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Kidney Transplant Recipients Facing Acute Kidney Injury Complication COVID-19 Infection

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: Acute kidney injury (AKI) was noticed as a common complication of COVID-19 infection, associated with increased intensive care unit (ICU) admissions and mortality. Not surprisingly, Kidney transplant recipients appeared to be at higher risk either for severe COVID-19 infection but also for AKI, due to coexisting conditions and chronic immunosuppression.
Study Design: This is a monocentric retrospective descriptive study.
Place and Duration of Study: The study took place in the nephrology, dialysis and renal transplantation unit and anesthesiology and reanimation department of CHU IBN ROCHD, in Casablanca, between March 2020 and September 2021.
Methodology: The inclusion criteria were: all kidney transplant recipients, who were hospitalized in the nephrology and/or the reanimation departments, at the IBN ROCHD CHU in Casablanca, MOROCCO, who tested positive by PCR for COVID-19 and who developed acute renal failure AKI during their follow up. The study took place between 03/2020 and 09/2021 (i.e. 18 months).

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The definition and staging of AKI was based on the KDIGO criteria. Total recovery was defined as the return to baseline of renal graft function. In our study, we excluded patients who had a suspicion of COVID-19 infection without PCR positivity, an estimated glomerular filtration rate (eGFR) lower than15 ml/min/1.73 m2 before admission, and who did not complete at least 1 year of follow-up after kidney transplant.

Results: Thrithy-five of them tested positive for COVID-19. Among them, 65,71% (n=23) developed acute renal failure. Fifteen were men (65.7%) and 8 were women (34,3%). The mean age was 45.77 years with extremes from 25 to 68 years. The most common comorbidity found was arterial hypertension with a 28.57% rate. The median time between kidney transplant and COVID-19 infection diagnosis was 8.82 years (IQR 27-87 months). All patients presented fever, and 15 presented cough, myalgia and dyspnea were noted in 19 of the 23 patients. All of them presented radiological signs on thoracic CT, estimating lesions suggestive of COVID-19 from 10 to 80% of the lungs. Nineteen patients (54;28%) needed to be admitted to an intensive care unit, during hospitalization or during their stay. Seven patients (30.4%) required conventional hemodialysis sessions. All patients received intravenous perfusion of either dexamethasone or methylprednisolone and most commonly an increased dose of the corticosteroids already prescribed; for a period of 7 to 10 days. Immunosuppressive therapy was decreased in 80% of patients. The average length of stay in the intensive care unit was 7 days [3 to 31 days]. Complete remission of the graft function was obtained in 60.8%, while 8.7% returned permanently to hemodialysis. The mortality rate was 30.4%.

Conclusion: Kidney transplant recipients are at higher risk of developing severe COVID-19 infection due to chronic immunosuppression and comorbidities. To this, the rate of acute kidney injury is increased leading to higher rates of admission in intensive care units and mortality.

Keywords: Acute renal injury; acute renal failure; kidney transplant; COVID 19; infection.

1. INTRODUCTION

In 2019, the COVID-19 pandemic, spread promptly around the world with a high risk of contamination to all groups of the population. Most patients with COVID-19 have mild symptoms, but about 5% develop severe symptoms, which can include acute respiratory distress syndrome, septic shock, and multiple organ failure. Kidney involvement is frequent, with clinical presentation ranging from mild proteinuria to progressive acute kidney injury (AKI) necessitating renal replacement therapy (RRT) [1-3]. Acute kidney injury (AKI) is defined as a sudden loss of excretory kidney function. AKI is part of a range of conditions summarized as acute kidney diseases and disorders (AKD), in which slow deterioration of kidney function or persistent kidney dysfunction is associated with an irreversible loss of kidney cells and nephrons, which can lead to chronic kidney disease [4,5]. AKI was noticed as a common complication, associated with increased intensive care unit (ICU) admissions and mortality. Not surprisingly, Kidney transplant recipients appeared to be at higher risk either for severe COVID-19 infection but also for AKI. This was mostly attached to an already impaired immune system consequent to chronic immunosuppressive therapies. In this study, we took an interest in this specific population.

2. MATERIALS AND METHODS

This is a retrospective, monocentric and purely descriptive study. The inclusion criteria were: all kidney transplant recipients, who were hospitalized in the nephrology and/or the reanimation departments, at the IBN ROCHD CHU in Casablanca, MOROCCO, who tested positive by PCR for COVID-19 and who developed acute renal failure AKI during their follow up. Two imperative concomitant conditions. The study took place between 03/ 2020 and 09/2021 (i.e. 18 months).

Definitions and staging of AKI were based on the KDIGO criteria. Total recovery was defined as the return to baseline of renal graft function. In our study, we excluded patients who had a suspicion of COVID-19 infection without PCR positivity, an estimated glomerular filtration rate (eGFR) lower than15 ml/min/1.73 m2 before admission, and kidney transplant recipients who did not complete at least 1 year of follow-up after kidney transplant.

3. RESULTS

It is important to discuss the results compared to the 280 transplant recipients on regular follow-up

in our unit. Thrithy-five of them tested positive for COVID-19. Among these 35 patients, 65,71% (n=23) developed acute renal failure,

Fifteen were men (65.7%) and 8 were women (34,3%).

The mean age was 45.77 years with extremes from 25 to 68 years.

The most common comorbidity found was arterial hypertension with a 28.57% rate.

The median time between kidney transplant and COVID-19 infection diagnosis was 8.82 years (IQR 27-87 months).

All patients presented fever, and 15 presented cough, myalgia and dyspnea were noted in 19 of the 23 patients.

All of them presented radiological signs on thoracic CT, estimating lesions suggestive of COVID-19 from 10 to 80% of the lungs.

Nineteen patients (54;28%) had a severe COVID-19 infection and needed to be admitted to an intensive care unit, at hospitalization or during their stay.

Seven patients (30.4%) required conventional hemodialysis sessions.

All of these patients received intravenous perfusion of either dexamethasone or methylprednisolone and most commonly an increased dose of the corticosteroids already prescribed; for a period of 7 to 10 days.

Furthermore, we decreased immunosuppressive therapy - mycophenolate mofetil (MMF) or anticalcineurine – in 80% of patients.

The average length of stay in the intensive care unit was 7 days (extremes 3 to 31 days).

The follow-up was favourable for 60.8% of patients with complete remission of the graft function, while 2 kidney transplant recipients among the 7 who were on dialysis returned permanently to hemodialysis (8.7%). The mortality rate was 30.4% with seven patients who did not survive.

4. DISCUSSION

In 2019, the COVID-19 pandemic, spread promptly around the world with a high risk of contamination to all groups of the population. Moreover, acute kidney injury was reported in 5 to 15% of the cases infected by SARS-CoV and up to 50% in patients with severe COVID-19 infection [6]. Not surprisingly, kidney transplant recipients were not an exception. Mostly due to an already impaired immune system consequent to chronic immunosuppressive therapies. However, we reported 35 kidney transplant recipients affected with COVID-19 from the 280 who were continuously followed up by our team, and thus only 12.5% of all the kidney transplant recipients. Based on their impaired immunity, these numbers were pretty low. However, kidney transplant recipients knowing they were at high risk of being infected were very careful and took all the precautions possible to avoid contamination. Moreover, we limited the hospital visits to a strict minimum and developed a system of « e-follow up ». All these reasons may explain the low percentage of infections. On the other hand, we point out the fact that a large amount of the 35 kidney transplant recipients developed kidney injury and thus maybe correlated to the severity of the infection in this population.

The TANGO consortium revealed the time of diagnosis of COVID-19 after transplant ranged from <1 year to 31 years (median 5 years), which is quite similar to our results [7]. The COVID-19 symptoms were various but very similar to the general population, presenting fever, myalgia, cough and dyspnea [7,8]. Thoracic CT imaging was very suggestive of the COVID-19 affliction [7].

A very interesting and large multicenter study, conducted in 12 hospitals across the United states, Spain and Italy, collected 144 kidney transplant recipients infected with COVID-19 among the 9845 who were on regular follow-up. Sixty-six per cent of the patients afflicted were men, with a mean age of 60 (±12) years, and the most prevalent comorbidity was hypertension in 95% [7]. All these epidemiologic results concur with ours.

In the study conducted by NAIR.V & al., on 10 kidney transplant recipients afflicted by COVID-19, half of them were admitted to the intensive care unit (ICU) and all of them died, predicting a poor prognosis, similar then to the general population [8]. However, all the studies did not have close to similar results. In the CRAVEDI & al. TANGO

consortium, the mortality rate was estimated between 25 and 32% [7]. These results were pretty similar to ours, with a ratio of almost 55% of patients in need of an ICU admission.

Concerning renal replacement therapies (RRT), 1.5 to 9% of patients infected with COVID who developed AKI required RRT, and up to 25% of those with severe infection [6]. Cummings & al., in their prospective cohort study, reported a rate of 31% of patients receiving renal replacement therapy joining our results.

Many studies described the management of immunosuppressive therapy, some decreased the anticalcineurin inhibitors or the MMF and increased the corticosteroids, and others ceased completely the immunosuppressive therapy during the hospitalization and up to 5 to 7 days after discharge [9,10]. Our approach was to decrease the dosage and increased it at the follow-up after the complete remission [11].

5. CONCLUSION

Kidney transplant recipients are at higher risk of developing severe COVID-19 infection due to chronic immunosuppression and comorbidities. To this, the rate of acute kidney injury is increased leading to higher rates of admission in intensive care units and mortality.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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