



Letter to the Editor

Clinical characteristics and prognosis of 1589 omicron patients with cardiovascular disease in Shanghai



Dear Editor,

A recent letter published in this journal provided important evidence for systematically understanding clinical characteristics and outcomes of 1965 patients infected by Omicron in Shanghai.¹ Omicron variant of the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has rapidly resulted in numerous asymptomatic and mild cases during pandemic of Corona virus disease 2019 (COVID-19) in Shanghai.² Considering higher infectivity and lower severity of Omicron, shelter hospitals providing isolation for non-severe cases were used to effectively cut down further spread of virus.³ In shelter hospitals, there were many patients combined with cardiovascular disease (CVD), who might have different clinical features and prognostic outcomes. According to previous studies in Wuhan, CVD patients infected with SARS-CoV-2 were more likely to have severe pulmonary edema, multiple organ failure and high rate of mortality.^{4, 5} However, little is known about Omicron infection combined with CVD. We aimed to comprehensively analyze clinical characteristics and outcomes of CVD patients infected with Omicron in shelter hospital.

In this study, a total of 1589 COVID-19 patients with confirmed diagnoses of hypertension, coronary heart disease (CHD) or chronic heart failure (CHF) in Shelter Hospital of National Convention and Exhibition Centre, the largest shelter hospital in China, were enrolled during April 14 to May 8 2022. Children under 18 years and pregnant women were excluded. Informed consent has been obtained from all the participants. This study was approved by the Ethics Committee of Chinese PLA General Hospital (S2022-769-01). RT-qPCR targeting nucleocapsid protein (N) and open reading frame 1ab (ORF 1ab) gene was daily detected for patients from admission to discharge. Primary outcomes were deterioration, which meant admission into designated hospitals or ICU. The second outcomes were length of stay (LOS) in hospital, which meant the days from admission to discharge in shelter hospital. Basic information, including gender, age, ethnicity, comorbidity, vaccination status, initial symptoms, was recorded and verified carefully. If some data were missing or unclear, we re-obtained them by directly communicating with patients within 24 hours. Continuous variables were described as median and interquartile range (IQR) and categorical variables were summarized as percentages and numbers. Fisher's exact probability test was performed to compare difference of proportions for categorical variables. The Mann-Whitney U test was performed to analyze the difference between two independent groups of continuous variables. Spearman's correlation was performed to evaluate correlations between stay length in hospital and other variables.

In the entire cohort, median age was 57 years (IQR, 49–65). Distribution diagram in Fig. 1A revealed that age of adult patients was concentrated in range of 45–75 years old, in which 1264 patients accounted for 79.5%. The most common comorbidity of CVD was hypertension (1363, 85.8%), followed by CHD (397, 25.0%) and CHF (92, 5.8%) (Fig. 1B). 66.8% of participants were initially diagnosed with asymptomatic infection. Cough was the most common symptom (23.2%), followed by expectoration (14.7%), fatigue (8.3%) and fever (6.0%) (Fig. 1C). Similarly, a recent study showed that clinical symptoms of patients with Omicron infection were more complex and needed to be differentiated from influenza.⁶ The median LOS was 5 days (IQR, 4–7). Distribution curve in Fig. 1D demonstrated that most of participants (98.0%) were discharged within 2 weeks, 77.9% discharged within 7 days. These findings can be explained by lower pathogenicity of Omicron variants⁷ and exclusion of severe cases from shelter hospitals on admission.

Eventually, only 8 participants (0.5%) had deteriorated and were transferred to designated hospitals for further treatment. Results showed that CVD Patients with deterioration were significantly older than those without deterioration (67.5 vs. 57.0, $P=0.005$, Fig. 1E). In addition, percentage of deterioration among patients with CHF was remarkably higher than that without CHF (3.3% vs. 0.3%, $P=0.002$, Fig. 1F). These results suggested that patients who were older or with CHF should be treated more cautiously due to the higher risk of deterioration. In contrary, percentage of vaccinated patients in deterioration group was significantly lower than that in non-deterioration group (37.5% vs. 75.3%, $P=0.040$, Fig. 1G). Moreover, booster vaccination effectively reduced the rate of deterioration (0.1% vs. 1.3%, $P=0.050$, Fig. 1H). Therefore, accelerating coverage of vaccination, especially booster vaccination, might be an effective strategy to fight against COVID-19 pandemic in the future.

Further, data showed that LOS in shelter hospital was positively correlated with age (Spearman $r=0.136$, $P<0.001$, Fig. 2A). Consistently, a previous study has revealed a similar trend that adults gradually recover slower from the infections as they age.¹ In contrary, an inversely proportional relationship was observed between LOS and CT values of N gene on admission, semi-quantitative proxies of viral load (Spearman $r=-0.096$, $P<0.001$, Fig. 2B). Previous studies have demonstrated that Ct value is associated with biochemical and hematological markers,⁸ disease severity⁹ in COVID-19 patients. Compared with asymptomatic cases, those with cough, expectoration, fatigue, fever or myalgia had longer LOS in shelter hospital (both $P<0.005$, Fig. 2C). In addition, vaccinated patients had shorter LOS than unvaccinated patients ($P=0.047$, Fig. 2D). All of above characteristics could be used to predict the length of stay, manage public resource allocation and adjust pandemic control strategies faster.

Taken together, this study provides important evidence to comprehensively understand clinical characteristics of CVD patients in-

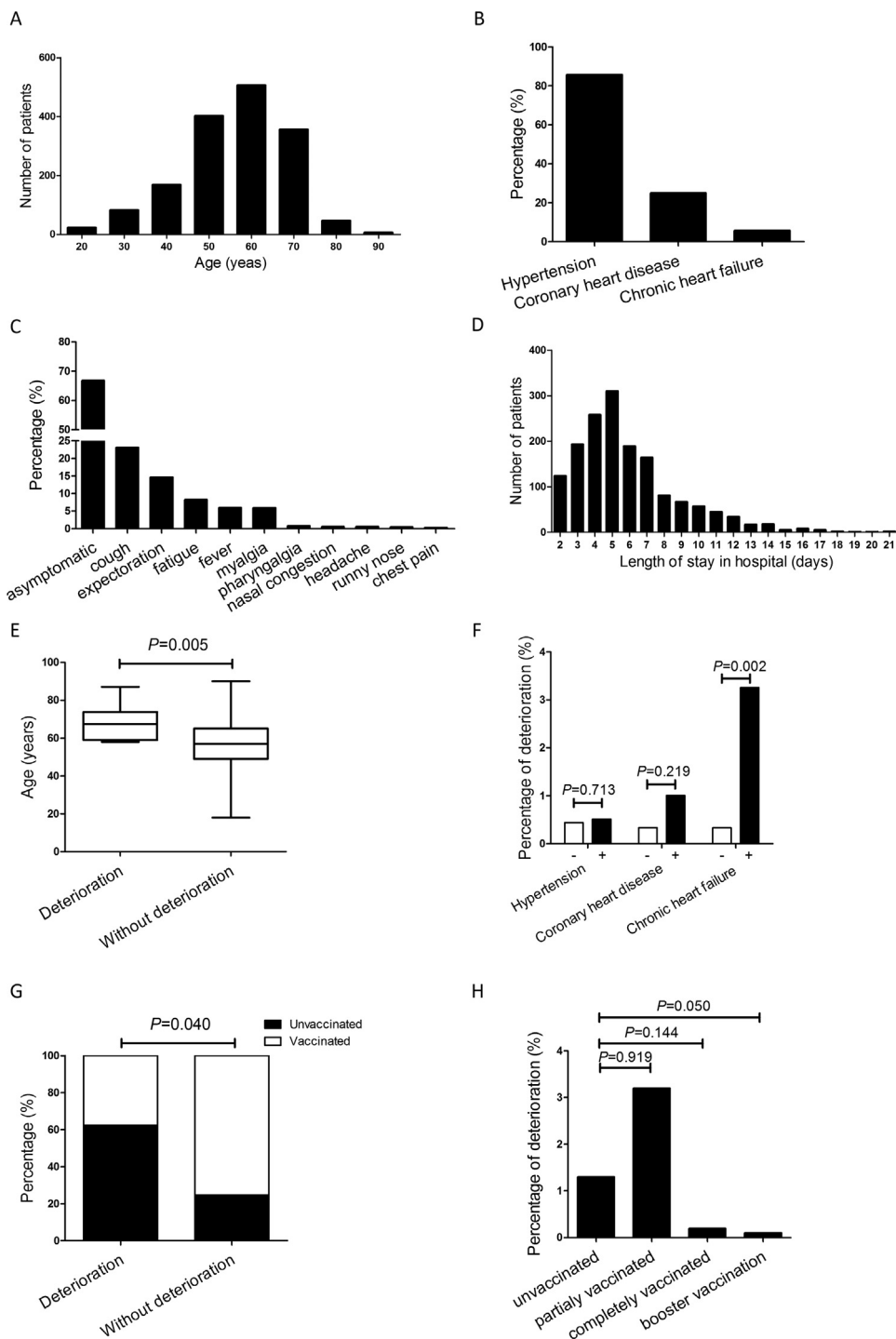


Fig. 1. Clinical characteristics and risk factors of CVD patients infected by Omicron. (A) Distribution of patients' age. (B) Proportion of Omicron patients with different CVD comorbidities, including hypertension, coronary heart disease and chronic heart failure. (C) Proportion of patients with different initial symptoms. (D) Distribution of length of stay (LOS) in hospitals among patients without deterioration. (E) Comparison of ages in deterioration group and non-deterioration group subjects. (F) Percentage of deterioration in patients with hypertension, coronary heart disease and chronic heart failure, respectively. (G) Percentage of vaccinated and unvaccinated patients in deterioration group and non-deterioration group. (H) Percentage of deterioration in patients with different vaccination status.

ected with Omicron. Milder symptoms, shorter hospital duration and better outcomes underline that pandemic control strategies for CVD patients should be improved in time. By analyzing risk factors of short-term prognosis, including deterioration and LOS, it was observed that older or unvaccinated CVD patients were more likely to have longer LOS and deterioration. Therefore, accelerating vaccination among CVD patients might play a contributing role better preparation during the COVID-19 future epidemic.

Declaration of Competing Interest

All the authors declare no conflicts of interest.

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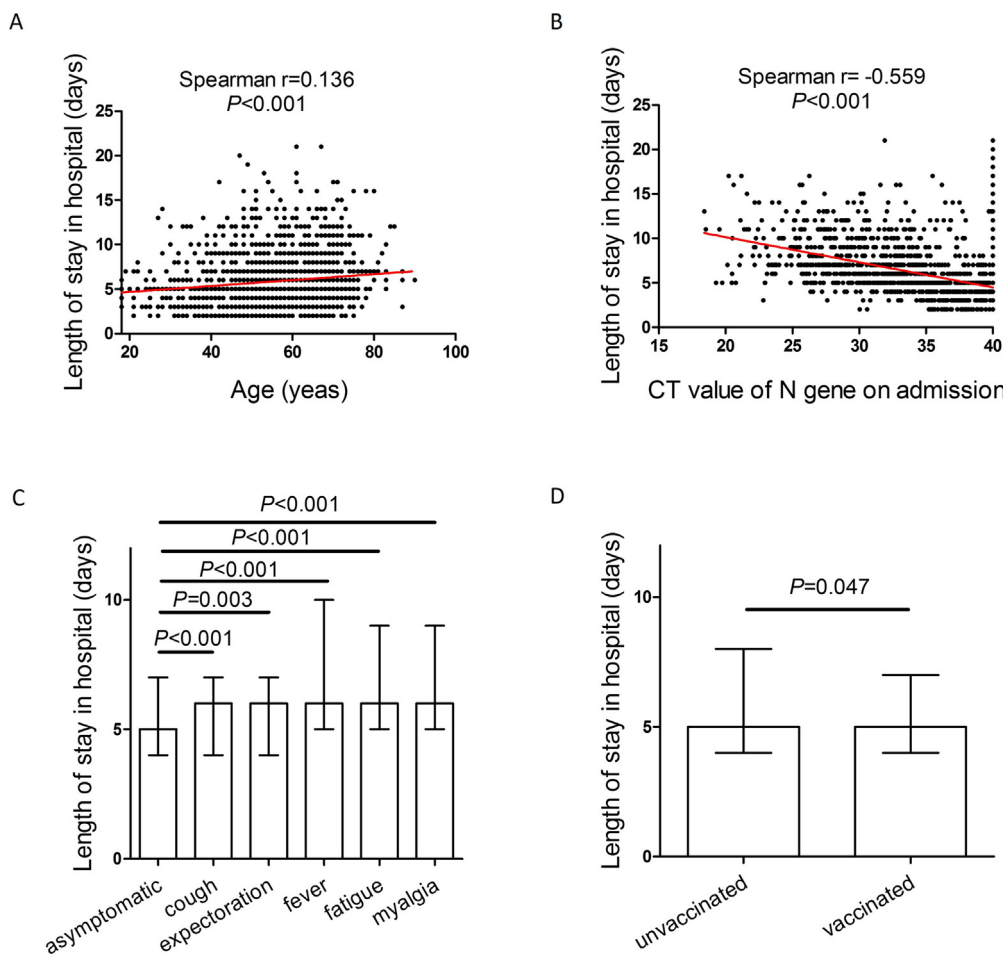


Fig. 2. Influencing factors for LOS in CVD patients infected by Omicron. (A) Correlation analysis between LOS and ages. (B) Correlation analysis between LOS and Ct values of N gene. Red lines represent fitted curves. (C) LOS of patients with different initial symptoms. (D) LOS of vaccinated and unvaccinated patients.

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Chun Yin¹

Department of Cardiology, Xinqiao Hospital, Third Military Medical University (Army Medical University), Chongqing, China
 Department of Cardiology, the 902nd Hospital of PLA Joint Service Support Force, Bengbu, China

Mingpeng Jin¹

Key Laboratory of Arrhythmias of the Ministry of Education of China, Research Center for Translational Medicine, East Hospital, Tongji University School of Medicine, Shanghai, China

Shuili Wang

Department of Cardiology, the 902nd Hospital of PLA Joint Service Support Force, Bengbu, China

Jun Jin*

Department of Cardiology, Xinqiao Hospital, Third Military Medical University (Army Medical University), Chongqing, China

Cheng Chen**

The Second Medical Center & National Clinical Research Center for Geriatric Diseases, Chinese PLA General Hospital, Beijing, China

*Corresponding author at: Department of Cardiology, Xinqiao Hospital, Army Medical University (The Third Military Medical University), Chongqing, China.

**Corresponding author at: The Second Medical Center & National Clinical Research Center for Geriatric Diseases, Chinese PLA General Hospital, Beijing, China.

E-mail addresses: jjxqyy@163.com (J. Jin), m18702980988@163.com (C. Chen)

¹ Chun Yin and Mingpeng Jin contributed equally to this work.