



COVID-19 and Long-Term Impact on Kidney Function

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INTRODUCTION

The COVID-19 pandemic has had profound effects on multiple organ systems, including the kidneys. While the primary target of SARS-CoV-2 is the respiratory system, increasing evidence suggests that kidney involvement is common, with both acute and long-term consequences. Acute Kidney Injury (AKI) is frequently observed in hospitalized COVID-19 patients, and emerging data indicate a potential link between COVID-19 and Chronic Kidney Disease (CKD). This article explores the long-term impact of COVID-19 on kidney function and the implications for clinical management. SARS-CoV-2 affects kidney function through multiple mechanisms, including direct viral invasion, immune-mediated injury, and hemodynamic alterations. The virus binds to angiotensin-converting enzyme 2 receptors, which are highly expressed in renal tubular cells, leading to direct cytopathic effects. Additionally, the hyperinflammatory response triggered by COVID-19, characterized by cytokine storm and endothelial dysfunction, contributes to kidney injury.

DESCRIPTION

Patients recovering from COVID-19-related AKI face a heightened risk of CKD due to residual kidney damage, fibrosis, and incomplete recovery of renal function. Longitudinal studies have shown that a significant proportion of AKI survivors develop reduced glomerular filtration rate and proteinuria. Even in patients without AKI during the acute phase, persistent proteinuria and hematuria have been reported post-COVID-19, indicating ongoing glomerular injury and endothelial dysfunction. COVID-19 may act as a catalyst for faster progression of pre-existing CKD. Patients with diabetes, hypertension, and other risk factors are particularly vulnerable to worsening kidney function after COVID-19 infection. Some COVID-19 survivors experience persistent symptoms collectively known as long COVID, which may include renal complications such as fatigue-associated renal dysfunction and dysregulated electrolyte balance. Given the potential long-term impact on kidney health, post-COVID-19 patients should undergo regular renal function monitoring, especially those with a history

of AKI or pre-existing CKD. Periodic assessment of serum creatinine, eGFR, and urine protein levels. Blood pressure control and optimization of cardiovascular risk factors. Avoidance of nephrotoxic drugs and adequate hydration. Referral to nephrologists for high-risk individuals requiring specialized care. Further research is needed to understand the full extent of COVID-19's impact on kidney function, identify high-risk populations, and develop targeted therapies to prevent long-term renal complications. Studies exploring the role of antiviral therapies, immunomodulators, and renoprotective interventions are crucial in mitigating kidney damage post-COVID-19.

CONCLUSION

COVID-19 poses significant risks to kidney health, with AKI being a common complication and long-term consequences ranging from persistent proteinuria to CKD progression. Early detection, regular follow-up, and preventive strategies are essential to mitigate the impact of COVID-19 on kidney function. Ongoing research will be pivotal in shaping future nephrology care for COVID-19 survivors. Additionally, the hyperinflammatory response triggered by COVID-19, characterized by cytokine storm and endothelial dysfunction, contributes to kidney injury. Hypoxia, microvascular thrombosis, and rhabdomyolysis further exacerbate renal damage. AKI is a common complication in severe COVID-19 cases, with incidence rates varying from 20% to 40% among hospitalized patients. Factors such as sepsis, dehydration, nephrotoxic medications, and mechanical ventilation contribute to AKI development.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The author declares there is no conflict of interest in publishing this article.

Received:	02-September-2024	Manuscript No:	ipacn-25-22445
Editor assigned:	04-September-2024	PreQC No:	ipacn-25-22445 (PQ)
Reviewed:	18-September-2024	QC No:	ipacn-25-22445
Revised:	23-September-2024	Manuscript No:	ipacn-25-22445 (R)
Published:	30-September-2024	DOI:	10.21767/JCNB-24.3.24

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Citation Li L (2024) COVID-19 and Long-Term Impact on Kidney Function. Ann Clin Nephrol. 8:24.

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