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RENAL COMPLICATION DURING COVID -19 ERA

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Abstract
SARS-CoV-2, the virus responsible for the condition now known as coronavirus disease 2019 (COVID-19), has spread from China to the rest of the world. The true prevalence of acute kidney infection is unknown due to a lack of a defined classification and staging of this illness. Renal complications following covid-19 infection were one of the leading causes of death at the time. The following article discusses the concerns and hurdles we had in healthcare during Corona with renal complications.

Key words: Renal complication, COVID -19, acute kidney infection

INTRODUCTION
In January 2020, a novel virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was identified as the causative agent for a cluster of pneumonia cases initially detected in Wuhan City, Hubei province, China [1]. SARS-CoV-2, which causes the disease now named coronavirus disease 2019 (COVID-19), have spread from China to the rest of the world [2, 3].

Corona virus disease-2019 (COVID-19) is a form of zoonosis caused by the novel coronavirus which has caused a global pandemic emergency. In December 2019, a novel coronavirus (SARS-CoV-2) emerged in Wuhan, China, and has since spread as a global outbreak causing Corona virus disease (COVID-19), with over 23 million cases in 188 countries and over 800,000 deaths. SARS-CoV-2 is a single-stranded RNA virus with a positive sense that spreads by nose and mouth secretions, including minute droplets produced by coughing. The standard method of diagnosis is real-time reverse transcription polymerase chain reaction (rRT-PCR) on nasopharyngeal swab respiratory samples. Clinical signs might range from moderate upper respiratory tract sickness symptoms to severe acute respiratory distress syndrome (ARDS) leading to interstitial bilateral pneumonia, multiple organ failure, and death. [4]

Overall, the incidence of AKI ranges from 0.5% to 80.3%, although the study that reported the upper value considered only critically ill patients. In fact, the severity of pneumonia and ARDS has been identified as the most important risk factors for the development of kidney failure and subsequent poor function recovery. [5,6]
The receptor for SARS-CoV-2 is the membrane-bound angiotensin-converting enzyme 2, and this interaction may result in an imbalance of the Renin-Angiotensin System (RAS), which is associated with worse clinical manifestations of COVID-19, such as acute pulmonary injury, hyper inflammatory state, and haematological alterations. In the context of renal disorders, the development of acute kidney injury is generally connected with immunological changes and direct cytopathic lesions caused by the virus, which leads to greater mortality. In terms of chronic kidney disease, patients in the non-terminal stage have a worse prognosis, whereas hemodialysis patients appear to have moderate COVID-19 courses, most likely due to a lower risk of being affected by the cytokine storm. Furthermore, the existing situation makes kidney donation and transplantation unfavorable. The relationship between COVID-19 and immunosuppression in kidney transplantation recipients has been greatly discussed to determine whether it increases mortality and how it interacts with immunosuppressive medications.
the real incidence of Acute kidney infection remains uncertain because of a lack of a clear definition and staging of this condition.

OUTCOMES ON RENAL FUNCTION DURING COVID INFECTION

The corona virus disease-2019 (COVID-19) pandemic has led to an urgent need for reliable biomarkers to identify disease severity. Infection with COVID-19 is rapidly spreading posing a serious threat to community health. The ongoing COVID-19 pandemic has propelled an urgent need to explore effective disease severity predictors. The present study establishes biomarkers that can accurately predict the severity of COVID-19 patients. The routine biochemical markers of kidney function were evaluated for correlation with disease severity.

Kidney damage is frequent during the active stage of COVID-19. A meta-analysis in China involving 4375 patients revealed high relative rates of proteinuria (42.0%), hematuria (30.3%) and AKI (7.7%), as well as elevated creatinine (6.6%) and urea (6.2%) [7]. Also in China, higher mortality was reported for COVID-19 patients with renal damage (11.2%; 28/251) than for those without (1.2%; 1/82).[8]
A prospective study of 1603 patients in Spain obtained similar results.[5]A US study of 5449 COVID-19 patients revealed hematuria and proteinuria in 46%, AKI in 37%, and dialysis required for 15% [9] .Over 40% of ICU patients required RRT. A novel third virus belongs to coronaviruses that have emerged in the last 20 years was first identified in Wuhan, China in December 2019. The virus has spread worldwide and led to high morbidity and mortality.[10]

Kidneys play a significant role in the regulation of blood fluid and pressure as well as hematopoiesis by producing erythropoietin and thrombopoietin hormones. The evaluation of biochemical profile is a significant assessment of the functional capacity of several critical organs and systems including kidneys. It is essential to illustrate that more than 40% of COVID-19 patients who are admitted to the hospital have abnormal renal function tests including albuminuria or hematuria [11]. Interestingly, hospitalized patients with SARSCoV-2 infection are at a high risk of mortality. Additionally, a study demonstrated that chronic renal failure patients are prone to be infected with COVID-19 infection. Thus, those patients require high care and well isolation. Renal function tests revealed an elevation in serum creatinine and blood urea nitrogen during the COVID-19 infection period. Specifically, this increase in serum creatinine and blood urea nitrogen was significant in the COVID-19 peak when compared to the recovery period suggesting that SARS-CoV-2 infection has a high impact on renal function.

A higher incidence has been reported in the United States than in China. Also, studies from China reported the onset of AKI within a median of 7 to 14 days after admission, whereas a large study of

patients hospitalized with COVID-19 in the United States [12] found that the onset tended to be early; 1,993 (36.6%) of 5,449 US patients developed AKI, and of these, 37.3% either arrived with it or developed it within 24 hours of admission. Of those with AKI, 31.1% reached stage 3 (the highest, defined as an increase of 3 times or more in serum creatinine within 7 days or start of kidney replacement therapy), and 14.3% needed kidney replacement therapy. In another study,79 (31%) of 257 critically ill patients required kidney replacement therapy. A study contrasting AKI incidence between 3,345 patients with COVID-19 and 1,265 patients without COVID-19 hospitalized during the same time period showed that those with COVID-19 had a higher incidence of AKI (56.9% vs. 37.2%), and more of them needed kidney replacement therapy (4.9% vs. 1.6%)[13]

In a recently published ancillary study of STOP-COVID,[14]focused upon clinical outcomes in adults with pre-existing non dialysis-dependent CKD (ND-CKD) or with KFRT admitted to ICU with COVID-19 between March 4 and May 10, 2020. Patients were followed forward in historical time from ICU admission to in-hospital death, hospital discharge, or June 6, 2020, when the database was locked. Baseline biomarkers also varied between groups with patients with KFRT having lower white blood counts, platelets count and fibrinogen levels but higher C- reactive protein (CRP), IL-6 ,ferritin, and troponin levels than those without CKD. Many patients in this study received interventions intended to suppress SARS-CoV-2 and / or inflammations despite the fact that patients in this study were enrolled before data were available from large COVID-19 clinical trials , and patients with CKD were excluded from most of those trials.[15]

Reports refer that kidney involvement is frequent and ranges from mild proteinuria to an forward AKI that clinical evidence has shown the increase of serum creatinine and blood urea nitrogen in COVID-19 cases in a large prospective study in China. BUN and creatinine of the COVID-19 patients reviewed in this study also showed increased patterns. Among the subjects of this study, men's BUN was higher than the reference interval. It was particularly high in those in their 60s and 80s or older, and creatinine levels were also observed in a similar manner . Studies found that hypokalemia has been described in COVID-19 patients in China. Hyponatremia has been reported in COVID-19 patients in a clinical case and in a small study in the United States and hyponatremia and hypokalemia were reported in a series of 12 patients in China.[16,17]

COVID-19 Infection and AKI

Acute kidney failure in COVID-19 infection may result from a synergistic effect of a direct cytotropic effect caused by the virus and a systemic inflammatory response caused by cytokines. AKI is more pronounced in patients with severe disease, acute respiratory distress syndrome (ARDS), and patients requiring intensive care. Other possible mechanisms of AKI may include acute tubular necrosis (ATN) due to multiorgan failure and shock, and possible prerenal etiology due to fluid depletion secondary to decreased oral intake and high fever. Drug toxicity, hemodynamic insult, and contrast exposure may also play a role. The workup for AKI in COVID-19 infection should be similar to the other causes of AKI. Mohamed et al [18] discussed different etiologies of AKI in their study which include ischemic acute tubular injury, toxic acute tubular injury or combination of, acute interstitial nephritis, de novo glomerular disease, pre-renal azotemia, and unspecified reasons. The contributing factors to different etiologies include hypotension, shock, rapid atrial fibrillation, prolonged volume depletion, rhabdomyolysis, toxic agents such as vancomycin, and iodinated contrast, overt Proteinuria [18,19]

The incidence of AKI in patients with non-COVID-19 ARDS is reported as approximately 44% and has a mortality of 42% [20]. However, our data demonstrate that patients are more at risk of developing renal impairment with COVID-19 infection which translates to a higher mortality rate. The high mortality rates observed in our study cohort of patients with AKI and COVID-19 infection is similar to other studies [21]. However, unlike other reports, we also investigated patients with pre-existing renal pathologies and included those patients with a previous, viable renal transplant and

those with CKD. The mortality rate of recipients of renal transplants is markedly higher than the other groups and these patients are, therefore, an extremely vulnerable group. There are several possible reasons for this such as the pre-existing immunosuppressed state and associated comorbidities of this patient sub-group [22,23].

Taken together, existing literature suggests that the most common renal complications in patients hospitalized with COVID-19 are electrolyte imbalances (particularly hyperkalemia), AKI, and the need for RRT. Active monitoring and treatment of these renal complications may help predict a more favorable outcome.

Conclusions

Further studies are necessary to better understand disease pathology, acute kidney injury associated with infection, long-term renal consequences, and potential therapies. Rigorously controlled interventional studies and international registry analyses will be crucial to define risk factor and the best therapeutic approaches to resolving COVID-19 disease outcomes. This overview of reviews addressed systematic reviews and primary studies that evaluated different outcomes in patients with CKD who contracted COVID–19. Our overview also evaluated the quality of both systematic reviews and individual studies. Evidence consistently demonstrated an increased risk of mortality and hospitalization in patients with CKD and COVID–19. The extent to which CKD increases the likelihood of the rate of infection, and other poor outcomes is not currently well understood, and the results are inconsistent among studies. The results shed some light on the significance of prioritizing patients with CKD for COVID–19 vaccination and critical care management. Further research studying the pathophysiology behind the effect of CKD on COVID–19 outcomes would provide deeper insight for the management of such patients.

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