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COVID-19 and the kidney

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In the year 2020, 2 million people lost their lives because of coronavirus disease 2019 (COVID-19) worldwide, and thousands of researchers have exhausted themselves to unravel the secrets of this novel disease. As owing to a shift in scientific priorities in this extraordinary year, many articles have been published in a short time, which sometimes sparked scientific debates (1). It is now clear that COVID-19 caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is not only a respiratory infection but also a systemic disease that affects multiple organs. This article has focused on the relationship between COVID-19 and the kidney, because kidneys are the most affected organs after the lungs in COVID-19 and because March 11, 2021, is World Kidney Day.

Both angiotensin-converting enzyme 2 (ACE2) and transmembrane protease serine type 2 (TMPRSS2) receptors play an important role in the entry of SARS-CoV-2 into the cell and are highly expressed in the kidneys (2). Therefore, the kidneys are one of the primary target organs of SARS-CoV-2 after the lungs (3). Indeed, early postmortem renal histopathological analyses in patients with COVID-19 have shown direct parenchymal infection in tubule epithelial cells and podocytes, acute tubular injury, and acute tubular necrosis (4). The pathogenesis of kidney damage in patients with COVID-19 is not yet clear; however, it is considered that kidney damage can result from direct cytopathic effects of the virus or other concomitant complications such as hypovolemia, acute respiratory distress syndrome, and hyperinflammatory state (5, 6). The most common findings of renal involvement are increased serum creatinine level, proteinuria, and hematuria (7). The development of acute kidney injury (AKI) is the most important predictor of mortality in adult patients with COVID-19 (7). The incidence of AKI has been reported up to 37% in hospitalized patients, and this rate is higher in patients admitted to the intensive care unit (ICU) (7-10). Notably, there are limited data on the incidence rate of AKI among pediatric patients with COVID-19. In a publication from China at the beginning of the pandemic, none of the 36 hospitalized children had renal dysfunction (11). In contrast, subsequent data have drawn attention to the increased frequency of AKI in children with COVID-19. An AKI incidence rate of 29% has been reported in hospitalized children, and this rate was 44% in children admitted to the ICU (12, 13). In addition to acute tubular injury, renal histopathological findings have also revealed different lesions due to COVID-19, such as tubulointerstitial nephritis, collapsing glomerulopathy, and thrombotic microangiopathy (14-16).

There is also strong evidence that patients with preexisting kidney disease are at increased risk of developing severe illness from COVID-19. The mortality rate is much higher among patients with advanced stages of chronic kidney disease, requiring dialysis and renal transplantation compared with those without kidney disease (17). Information on COVID-19 in children with kidney disease is scarce. Recently, a global study from 30 countries evaluated 113 pediatric COVID-19 patients with kidney disease receiving immunosuppressive medication (18). In this study, 47% of the patients had kidney transplants, 27% had nephrotic syndrome, and 10% had systemic lupus erythematosus; furthermore, it was shown that most of the patients had mild diseases. In addition, 4 deaths (4%) were reported, all of which were from low-income countries.

Kidney diseases are a global public health problem and currently affect approximately 850 million people worldwide (19). Every year, the second Thursday of March is celebrated as

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World Kidney Day. The World Kidney Day Steering Committee has declared 2021 as the year of "Living well with kidney disease" (20). In 2021, World Kidney Day aims to raise awareness of the rise in kidney disease worldwide. Obviously, in the COVID-19 era, it is not possible to ignore the effects of SARS-CoV-2 on kidney health within the goals of 2021. In this context, early recognition and prevention of AKI should be one of the top priorities to reduce mortality in hospitalized patients with COVID-19. As there is currently no specific antiviral treatment or management of SARS-CoV-2 infection, preventive measures and vaccination are essential to provide protection against SARS-CoV-2. It is important to prioritize patients at high risk of severe COVID-19 like patients with chronic kidney disease. The pandemic has also caused a serious disruption in the access to healthcare for patients with chronic conditions. In this global health crisis, there has been an increasing interest in the use of telemedicine to maintain healthcare, particularly for the care of patients with chronic illness (21). Telemedicine continues to make a significant impact in providing routine medical care to patients with preexisting kidney disease. On the other hand, the COVID-19 pandemic has affected the daily lives and changed the dietary and lifestyle behaviors of individuals due to the lockdown restrictions. These changes have brought along risks to kidney health, such as obesity and hypertension. Therefore, it is important to pay attention to maintaining healthy eating habits and being physically active.

In summary, COVID-19 remains a global threat to human health. Kidney involvement is common in COVID-19, and AKI is an important risk factor for mortality. One of the goals should be to prevent primary and secondary renal damage that may develop because of COVID-19 and to protect patients with kidney disease from the increased morbidity and mortality risks of COVID-19.

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