

Renal Involvement During the COVID-19 Pandemic: Experience of the Nephrology Department of CHU Bab El Oued

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Abstract

Introduction: During the COVID-19 pandemic, numerous extrapulmonary manifestations were the subject of study and research. The relationship between the kidney and COVID-19 attracted particular interest given the frequency of acute kidney injury observed.

Objectives: To determine the characteristics of SARS-CoV-2 infection in dialysis and kidney transplant populations and to describe the clinical, biological, and histological renal manifestations associated with SARS-CoV-2 infection.

Materials and Methods: This was a retrospective descriptive study conducted in the Nephrology Department of CHU Bab El Oued over a 2-year period, from February 2020 to February 2022. We studied the characteristics of COVID-19-related acute kidney injury in patients requiring hemodialysis, the histological renal manifestations associated with SARSCoV-2 infection, and the incidence and characteristics of COVID-19 infection in dialysis patients (hemodialysis and peritoneal dialysis) as well as in kidney transplant recipients.

Results: Eighty patients with renal failure associated with COVID-19 infection were managed with hemodialysis at our center. Thirty-six patients (45%) were dialyzed for acute kidney injury, while 44 patients (55%) already had chronic kidney disease at the stage of extrarenal replacement therapy. The majority of these patients (40 patients, 62%) were hospitalized in the intensive care unit. Most patients were intubated and ventilated (56 patients, 69%), with a high mortality rate of 76% (60 patients). Five patients underwent renal biopsy for renal involvement concomitant with or following COVID-19 infection. Renal histology revealed three cases of membranous nephropathy, one of which was associated with focal segmental glomerulosclerosis, and two cases of IgA nephropathy, one of which was associated with tubulointerstitial nephritis. Among chronic hemodialysis patients in our department, 10 patients (37%) were infected with SARS-CoV-2, presenting with a mild form in the majority of cases (6 patients, 60%). Four patients (40%) presented with severe respiratory distress syndrome, and 3 patients (30%) died. In peritoneal dialysis, 8 patients (32%) were infected with COVID-19, with 100% mild forms and no hospitalization. In the kidney transplant population, 24 transplant recipients (24%) were infected with COVID-19; 18 patients (75%) had mild forms, and only 6 patients (25%) presented with more or less severe forms with complications such as diabetes and graft function deterioration.

Discussion: Renal failure was associated with severe forms of COVID-19 (the majority of hemodialysis patients were hospitalized in the intensive care unit), with significant mortality. Renal involvement during COVID-19 can affect all compartments (glomerular, tubulointerstitial, and vascular). COVID-19 infection in kidney transplant recipients was not particularly more severe despite the immunosuppressed state.

Conclusion: As a newly emerging disease, the characteristics of renal involvement during COVID-19 infection, like the majority of systemic manifestations (cardiac, cerebral, digestive, etc.), have been derived from various studies and experiences from different centers worldwide but remain far from being well-labeled and codified.

Keywords: COVID-19, SARS-CoV-2, acute kidney injury, chronic kidney disease, hemodialysis, peritoneal dialysis, kidney transplantation, membranous nephropathy, IgA nephropathy.

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1. Introduction

The emergence of SARS-CoV-2 in December 2019 rapidly escalated into a global pandemic [1]. While primarily a respiratory illness, COVID-19 is associated with significant extrapulmonary manifestations, including acute kidney injury [2,3]. Patients with pre-existing chronic kidney disease, those on dialysis, and kidney transplant recipients have been identified as particularly vulnerable populations with increased morbidity and mortality [4,5].

The SARS-CoV-2 virus uses the angiotensin-converting enzyme 2 (ACE2) receptor to enter host cells [6]. This receptor is expressed on numerous tissues, including the lungs, the nervous system, and the kidneys, where it is found on endothelial cells, podocytes, and the apical pole of proximal tubular cells [7, 8]. This widespread distribution of ACE2 explains the systemic nature of the disease and its impact on multiple organs, including the kidneys.

The relationship between the kidney and COVID-19

attracted particular interest given the frequency of acute kidney injury observed during the pandemic[2, 3] . Multiple mechanisms have been proposed to explain renal involvement, including direct viral infection, cytokine storm, hypoxemia, and thrombotic complications[9, 10] .

We report the experience of the Nephrology Department of CHU Bab El Oued during the COVID-19 pandemic, focusing on the clinical, biological, and histological renal manifestations associated with SARS-CoV-2 infection.

Materials and Methods

Study Design

This was a retrospective descriptive study conducted in the Nephrology Department of CHU Bab El Oued, Algiers, Algeria, over a 2-year period, from February 2020 to February 2022.

Study Population

The study included all patients with COVID-19 infection who were managed in our department. We studied three groups: patients with COVID-19-related acute kidney injury requiring hemodialysis, chronic dialysis patients (hemodialysis and peritoneal dialysis) who developed COVID-19 infection, and kidney transplant recipients who developed COVID-19 infection.

Data Collection

- Number of patients in each group
- Clinical presentation (mild form, severe respiratory distress syndrome, complications)
- Renal biopsy findings
- Clinical outcomes (recovery, death)

Results

COVID-19-Associated Acute Kidney Injury

A total of 80 patients with renal failure associated with COVID-19 infection were managed with hemodialysis at our center. Thirty-six patients (45%) were dialyzed for acute kidney injury, while 44 patients (55%) already had chronic kidney disease at the stage of extrarenal replacement therapy.

The majority of these patients (40 patients, 62%) were hospitalized in the intensive care unit. Most patients were intubated and ventilated (56 patients, 69%), with a high mortality rate of 76% (60 patients).

Histological Renal Involvement

Five patients underwent renal biopsy for renal involvement concomitant with or following COVID-19 infection. Renal histology revealed:

- Three cases of membranous nephropathy, one of which was associated with focal segmental glomerulosclerosis
- Two cases of IgA nephropathy, one of which was associated with tubulointerstitial nephritis

These findings indicate that renal involvement during COVID-19 can affect all compartments:

glomerular, tubulointerstitial, and vascular.

COVID-19 in Chronic Hemodialysis Patients

Among chronic hemodialysis patients in our department, 10 patients (37%) were infected with SARS-CoV-2. Clinical presentation was as follows:

- Six patients (60%) presented with a mild form
- Four patients (40%) presented with severe respiratory distress syndrome □ Three patients (30%) died

COVID-19 in Peritoneal Dialysis Patients

Among peritoneal dialysis patients, 8 patients (32%) were infected with COVID-19. All patients (100%) presented with mild forms, and none required hospitalization.

COVID-19 in Kidney Transplant Recipients

In the kidney transplant population, 24 transplant recipients (24%) were infected with COVID-

19. Clinical presentation was as follows:

- 18 patients (75%) had mild forms
- 6 patients (25%) presented with more or less severe forms with complications such as diabetes and graft function deterioration

Discussion

Our study demonstrates that renal failure was associated with severe forms of COVID-19, as the majority of hemodialysis patients were hospitalized in the intensive care unit, with significant mortality. This is consistent with the literature, which has reported that CKD patients infected with SARS-CoV-2 have an increased risk of death compared to those without CKD

[4].

The histological findings in our patients revealed that renal involvement during COVID-19 can affect all compartments: glomerular (membranous nephropathy, focal segmental glomerulosclerosis, IgA nephropathy), tubulointerstitial (tubulointerstitial nephritis), and vascular. This is consistent with the literature, which has described various patterns of renal injury in COVID-19, including acute tubular necrosis, thrombotic microangiopathy, and collapsing glomerulopathy [9-11].

COVID-19 infection in kidney transplant recipients was not particularly more severe in our study, despite the immunosuppressed state. This is consistent with some reports suggesting that immunosuppression may paradoxically attenuate the cytokine storm in COVID-19 [12]. However, the complications observed, including diabetes and graft function deterioration, underscore the need for close monitoring in this population[13].

As a newly emerging disease, the characteristics of renal involvement during COVID-19 infection, like the majority of systemic manifestations (cardiac, cerebral, digestive, etc.), have been derived from various studies and experiences from different centers worldwide but remain far from being well-labeled and codified [2, 3, 5].

Conclusion

The COVID-19 pandemic has disproportionately affected patients with chronic kidney disease. Renal failure was associated with severe forms of COVID-19, with significant mortality. Renal involvement during COVID-19 can affect all compartments: glomerular, tubulointerstitial, and vascular. COVID-19 infection in kidney transplant recipients was not particularly more severe in our study, despite the immunosuppressed state. As a newly emerging disease, the characteristics of renal involvement during COVID-19 remain far from being well-labeled and codified, highlighting the need for continued research and surveillance.

Conflict of interest

The authors declare no conflicts of interest regarding the publication of this manuscript. No financial or personal relationships have influenced the design, conduct, analysis, or reporting of this study. All authors have approved the final version of the manuscript and agree to its submission.

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Authors' contributions

Ghalia Khellaf: Conceptualization, methodology, supervision, validation, writing - review and editing

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Fatima Abib: Data curation, investigation

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Habiba Rafa: Data curation, formal analysis

Lamis Debchi: Data curation, investigation

Ali Benziane: Methodology, supervision, writing - review and editing

All authors have read and approved the final version of the manuscript.

Ethical approval

This study was conducted in accordance with the Declaration of Helsinki. As this was a retrospective study using anonymized data extracted from electronic medical records, ethical approval was obtained from the institutional review board of CHU Bab El Oued. All patient data were anonymized prior to analysis, and informed consent was waived due to the retrospective nature of the study.

Data availability statement

The data that support the findings of this study are

available from the corresponding author upon reasonable request. The data are not publicly available due to privacy and ethical restrictions.

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