 2 respiratory failure, and 20 patients (33.3%) had PaO_2/FiO_2 ratio between 200 and ≤300 mm hg indicating acute lung injury. A meta-analysis was done by Schmidt et al.,[24] on 4244 patients among which 2233 patients had ARDS needing ICU care. In that study, there were 24% patients with mild ARDS, 52% with moderate ARDS, and 24% belonged to severe category. In our study, on radiological findings 98% of the chest X-rays were abnormal. This was mainly due to the inclusion of moderate and severe category patients where bilateral infiltrations and pneumonia are common findings. The patients were further followed up with HRCT chest to identify the category and classify the type of respiratory involvement present among the patients. Here, we found that most common involvement was bilateral ground glass opacities (68.3%). Other findings consisted of lobar consolidation (6.7%), pulmonary edema (5%), cavitatory lesion (5%), pneumothorax (3.3%), tree in bud appearance (3.3%), emphysematous changes (3.3%), and pleural effusion (3.3%). This is in accordance study done in China by Ren et al.,[25] comprising 41 patients of mild and severe category, the distribution of lung involvement consisted of ground glass opacity in 68.6% patients, consolidation in 41.1% patients, and pleural effusion in 13.7% patients. There were some patients with both ground glass opacities and consolidation. Another study done in Italy by Salvatore et al.,[26] described the CT findings of 98 patients where there were 10% patients with isolated ground glass opacity, 2% patients with isolated consolidation, and 87.8% patients with both. Emphysema was also seen in 33.8% patients. Hence, it can be said that ground glass opacity is the most common finding in patients of infection with SARS-CoV-2 of moderate and severe categories. It can be associated with other findings such as consolidation, pulmonary nodule, cavity, emphysema, or pleural effusion.

In our study, 25% of the patients had cardiovascular involvement based on the assessment of ECG, cardiac markers such as qualitative Troponin T and CK-MB. Based on these abnormalities 9 patients (15%) had ACS. On further analysis it included STEMI (3.3%), non- STEMI (NSTEMI) (10%), and unstable angina (1.67%). Among the NSTEMI patients, 2 had lateral wall involvement, 2 had anteroseptal wall involvement, and 2 had inferior wall involvement. One NSTEMI patient had first degree

heart block. 5 NSTEMI patients had troponin T positive value and one had raised CK-MB with negative troponin T. Among the 2 STEMI patients, one patient had positive troponin T value and the other one had raised CK-MB only. One patient with anterolateral STEMI had left bundle branch block. Troponin T was positive in total of 8 patients. The higher positive value of troponin T may reflect the presence of myocarditis or ACS in patients of infection with SARS-CoV-2. Troponin T had a significant correlation with abnormal ECG ($P<0.001$) in our study. The mean CK-MB value was 14.78±10.3 ranging from 6 to 70. CK-MB was raised in 10 patients (16.67%). Among these patients with cardiovascular involvement 10% patients had cardiomegaly on Chest X-ray and one patient (1.67%) had pulmonary edema on Chest X-ray. Hence, as per the studies there is not only myocardial injury but conduction system involvement is also common as well in patients with infection with SARS-CoV-2. A study is done in India by Kaliyaperumal et al.,[21] including 315 patients where the abnormal ECG findings included ST elevation in 8.6% patients, ST depression in 3.2% patients, T wave inversion in 23.8% patients, sinus bradycardia in 12.7% patients, prolonged PR interval in 2.9% patients, and irregular rhythm in 2.9% patients. There was higher prevalence of cardiovascular abnormality among the severe and moderate category patients as compared to mild category patients.

In our study, analysis of biochemical leukocytosis was more common (31.67%) than leukopenia (1.67%). In differential count lymphopenia was there in 73.3% and neutrophilia was present in 53.3% patients. The reason for occurrence of neutrophilia may be due to the chemotactic response in pulmonary epithelial cells which causes activation of polymorphonuclear neutrophils. The lymphopenia may be due to the older age group patients in our study in whom immunity weakens with age thus predisposing them to infection with SARS-CoV-2 and causing a further decrease in immune cells. Hence, according to our data, it can be concluded that infection with SARS-CoV-2 is associated with leukocytosis. About 10% of the patients had higher ALP levels. This may be due to liver injury due to hypoxic injury, hyperinflammatory state, and sepsis. Significant amount of dyselectrolytemia was seen among the patients. In electrolytes, 16 patients (26.67%) had hyponatremia while 2 patients (3.3%) had hypernatremia. The high prevalence of hyponatremia may be due to the effect of invasion of renal epithelium directly or indirectly through inflammatory cytokines leading to electrolyte disbalance. In potassium value, 16 patients (26.67%) had hyperkalemia and 4 patients (6.67%) had hypokalemia. The importance of this is hyperkalemia and is an important factor leading to cardiac arrhythmias. Another significant finding in our study was hypoalbuminemia in 14 patients (23.3%). The reason for hypoalbuminemia may be due to the utilization of amino acids of the body by the virus during replication or may also be due to the liver injury directly or indirectly by the virus leading to decreased production of albumin in the body.[27] In our study, nutritional deficiency in older age group, liver injury and prevalence of diet lacking in protein may be the cause of hypoalbuminemia in patients of infection with SARS-CoV-2.

To summarize our study, we found that infection with SARS-CoV-2 can involve any age group of patients but more frequently middle aged and elderly individuals with slightly higher incidence in males. The large majority of patients presents with fever, cough, and dyspnea. Incidence of other symptoms varied and included sore throat, chest pain, abdominal pain, loose stool, vomiting, dysuria, altered sensorium, seizures, and skin lesions. Respiratory system involvement is seen in large majority of patients (85%) and both Type 1 respiratory failure (23.3%) and Type 2 respiratory failure (13.3%) occurs. On radiological investigation, the lung parenchymal involvement with ground glass opacities in bilateral lungs (68.3%) is the most common finding. According to the CT severity index, severe category patients (56.67%) are more prevalent in our study than moderate category (41.67%). Cardiovascular abnormality (25%) is another common complication in this infection. There are 9 patients (15%) with ACS in the form of STEMI (3.3%), NSTEMI (10%), and unstable angina (1.67%). Other complications include conduction abnormalities such as atrial fibrillation (1.67%), bundle branch block (3.3%), bradycardia (1.67%), congestive heart failure (5%), and myocarditis. ACS, myocardial injury, and conduction abnormalities correlate with cardiac marker abnormality. Hence, it can be said that moderate to severe category of SARS-CoV-2 patients need to be carefully examined for cardiovascular and respiratory involvement to formulate effective therapeutic strategies to lower the mortality in these patients.

Limitations of the study

The limitation of our study was that since it was cross-sectional and not prospective, follow-up of patients was not done. Only a small sample of 60 was included in the study.

But to reiterate even in such a small group the burden of cardiovascular morbidity was significant.

CONCLUSION

We cannot overemphasize the need to evaluate cardiac comorbidities thoroughly in all moderate to severe SARS-CoV-2 cases and treat them in timely manner thereby reducing worsening due to coronary events.

ACKNOWLEDGMENT

We are grateful to the patients who consented to participate and for their cooperation. Cooperation from Department of Radiology, GTB hospital also helped in this research.

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Authors' Contributions:
SM and GSR- Concept and design of the study, prepared first draft of manuscript; **SM, GSR and SN-** Reviewed the literature, and manuscript preparation; **SM, GSR and AT-** Concept, coordination, statistical analysis and interpretation, Interpreted the results; **GSR, SM and AT-** Revision of the manuscript.

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Source of Support: Nil, **Conflicts of Interest:** None declared.