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Correspondence



Cardiovascular disorders followed by SARS-CoV-2 infection: An inevitable challenge – Correspondence^{*}

Dear Editor,

The SARS-CoV-2 is a highly virulent contagious pathogen that mostly affects the respiratory system in humans, particularly in susceptible individuals with underlying comorbidities, e.g., patient age, hypertension, diabetes mellitus, and cardiovascular diseases [1]. However, the continuous evolution and emergence of novel variant of concern (VOC) strains have intensified the current situation. As writing of this letter, there are 565 million confirmed cases with 6.37 million deaths worldwide.

The clinical presentations of SARS-CoV-2 infection vary from asymptomatic carriers to severe pneumonia with respiratory failure and even death. Current evidence suggests that cardiovascular-related mortality has increased during the COVID-19 pandemic. In China, 22.7% of deaths occurred in individuals with pre-existing cardiovascular disorders [2]. Previously, it has been revealed that pneumonia and influenza virus considerably increased the risk of susceptibility to acute myocardial infarction to about six-fold [3]. According to medical literature review, the prevalence of cardiac complications in COVID-19-infected individuals ranged from 20% to 44% in observational studies [4]. Several underlying risk factors such as elderly patients, severity of COVID-19 infection, respiratory failure, cardiovascular comorbidities, immune-compromised status, or receivers of any cardiotoxic therapies to be associated with development of cardiac complications [5]. MRI evidence showed presence of cardiac inflammation in COVID-19 infected persons with cardiovascular complications [6]. It seems that the SARS-CoV-2 virus has specific targets on cells of the cardiovascular system, and SARS-CoV-2 can be recruited in the heart following viremia or immune cell trafficking. Furthermore, SARS-CoV-2 can also cause direct myocardial injury resulting from hypoxemia, inflammatory myocarditis, microvascular dysfunction followed by thrombus formation, acute plaque rupture, or cytokine storm following systemic inflammation [7].

Most current studies emphasize on clinical characteristics and the respiratory failure of COVID-19. However, the evaluation of cardiovascular complications following COVID-19 has been less reported in the medical literature. We collected all available retrospective observational studies on cardiovascular complications following SARS-CoV-2 infection and their effects on final clinical outcomes.

There are fourteen retrospective studies on 4518 SARS-CoV-2 infected individuals that included 3085 survivors and 1433 deaths cases [8–21]. The results showed that the pooled prevalence of shock was 18.2% (95%CI: 14.2–23.0), myocarditis 23.8% (95%CI: 16.0–33.7),

heart failure 10.6% (95%CI: 5.2–20.4), and arrhythmia 13.2% (95%CI: 6.3–25.7). When compared survivors with deaths, the pooled odds ratio (OR) demonstrated the risk of shock was 3-fold higher (OR: 3.02; 95%CI: 1.58–4.46). The risks of myocarditis, heart failure, and arrhythmia were also significantly higher in death-related COVID-19 patients (OR: 3.19 (95%CI: 2.03–4.35), OR: 1.84 (95%CI: 0.44–3.23), and OR: 2.63 (95%CI: 1.67–4.12), respectively.

Consistent with our findings, Cannata et al., in 2022 showed that hospital mortality for patients with cardiovascular conditions during the COVID-19 pandemic was 62% higher than the pre-pandemic [22]. Recent studies found presence of SARS-CoV-2 RNAs and their proteins in heart tissues. Indeed, the entry of SARS-CoV-2 into hearts and hypoxemia-related respiratory failure can make their hosts susceptible to cardiovascular complications. Our study showed that shock, myocarditis, arrhythmias, and heart failure were more in SARS-CoV-2 infected individuals. The mortality was also significantly higher in these cases. Thus, careful monitoring of cardiovascular complications in patients is essential to improve patient management. Hyper-coagulation is common in SARS-CoV-2 infected cases with severe respiratory failure, but thrombolytic therapy can increase the risks of serious cardiovascular outcomes, including interracial hemorrhage, systemic hemorrhage, immunologic complications, hypotension, and myocardial rupture [23]. There is still limited information on the effects of SARS-CoV-2 infection on cardiovascular complications. Further investigations are needed to elucidate the true clinical relevance of SARS-CoV-2 infection on the cardiovascular system.

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