



# The impact of COVID-19 on kidney diseases

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## ■ Implication for health policy/practice/research/medical education

Although primary symptoms of COVID-19 are respiratory failure and hypoxia, renal dysfunction is frequently seen. Significant changes have been made to the incidence and treatment of renal disease as a result of the COVID-19 outbreak. Evidence suggests that COVID-19 affects kidney patients disproportionately or puts them in danger. Conversely, COVID-19 patients are at risk of acute renal injury, whereas dialysis patients and kidney transplant recipients are at higher risk of COVID-19 poor outcomes.

**Keywords:** COVID-19, Renal injury, Kidney damage, Viral infection

**Please cite this paper as:** Pakravan S, Teimouri K, Azadbakht K. The impact of COVID-19 on kidney diseases. J Parathyr Dis. 2022;10:e91498. doi:10.34172/jpd.2022.9149.

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## Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the culprit behind COVID-19. After being discovered for the first time in Wuhan, China, in December 2019, the illness spread fast to more than 40 million people in other countries. Clinical manifestations vary greatly in their symptoms, severity, and organ involvement. One of the main organs affected is the kidney, which exhibits acute renal damage associated with COVID-19 (1). Since SARS-CoV-2 antigens accumulated in renal epithelial tubules, renal impairment is likely the result of direct SARS-CoV-2 infection of the human kidney. Evidence has revealed that COVID-19 patients frequently experience acute renal injury, especially those who are in intensive care units (2). It probably affects more than 20% of hospital patients and more than 50% of patients in the intensive care unit, according to the evidence currently available (3). Since these patients are often older and frequently have high blood pressure, cardiovascular disease, and diabetes mellitus, patients who have undergone a kidney transplant or are on dialysis are at a particularly high risk of passing away (4). Immunosuppressive medications are also given to kidney transplant recipients, increasing their likelihood of contracting SARS-CoV-2 and showing severe symptoms (5). In this study, we will examine the relationship between COVID-19 and kidney diseases.

## Materials and Methods

The published papers that look at the connection between kidney failure and COVID-19 are reviewed in this article. ScienceDirect, Google Scholar, and PubMed databases

were searched for articles using keywords like COVID-19, kidney disorders, dialysis and kidney transplantation.

## Mechanism of kidney damage in covid-19 patients

The SARS-CoV-2 spike protein has a high affinity for the angiotensin-converting enzyme 2 (ACE2) receptors found on human cells. As a result, cells that express ACE2 may serve as target cells and be vulnerable to Covid-19 infection (6).

ACE2 expression is approximately 100 times higher in urinary organs (kidney) than in respiratory organs (lung) (7). ACE2 is highly expressed in the renal tubular epithelium, particularly in proximal tubule cells, the tubular epithelium may be a target for infection. Coronavirus entry into kidney cells via an ACE2-dependent pathway may therefore be the cause of kidney disease. ACE2-expressing target cells may also facilitate coronavirus entry, replication, dissemination, and pathogenesis (8).

Cytokine storm is another method that causes kidney injury. By binding to angiotensin-converting enzyme 2, the SARS-CoV2 spike protein initiates cell infection. Viral replication and cell infection then trigger inflammation in the host cell, which results in the release of pro-inflammatory cytokines. Cytokine storm is a term for the excessive release of cytokines in response to viral infection (9).

Organ failure, fast proliferation, and hyperactivity are characteristics of the potentially fatal illness known as cytokine storm syndrome. Additionally, T cells and macrophages are just two examples of the immune system's several parts that are identified. In patients with Covid-19,

Received: 10 July 2022, Accepted: 11 August 2022, ePublished: 16 August 2022

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elevated cytokine levels, especially IL-6, be a key mediator of multi-organ dysfunction, including kidney impairment (10,11).

### Acute kidney disease associated with COVID-19

The abrupt loss of renal function brought on by COVID-19 acute kidney illness is closely linked to higher rates of morbidity and mortality (12). The most typical type of kidney involvement in COVID-19 is AKI. According to reported rates of acute kidney disease (AKI) development, rates outside of China are higher: 1-29% in China and 19-43% in the United States (3). According to the study by Chan et al, 46% of 3993 hospitalized patients with COVID-19 had AKI, and 50% of corona patients with AKI died (13).

### Dialysis patients

The average age of those receiving maintenance dialysis is 65 years, and these patients typically have multiple co-morbidities, including diabetes, obesity, and immunodeficiency from uremia, all of which increase their risk if they develop COVID-19. Patients with kidney failure receiving maintenance dialysis are particularly vulnerable to COVID-19 (14, 15).

Studies from China, Italy, the United Kingdom, and the United States (Southern California and New York) have revealed that maintenance dialysis patients on COVID-19 have higher mortality and more serious illness than general population (16, 17).

### Kidney transplant patients

According to a study that monitored 1219 kidney transplant recipients, they had a greater rate of SARS-CoV-2 infection than the general population (18). In a US study, it was discovered that patients with COVID-19 who were on the kidney transplant waiting list had a mortality rate that rose by 43% (19).

### Conclusion

The involvement of the kidneys is prevalent after SARS-CoV-2 infection. Now that COVID-19 has spread globally, health systems everywhere are dealing with serious difficulties. Even though most SARS-CoV-2 infections are mild or moderate, it is crucial to be able to recognize renal individuals who are at high risk of developing the disease early on.

### Authors' contribution

Conceptualization: SP and KT. Methodology: SP and KT. Investigation: SP, KT, KA. Resources: SP, KT, KA. Data Curation: SP, KT, KA. Writing—Original Draft Preparation: SP, KT, KA. Writing—Review and Editing: SP, KT, KA. Supervision: SP, KT, KA. Project Administration: SP, KT, KA.

### Conflicts of interest

There are no conflicts of interest declared by the authors.

### Ethical issues

Ethical concerns (including plagiarism, data fabrication, and double publication) are fully respected by the authors.

### Funding/Support

No financing from any source.

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