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A Follow-up Study of Recovered Patients with COVID-19 in Wuhan, China

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The 2019 novel coronavirus disease (COVID-19) epidemic has clearly entered a new stage with rapid spread in countries outside China^[1]. It has been declared a pandemic by the World Health Organization. The Chinese government has taken serious actions and made unremitted efforts in prevention and control of COVID-19 epidemic, including imposing quarantines and travel restrictions on an unprecedented scale and investing a huge amount of medical resources^[2]. Currently, a large number of COVID-19 patients in Wuhan have been cured and discharged.

In Wuhan, China, all cured patients with COVID-19 are required to quarantine in either a designated hotel room or at home for 14 days^[3]. They will return to normal

social life after a follow-up by strictly eliminating the recurrence of COVID-19. They will receive follow-up check-ups in a designated fever clinic, including physical examination, laboratory test including IgG and IgM antibody, C-reactive protein, the level of leukocyte and lymphocyte, and chest CT scan. At present, the outcome of these patients is not yet fully clear. We retrospectively evaluated the data of the recovered patients with COVID-19 in two different designated fever clinics in Wuhan, with a goal to provide relevant information about these patients.

A total of 1673 cured patients with COVID-19 were followed up in two different fever clinics from March 1, 2020 to March 20, 2020. The mean age of these patients was 46.5 years, and there were 905 males and 768 females. The mean surveillance time was 19.7 days (14-27 days). Each patient was followed up for a mean of 3.5 times (2-6 times). After all respiratory symptoms disappear, lung consolidation on chest CT imaging is completely absorbed, and throat-swab sputum real-time reverse-transcriptase polymerase-chain-reaction (RT-PCR) assay is negative for SARS-CoV-2 virus, these patients can return to normal social life (Figure 1).

A total of 13 (13/1673, 7.7‰) patients with COVID-19 were relapsed, and all of these patients presented with related symptoms of COVID-19. The chest CT imaging showed a progressive lung lesion with consolidation, and RT-PCR test was positive for SARS-CoV-2 virus. Hence, these patients were re-admitted to the designated hospital for treatment. However, no patient needed to enter ICU. The serological test for IgG antibody was negative in 10 (10/13, 76.9%) cases, IgM antibody was positive in 3 (3/13, 23.0%) cases, and both IgG and IgM were positive in 3 (3/13, 23.0%)

cases. In addition, all these relapsed cases had a high level of C-reactive protein (21.6 ± 3.7 mg/L), and a low level of leukocyte ($1.9 \pm 0.3 \times 10^9$ /L) and lymphocyte ($0.4 \pm 0.2 \times 10^9$ /L).

The remaining 1660 patients with COVID-19 did not relapse. They had no symptoms of fever, sore throat, and dyspnea, and all cough symptoms disappeared at a three-week follow-up. IgG antibody was negative in 1543 (1543/1660, 92.9%) cases. However, IgM antibody was positive in 1170 (1170/1660, 70.9%) cases, and both IgG and IgM were positive in 178 (178/1660, 10.7%) patients. The mean levels of C-reactive protein (7.3 ± 1.5 mg/L), leukocyte ($5.4 \pm 1.7 \times 10^9$ /L), and lymphocyte ($2.5 \pm 0.8 \times 10^9$ /L) were within the normal range. Furthermore, the lung lesions all disappeared on imaging.

In this study, only 7.7‰ patients experienced recurrence during isolation and observation, and all presented with mild symptoms. No nosocomial transmission was found in this process. Serological tests to identify antibodies played a key role in surveillance of recurrence of COVID-19^[4]. The studies about viral shedding in discharged patients need further investigation.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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This study was approved by the Medical Ethical Committee of Zhongnan Hospital of Wuhan University.

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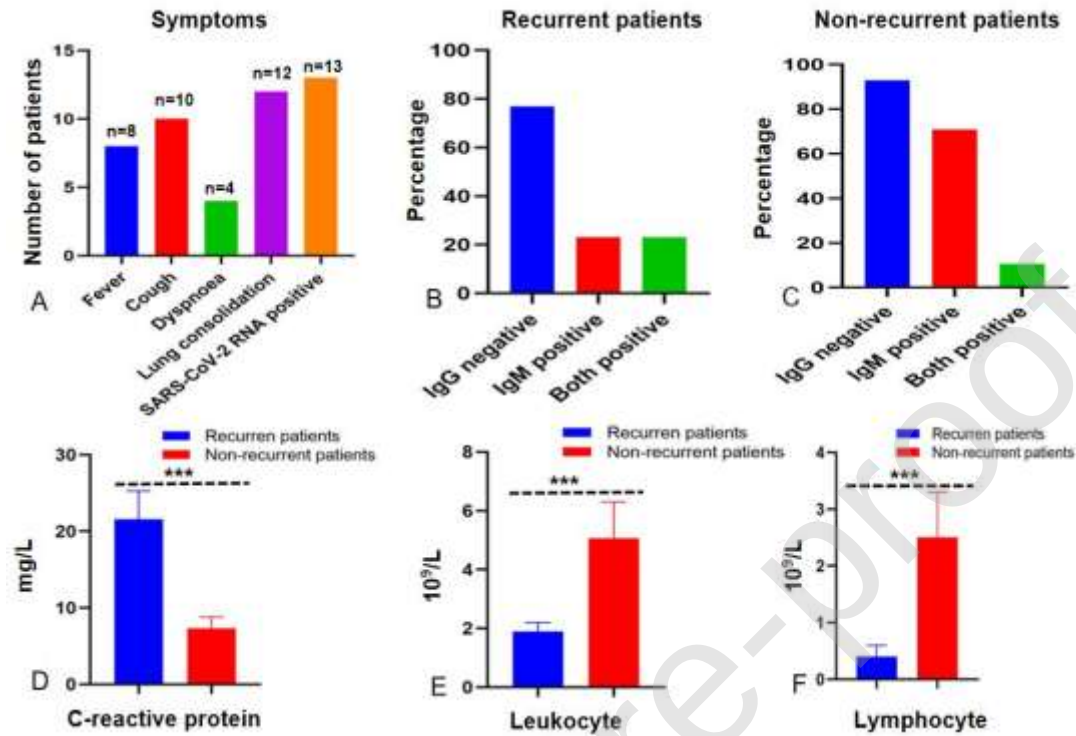


Figure 1. Data of recurrent patients and non-recurrent patients

Figure 1A: 13 patients with COVID-19 were relapsed, RT-PCR test was positive for SARS-CoV-2 virus and presented respiratory symptoms. Figure 1B: The serological test for IgG antibody was negative in 76.9% cases, IgM antibody was positive in 23.0% cases, and both IgG and IgM were positive in 23.0% cases of recurrent patients. Figure 1C: IgG antibody was negative in 92.9% cases, IgM antibody was positive in 70.9% cases, and both IgG and IgM were positive in 10.7% patients of free-relapsed patients. The mean levels of C-reactive protein (Figure 1D), leukocyte (Figure 1E), and lymphocyte (Figure 1F) were within the normal range of non-recurrent patients.

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