



## To Study the Incidence of Acute Kidney Injury in Patients of COVID-19 Disease admitted in a Tertiary Care Hospital

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### Abstract

**Background:** In COVID-19 disease, acute respiratory failure and diffuse alveolar damage are common clinical features. Early Symptom include fever, cough and Shortness of breath. Although lungs are the primary organ to be affected by COVID-19, in severe cases other organs can also be affected. Patients admitted with COVID-19, may also have acute kidney damage, some requiring hemodialysis.

**Objectives:** To study the incidence of AKI in patients of COVID 19 disease.

**Methods:** An observational study was conducted on 310 patients of COVID 19 disease admitted in a tertiary care hospital.

**Results:** Out of 310 COVID 19 patients, 227 (73.2%) were males and 83 (26.7%) were females. 81 (26.12 %) patients belong to mild, 75 (24.19%) to moderate and 154 (37.4 %) to severe COVID 19 disease. Overall AKI was present in 75 (24.19%) patients. In mild disease 8 (9.8%) patients, in moderate disease 14 (18.6%) patients and in severe disease 53 (34.4%) patients had AKI. Out of 227 male COVID 19 patients, 48 (21.14%) had mild disease, 63 (27.75%) had moderate disease and 116 (51.10%) had severe COVID 19 disease. AKI was present in 6 (12.5%), 12 (19.04%) and 40 (34.48%) patients of mild, moderate and severe male COVID 19 disease patients respectively. Out of 83 female COVID 19 patients, 33 (39.75%) had mild disease, 12 (14.45%) had moderate disease and 38 (45.78. %) had severe COVID 19 disease. AKI was present in 2 (6.06%), 12 (16.66%) and 40 (34.21%) patients of mild, moderate and severe female COVID 19 disease patients respectively.

**Keywords:** COVID-19, Acute Kidney Injury.

### Introduction

A number of pneumonia cases of unknown origin emerged in Wuhan, china in early December 2019. The disease had fast spread to other parts of China and globally to many countries<sup>1</sup>. The new causative organism named SARS-COV-2 (Severe Acute Respiratory syndrome corona virus-2) and the

resulting illness known as COVID-19 caused a great deal of anxiety and panic worldwide. World Health Organization (WHO) declared it pandemic on March 11, 2020<sup>2,3</sup>. The virus belongs to the same genus as the severe acute respiratory syndrome corona virus (SARS-COV) and Middle east respiratory syndrome corona virus (MERS-COV)<sup>4,5</sup>.

In COVID-19, acute respiratory failure and diffuse alveolar damage are common clinical features<sup>6</sup>. Early Symptom includes fever, cough and shortness of breath. The incubation period of COVID-19 seems to be 2-14 days<sup>7</sup>. According to reports, 81% of COVID-19 patients in China had mild symptoms while other had severe or critical involvement<sup>8-10</sup>. Although lungs are the primary organ to be affected by COVID-19, in severe cases other organs can also be affected. Patients admitted with COVID-19, may also have acute kidney damage, some requiring hemodialysis<sup>11-13</sup>. Mechanisms of AKI in COVID-19 are microvascular dysfunction, inflammation and metabolic disorders<sup>14,15</sup>. Entry of SARS-COV-2 in human body cells is mediated by ACE-2 receptors<sup>16,17</sup>. ACE-2 receptors is also expressed in the brush border of proximal tubular cells and, up to some extent in podocytes, but not in glomerular endothelial and mesangial cells<sup>18</sup>. During fatal pneumonia due to COVID-19, AKI patients may be affected by synergistic assaults from the virus induced cytopathic effects and systemic inflammatory response, especially in severe and critical cases with positive viral RNA in blood sample and massive proteinuria<sup>19</sup>. In total, renal function of patient hospitalized with COVID-19 infection needs to be monitored regularly to intervene early as possible and to prevent the development of AKI.

### Aims and Objectives

1. To study the incidence of AKI in patients of COVID 19 disease.
2. To study the incidence of AKI in different stages (mild, moderate and severe) of COVID 19 disease.

### Materials and Methods

Study was conducted on 310 patients of COVID 19 disease admitted in a tertiary care hospital.

**Type of Study:** Observational study.

AKI is defined according to KDIGO 2012 guidelines- an increase in serum creatinine of 0.3 mg/dl or more within 48 hours of observation or 1.5 times baseline or greater, which is known or

presumed to have occurred within 7 days or a reduction in urine volume below 0.5 ml/kg/hr. for 6 hours<sup>20</sup>.

Severity (mild, moderate and severe) of COVID 19 disease is defined according to WHO guidelines<sup>21,22</sup>.

### Results

Out of 310 COVID 19 patients, 227 (73.2%) were males and 83 (26.7%) were females. 81 (26.12 %) patients belong to mild, 75 (24.19%) to moderate and 154 (37.4 %) to severe COVID 19 disease.

Overall AKI was present in 75 (24.19%) patients. In mild disease 8 (9.8%) patients, in moderate disease 14 (18.6%) patients and in severe disease 53 (34.4%) patients had AKI.

Out of 227 male COVID 19 patients, 48 (21.14%) had mild disease, 63 (27.75%) had moderate disease and 116 (51.10%) had severe COVID 19 disease. AKI was present in 6 (12.5%), 12 (19.04%) and 40 (34.48%) patients of mild, moderate and severe male COVID 19 disease patients respectively.

Out of 83 female COVID 19 patients, 33 (39.75%) had mild disease, 12 (14.45%) had moderate disease and 38 (45.78%) had severe COVID 19 disease. AKI was present in 2 (6.06%), 12 (16.66%) and 40 (34.21%) patients of mild, moderate and severe female COVID 19 disease patients respectively.

**Table 1** Sex-wise distribution of COVID-19 patients

Severity of COVID-19 Disease	Number of Patients	Sex	
		Male	Female
Mild	81	48 (59.25%)	33 (40.74%)
Moderate	75	63 (84%)	12 (16%)
Severe	154	116 (75.32%)	38 (24.67%)

**Table 2** Incidence of AKI in different stages of COVID-19 Disease

Severity of COVID-19 Disease	Stagewise distribution of Patients	No of patients with AKI	Percentage
Mild	81	8	9.8%
Moderate	75	14	18.6%
Severe	154	53	34.4%

**Table-3** Incidence of AKI in male patients

Severity of COVID-19 Disease	Number of male patients	Number of male patients with AKI	Percentage
Mild	48	6	12.5%
Moderate	63	12	19.04%
Severe	116	40	34.48%

**Table 4** Incidence of AKI in female patients

Severity of COVID-19 Disease	Number of female patients	Number of female patients with AKI	Percentage
Mild	33	2	6.06%
Moderate	12	2	16.66%
Severe	38	13	34.21%

## Discussion

The involvement of kidney in patients with COVID-19 is common and can lead to development of acute kidney injury, requiring renal replacement therapy. AKI associated with COVID-19 has high mortality and is independent risk factor for in-hospital death in patients with COVID-19. The pathophysiology of AKI in COVID-19 patients is multifactorial, involving both the direct effects of the SARS-CoV-2 virus on the kidney and indirect mechanisms resulting from systemic consequences of viral infections.

Hirsch, J. S. et al<sup>23</sup>. of 5449 patients admitted with COVID-19 AKI developed in 1993 (36.6%). The peak stages of AKI were stage 1 in 46.5%, stage 2 in 22.4% and stage 3 in 31.1%. Of these 14.3% required RRT. AKI was primarily seen in COVID-19 patients with respiratory failure with 89.7% of patients on mechanical ventilation developing AKI compare to 21.7% of non-ventilated patients.

Argenziano, M. G. et al<sup>24</sup>. across all patients in hospital with COVID-19, 33.9% (288/850) developed AKI and 13.8% (117/850) required inpatient dialysis. In ICU, AKI and dialysis were even more common at 28% (184/236) and 35.2% (83/236) respectively.

Pei, G. et al<sup>25</sup>. On admission, of the 333 patients, 75.4% (251 of 333) patients had renal involvement, 65.8% (219 of 333) patients presented with proteinuria, and 41.7% (139 of 333) patients had haematuria. The incidence of AKI in the overall cohort was 4.7% (22 of 467) by KIDGO criteria and

7.5% (35 of 467) by expanded criteria. A total of 42.9% (24 of 56) critically ill cases developed AKI during the hospital stay.

In our study, out of 310 COVID 19 patients, 227 (73.2%) were males and 83 (26.7%) were females. 81 (26.12 %) patients belong to mild, 75 (24.19%) to moderate and 154 (37.4 %) to severe COVID 19 disease. Overall AKI was present in 75 (24.19%) patients. In mild disease 8 (9.8%) patients, in moderate disease 14 (18.6%) patients and in severe disease 53 (34.4%) patients had AKI.

## Conclusion

The new coronavirus (SARS-CoV-2) can cause kidney impairment. The exact mechanism of kidney involvement in COVID-19 infection has not been clarified yet. Until now, there is no specific medication for the cure of coronavirus; hence, the primary solution is supportive care such as preservation of vital signs, regulation of oxygen and blood pressure and reduction complications such as secondary infections or other failures of the organs of the body, including the kidney.

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