



Letter to the Editor



Possibility of Red Blood Cell Changes after COVID-19 Pandemic

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Dear editor,

The COVID-19 pandemic caused a lot of changes in society and the economy as well as individual, physical, and mental health. COVID-19 might cause acute respiratory syndrome, coagulopathy, vascular failure, and organ damage¹⁻³. In the study by Huang L et al., 2469 patients who recovered from severe COVID-19 were followed up for two years, the longest follow-up until now. They demonstrated that COVID-19 survivors had remarkably lower health status than the general population after two years and suggested urgent exploration into the pathogenesis of the disease⁴. Otherwise, there were some important issues with this study. First, it was not an international study that included different geographic regions, ethnicities, races, and countries. Another important point was that 80 percent of patients experienced mild or no symptoms of this disease which were excluded from this study. However, COVID-19 affected their health conditions as well as severe patients. It is clear that exposure to the virus in the recent pandemic is unavoidable and no one can be sure about the previous infection of the studied cases. Furthermore, many people were reluctant to take a PCR test despite mild symptoms and also, the PCR test has a high false-negative rate, which is affected by the sampling method and the time of interval^{5, 6}. It is suggested researchers investigate the COVID-19 effects on the general population.

Most COVID-19 patients reported breathlessness and reduced

fitness, which might be related to pulmonary damage and altered oxygen uptake into the red blood cells (RBC), leading to hypoxemia.

Some studies demonstrated that COVID-19 altered RBC morphology and revealed a higher percentage of elongated RBC⁷. The RBC deformability was significantly increased in COVID-19 patients⁷. Nader et al. showed that RBC aggregation increased in COVID-19 patients and correlated positively with the hospitalization length⁸. In a recent study, it was found that oxidation and fragmentation of ankyrin, spectrin beta, and the N-terminal cytosolic domain of band 3 (AE1) may cause RBCs disability in COVID-19 patients, who could respond to environmental changes in hemoglobin oxygen saturation/oxidant stress. Nonetheless, there were no alterations in hematological parameters, such as RBC count, hematocrit, or mean corpuscular hemoglobin concentration⁹. Based on these reports, the count of normal RBC is admissible, but maybe the function of RBCs in oxygen transfer have changes.

The above-mentioned studies indicated the temporary effects of COVID-19 on RBCs, but COVID-19 may cause some long-term effects on RBCs¹⁰. There is enough evidence indicating that the numbers of RBC and hematocrit (HCT) increase significantly in response to hypoxic environments, similar to changes that occur by living in high-altitude places¹¹. With the large-scale outbreak of

the COVID epidemic worldwide, the number of people using protective masks has increased rapidly. Using masks can cause problems, such as hypoxia symptoms, which increase RBC mass and HCT for a long time^{12,13}. According to recent studies, wearing a mask can alter peripheral Spo₂ after two hours, and it can cause small but significant changes in cerebral blood flow (CBF) and cerebral blood oxygen saturation (StO₂) while wearing different types of masks (surgical and FFP2)^{14,15}.

Based on the above-mentioned studies, the significant changes in RBC functions after the COVID-19 pandemic can be concluded, however the definitive diagnosis is not possible using routine laboratory tests. According to long-term changes in RBC count, the lack of any population-based studies on RBC changes before and after the COVID-19 pandemic, and the key role of RBC count in diagnosing disease, especially in anemia, more investigations seem to be necessary. Reference intervals need to be re-examined in the new health conditions after the COVID-19 pandemic.

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