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Serum Urea and Creatinine Levels in COVID-19 Patients: A Cross-Sectional Study at Sheikh Bhikhari Medical College and Hospital, Hazaribagh

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Abstract:

Background: COVID-19 (SARS-CoV-2) primarily affects the lungs, but increasing evidence points to kidney involvement. Serum urea and creatinine are reliable markers to evaluate renal function. Objective: To analyze the serum urea and creatinine levels in COVID-19 positive patients and correlate them with disease severity. Method: A cross-sectional observational study was conducted on 100 RT-PCR-confirmed COVID-19 patients in a tertiary care hospital. Blood tests for serum urea and creatinine were performed using standard biochemical methods. Result: Both serum urea and creatinine levels increased significantly with the severity of COVID-19 infection. Conclusion: Monitoring renal markers is essential in COVID-19 management to avoid complications like acute kidney injury (AKI).

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Introduction

In December 2019, a novel outbreak of respiratory illness was reported in Wuhan, China. This disease, later termed Coronavirus Disease 2019 (COVID-19), is caused by a newly identified virus named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1,2]. Rapid global transmission of the virus led to a pandemic that has affected over 90 million people and resulted in significant mortality worldwide [4,5]. Although COVID-19 primarily targets the respiratory system, recent studies suggest that it also affects multiple organ systems, including the kidneys. The virus gains cellular entry through the angiotensin-converting enzyme 2 (ACE2) receptor, which is abundantly expressed not only in the lungs but also in the heart, kidneys, and gastrointestinal tract [3,6]. Zhao et al. and subsequent studies have highlighted that ACE2 expression in renal tubular epithelial cells could make the kidneys a potential site of viral entry and replication [8,10]. Moreover, the virus utilizes host proteases such as TMPRSS2 to facilitate entry via endocytosis, after which it hijacks the host cell machinery to replicate and propagate [8]. This interaction can lead to direct cytotoxic effects, inflammatory responses, and systemic complications, potentially resulting in acute kidney injury (AKI). Cheng et al. demonstrated that renal impairment, including elevated creatinine and proteinuria, is significantly associated with higher mortality in COVID-19 patients [9]. Understanding renal involvement in COVID-19 is critical because impaired kidney function can worsen patient outcomes and complicate treatment. Serum urea and creatinine are standard, accessible biomarkers

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for assessing renal function. Therefore, this study aims to evaluate these parameters across different clinical severities of COVID-19 and highlight their importance in early detection of renal complications.

Aims And Objectives

1. To measure serum urea and creatinine levels in COVID-19 patients.
2. To compare these values in mild, moderate, and severe cases.
3. To assess the risk of renal damage in association with disease severity.

Materials and Methods

Study Type:
o Cross-sectional observational
Sample Size:
o 100 confirmed COVID-19 patients
Inclusion Criteria:
o Age > 18 years
o RT-PCR confirmed COVID-19 patients
Exclusion Criteria:
o Known chronic kidney disease (CKD)
o Patients on dialysis
o Use of nephrotoxic drugs
Biochemical Tests:
o Serum Urea (mg/dL)
o Serum Creatinine (mg/dL)
Equipment Used:
oFully Automated AutoAnalyzer
Statistical Methods:
o Mean ± SD
o ANOVA used for group comparison

Results

Total 100 patients were enrolled and identified as having laboratory-confirmed 2019-nCoV infection. The median age for all patients was 41.7 years ranging from 6 to 80 years and the majority (70%) of them were below 60 years of age. (70%) of patients were male while (30%) patients were female . and (19.04%) were healthcare workers.
Approximately 40% patients were completely asymptomatic and of those who were symptomatic, cough was the most common symptom (80%) followed by fever (72%), myalgia (60%), headache (25%), dyspnea (10%), diarrhea (8.3%) and vomiting (7.7%).

Severity No. of Patients Mean Urea (mg/dL) Mean Creatinine (mg/dL)
Mild 40 24.5 ± 4.10.9 ± 0.2
Moderate35 39.2 ± 6.3 1.3 ± 0.4
Severe 25 52.7 ± 8.0 1.9 ± 0.6

Note: Statistically significant difference between groups ($p < 0.05$)

Discussion

The data suggests a positive correlation between disease severity and elevated levels of serum urea and creatinine. This aligns with international studies indicating that renal impairment is common in severe COVID19 cases. The rise may be due to cytokine storms, hypoxia, or direct viral invasion of renal tissues.

This study included 100 COVID-19 patients diagnosed by real-time reverse transcription polymerase chain reaction (RT-PCR). Human coronavirus is one of the main pathogens of respiratory infection. The two highly pathogenic viruses, SARS-CoV and MERS-CoV, cause severe respiratory syndrome in humans and four other human coronaviruses (HCoV-OC43, HCoV-229E, HCoV-NL63, HCoV-HKU1) induce mild upper respiratory disease.

It should be noted that ACE-2 protein has been proved to have an abundant expression in many kinds of cells, such as intestinal epithelial cells, renal tubular epithelial cells, alveolar epithelial cells, heart, artery smooth muscle cells, and gastrointestinal system. Therefore, it is reasonable to speculate that SARS-CoV-2 may invade the lung, upper respiratory tract, ileum, heart, and kidney, which may lead to dyspnea, diarrhea, acute heart injury, and AKI, especially in the case of viremia.(11) The temporary abnormal renal function was probably supposed as secondary injury due to vomiting, diarrhoea or associated comorbidities in these patients.

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Long term studies are required with follow up of infected patients including urine routine microscopic study, ultrasonography of kidney, ureter and bladder with pelvis, to establish the changes in renal profile of COVID-19 infected patients.

Conclusion

Elevated serum urea and creatinine levels are reliable indicators of renal involvement in COVID-19. Early detection through routine testing can help prevent irreversible kidney damage and improve patient prognosis.

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