Dear Editor,

Across the globe, cardiovascular manifestations were commonly found among hospitalized and severe COVID-19 patients, which showed a significant impact on heart performance. Suppose any patient has pre-existing heart diseases/problems. In that case, the physicians should treat the patient with utmost care as the patient would be at high risk for morbidity and mortality due to COVID-19. The latest published literature described cardiac inflammatory necrosis, thromboembolism, disseminated intravascular coagulation, myocardial infarction, and heart failure were common cardiovascular manifestations, and ST-segment elevations/depressions, cardiac tamponade, arrhythmias, COVID-19-related myocarditis, Brugada-like pattern, and medication-induced cardiac dysrhythmias were the most common electrocardiographic manifestations.1,2 Usually, abnormal electrocardiography (ECG) waveforms indicate the underlying cardiac disorders if present in the patient. In this paper, we described various ECG manifestations and their implications in the early prediction of COVID-19 outcomes.

ECG and COVID-19

It has been observed that in COVID-19 patients, ST-T changes, sinus tachycardia, and atrial fibrillation observed in ECG have a great significance in the diagnosis of the severity of the disease, myocardial injury, and cardiac insufficiency.1,2 ST-T abnormal changes have been found as the most prevalent ECG manifestations in COVID-19 patients, especially in severe cases. ST-T change may be associated with hypocalcemia, hypertension, coronary heart disease, or myocardial damage induced by SARS-CoV-2. COVID-19 induced myocarditis can influence the development of ischemic heart disease. If a COVID-19 patient presents with chest pain, ECG findings may be similar to that of myocarditis.2 Hence, the patient’s history should be considered in such cases; it should be noted whether the patient has ischemic heart disease, dyslipidemia, diabetes, impairment in coronary arteries, and/or any history of coronary angiography. Serum troponin elevation has been observed in severe COVID-19 infection, which might attribute to cardiac involvement. Hence, the level of such cardiac enzymes should be evaluated to determine the diagnosis of myocarditis in COVID-19 patients.2

Early Detection of COVID-19 Outcomes Using ECG

Right Heart Strain on ECG

Using 12-lead ECG, Raad et al3 conducted a study to assess the association of right heart strain (RHS) with outcomes of severe and hospitalized COVID-19 patients. A retrospective study was conducted involving 480 patients by analyzing the ECG obtained during admission. RHS in ECG was confirmed by S1Q3T3 pattern, ST depressions with T-wave inversions in leads V1 to V3, new right-axis deviation, and leads II, III, aVF not present on a previous ECG.

• Cardiac injury (based on ECG) can be confirmed by T-wave flattening or inversion (probably not due to repolarization abnormalities), ST elevation or depression, R/S transition.
• Cardiac injury (based on laboratory data) can be confirmed by elevated troponin levels, high d-dimer levels, B-type natriuretic peptide [BNP], and N-terminal pro-BNP.

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Sinus tachycardia was the most common dysrhythmia found. The primary outcomes observed in this study were the need for mechanical ventilation and death. The secondary outcomes include acute respiratory distress syndrome and acute kidney injury, and various systemic outcomes. RHS-ECG findings are strongly associated with the worst outcomes, and these are independent predictors of mortality and the need for mechanical ventilation.3

In a systematic review, Nemati et al. assessed 31 articles involving 2379 patients and found an association between ECG findings and outcomes of the COVID-19 patients. ST-segment elevation, bradycardia, T-wave inversions, QT prolongation, atrial fibrillation, and left ventricular ejection fraction were found to be early predictors of worse COVID-19 outcomes.4 In a prospective single-center case-control study, De Vita et al. investigated the clinical profile and implications of abnormal ECG of COVID-19 patients compared with infectious acute respiratory diseases caused by other pathogens. A total of 556 patients were studied, 324 were COVID-19 positive patients and 232 patients were diagnosed with other infectious acute respiratory diseases. Standard 12-lead ECG was used, and atrial fibrillation, arrhythmias, ST-segment/T wave changes, and intraventricular conduction disorders were recorded.5 ECG abnormalities were found in 37% of the COVID-19 group and 43.5% of the no-COVID-19 group. The patients were followed up, and deaths noticed were 15.7% of the COVID-19 group and 12.9% of the no-COVID-19 group. ST-segment depression, a combination of Q, R and S wave (QRS) duration, and presence of any ECG abnormality were independently associated with mortality (assessed by multivariable Cox regression analysis). So, ECG findings at the time of admission helped physicians to predict the high risk of death among patients.5

Conclusion

In the current scenario of the COVID-19 pandemic, ECG findings along with specific cardiac biomarkers should be considered good indicators for outcomes due to COVID-19. ST-segment changes, T-wave changes, arrhythmias were the most common ECG findings, and elevated troponin was the most common cardiac biomarker. The above findings in COVID-19 patients were used as early predictors of worst COVID-19 outcomes in many studies. Physicians should use ECG findings wisely to diagnose myocardial injury and cardiovascular disorders along with risk stratification of COVID-19 patients.

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