

# Cardiac Injury and Mortality in Hospitalized COVID-19 Patients

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## Study Questions:

What is the association between cardiac injury and mortality in patients with COVID-19?

**Methods:** The investigators conducted a cohort study of 416 patients from January 20, 2020, to February 10, 2020, in a single center at Renmin Hospital of Wuhan University, Wuhan, China; the final date of follow-up was February 15, 2020. All consecutive inpatients with laboratory-confirmed COVID-19 were included in this study. Clinical laboratory, radiological, and treatment data were collected and analyzed. Outcomes of patients with and without cardiac injury were compared. The association between cardiac injury and mortality was analyzed. Survival curves were plotted using the Kaplan-Meier method and compared between patients with versus without cardiac injury using the log-rank test. Multivariate Cox regression models were used to determine the independent risk factors for death during hospitalization.

**Results:** A total of 416 hospitalized patients with COVID-19 were included in the final analysis; the median age was 64 years (range, 21-95 years), and 211 (50.7%) were female. Common symptoms included fever (334 patients [80.3%]), cough (144 [34.6%]), and shortness of breath (117 [28.1%]). A total of 82 patients (19.7%) had cardiac injury, and compared with patients without cardiac injury, these patients were older (median [range] age, 74 [34-95] vs. 60 [21-90] years;  $p < 0.001$ ); had more comorbidities (e.g., hypertension in 49 of 82 [59.8%] vs. 78 of 334 [23.4%];  $p < 0.001$ ); had higher leukocyte counts (median [interquartile range (IQR)], 9400 [6900-13,800] vs. 5500 [4200-7400] cells/ $\mu$ l) and levels of C-reactive protein (median [IQR], 10.2 [6.4-17.0] vs. 3.7 [1.0-7.3] mg/dl), procalcitonin (median [IQR], 0.27 [0.10-1.22] vs. 0.06 [0.03-0.10] ng/ml), creatinine kinase-myocardial band (median [IQR], 3.2 [1.8-6.2] vs. 0.9 [0.6-1.3] ng/ml), myohemoglobin (median [IQR], 128 [68-305] vs. 39 [27-65]  $\mu$ g/L), high-sensitivity troponin I (median [IQR], 0.19 [0.08-1.12] vs.  $<0.006$  [ $<0.006-0.009$ ]  $\mu$ g/L), N-terminal pro-B-type natriuretic peptide (median [IQR], 1689 [698-3327] vs. 139 [51-335] pg/ml), aspartate aminotransferase (median [IQR], 40 [27-60] vs. 29 [21-40] U/L), and creatinine (median [IQR], 1.15 [0.72-1.92] vs. 0.64 [0.54-0.78] mg/dl); and had a higher proportion of multiple mottling and ground-glass opacity in radiographic findings (53 of 82 patients [64.6%] vs. 15 of 334 patients [4.5%]). Greater proportions of patients with cardiac injury required noninvasive mechanical ventilation (38 of 82 [46.3%] vs. 13 of 334 [3.9%];  $p < 0.001$ ) or invasive mechanical ventilation (18 of 82 [22.0%] vs. 14 of 334 [4.2%];  $p < 0.001$ ) than those without cardiac injury. Complications were more common in patients with cardiac injury than those without cardiac injury and included acute respiratory distress syndrome (48 of 82 [58.5%] vs. 49 of 334 [14.7%];  $p < 0.001$ ), acute kidney injury (7 of 82 [8.5%] vs. 1 of 334 [0.3%];  $p < 0.001$ ), electrolyte disturbances (13 of 82 [15.9%] vs. 17 of 334 [5.1%];  $p = 0.003$ ), hypoproteinemia (11 of 82 [13.4%] vs. 16 of 334 [4.8%];  $p = 0.01$ ), and coagulation disorders (6 of 82 [7.3%] vs. 6 of 334 [1.8%];  $p = 0.02$ ). Patients with cardiac injury had higher mortality than those without cardiac injury (42 of 82 [51.2%] vs. 15 of 334 [4.5%];  $p < 0.001$ ). In a Cox regression

model, patients with versus those without cardiac injury were at a higher risk of death, both during the time from symptom onset (hazard ratio [HR], 4.26; 95% confidence interval [CI], 1.92-9.49) and from admission to endpoint (HR, 3.41; 95% CI, 1.62-7.16).

**Conclusions:** The authors concluded that cardiac injury is a common condition among hospitalized patients with COVID-19 and it is associated with higher risk of in-hospital mortality.

**Perspective:** This cohort study reports a statistically significant association between cardiac injury and mortality in patients with COVID-19. Furthermore, cardiac injury was a common complication (19.7%), and was associated with an unexpected high risk of mortality during hospitalization. Based on available data, it appears that an intense inflammatory response superimposed on pre-existing cardiovascular disease may precipitate cardiac injury in patients with COVID-19 infections. Given the frequency of cardiac injury in COVID-19, clinicians should consider this complication in COVID-19 management. There is a need for additional studies to define optimal management of cardiac injury among COVID-19 patients.