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Mortality among Patients with COVID-19 and Acute Kidney Injury in the Intensive Care Unit of the Infectious and Tropical Diseases Department of the Teaching Hospital of Treichville

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Abstract

Background: The development of acute kidney injury (AKI) is a negative prognostic indicator for survival in patients with COVID-19 infection. **Objective:** To identify risk factors for mortality among patients with COVID-19 and acute kidney injury. The study focused on patients admitted for COVID-19 infection who presented with acute kidney injury and whose hospitalization resulted in death. **Methods:** This was a retrospective, analytical study focusing on acute kidney injury in patients with COVID-19 admitted to the intensive care unit (ICU) of the Infectious and Tropical Diseases Department. The study was conducted between March 2020 and December 2021. Renal function was defined using the KDIGO classification of AKI. Diuresis was monitored from the first 6 hours of admission. Patients whose creatinine, urea, and albumin levels at admission, as well as their urine output/time period, were not available upon admission were excluded from the study. Similarly, incomplete records were those with incomplete sociodemographic, clinical, and paraclinical data. **Results:** The study included 289 patients who tested positive for COVID-19. Among them, acute kidney injury was observed in 107 cases, representing a prevalence of 37%. The mean age of patients with AKI was 61.3 ± 13.6 years, and 45.7% were aged 65 years or older. Male predominance was noted, with a male-to-female ratio of 2.68. The primary reasons for ICU admission were acute respiratory distress (ARD) in 71% of cases and dyspnea in 12.1%. Comorbidities included hypertension (67.2%), diabetes mellitus (41.1%), and obesity (14.9%). According to KDIGO criteria, AKI was classified as stage 3 in 52.3% of patients, stage 2 in 16.8%, and stage 1 in 30.5%. AKI was identified prior to hospital admission in

40.1% of cases, between 24 and 72 hours after admission in 42.9%, and more than 72 hours after admission in 16.8%. Hemodialysis was performed in 36.4% of patients. The clinical course was marked by death in 68 patients (63.5%). Multivariate analysis identified the following factors as independently associated with increased risk of mortality in the context of COVID-19: acute respiratory distress (OR = 5.06; p = 0.006), KDIGO stage 3 AKI (OR = 5.15; p = 0.003), orotracheal intubation (OR = 4.37; p = 0.0001), and mechanical ventilation (OR = 4.01; p = 0.0001). **Conclusion:** Acute kidney injury (AKI) is an adverse prognostic factor in the context of COVID-19. Mortality appears to be more closely related to the severity of SARS-CoV-2 infection than to respiratory support.

Keywords

Acute Kidney Injury, COVID-19, Acute Respiratory Distress, Respiratory Support

1. Introduction

The first case of COVID-19 was identified in December 2019. The disease rapidly evolved into a global pandemic and was declared a "Public Health Emergency of International Concern" by the World Health Organization (WHO) on March 11, 2020. On that same date, the first case of COVID-19 was detected in the Republic of Côte d'Ivoire. The causative agent, SARS-CoV-2, typically manifests as respiratory involvement, ranging from paucisymptomatic forms to severe pneumonia with acute respiratory distress [1]. Beyond its respiratory tropism, accumulating evidence suggests multiorgan involvement in infected patients, attributed to viral binding to angiotensin-converting enzyme 2 (ACE2) receptors expressed on various human cell types [1].

Although acute respiratory failure remains the most frequent and severe organ dysfunction, acute kidney injury (AKI) is commonly reported in patients with SARS-CoV-2 infection. AKI is a frequent complication among critically ill patients admitted to intensive care units (ICUs) for acute respiratory distress syndrome (ARDS) secondary to COVID-19. Its reported incidence in ICU settings varies from 5% to 25% across studies [2]. A study conducted in Bordeaux, France, estimated the incidence of AKI at approximately 80% among critically ill patients requiring ICU admission [3]. In a large cohort of over 1800 ICU patients with ARDS, 44.3% developed AKI, compared with 27.4% among ICU patients without ARDS [3].

The development of AKI is a negative prognostic indicator for survival in patients with COVID-19. In a study of patients aged 18 years and older hospitalized for COVID-19 across 13 hospitals in the New York metropolitan area between March 1 and April 27, 2020, and followed until hospital discharge, the incidence rates of in-hospital mortality were 10.8, 31.1, and 37.5 per 1000 patient-days among patients without AKI, those with AKI not requiring dialysis (KDIGO stages 1 - 3), and those with AKI requiring dialysis (stage 3D), respectively [4]. Using patients without AKI as the reference group, the authors observed significantly increased risks of in-hospital death for patients with AKI stages 1 - 3 (HR

5.6; 95% CI, 5.0 - 6.3) and stage 3D (HR 11.3; 95% CI, 9.6 - 13.1). Another study conducted in Ireland among ICU-admitted patients reported an incidence of dialysis-requiring AKI of 22.2%, with mortality exceeding 75% [5].

Several factors associated with mortality in the context of COVID-19 and AKI have been reported in the literature. This study aims to identify risk factors for death among patients with COVID-19 and acute kidney injury admitted to the intensive care unit of the Department of Infectious and Tropical Diseases.

2. Materials and Methods

2.1. Study Setting

This study was conducted in the COVID-19 ICU of the Department of Infectious and Tropical Diseases (DITD) at Treichville Teaching Hospital.

2.2. Study Design and Duration

This was a retrospective, analytical study focusing on acute kidney injury in patients with confirmed COVID-19, conducted between March 2020 and December 2021.

2.3. Study Population

The study population consisted of all patients admitted to the DITD COVID-19 ICU during the study period. We included all patients with laboratory-confirmed SARS-CoV-2 infection (via RT-PCR), with or without acute kidney injury. Exclusion criteria were: negative RT-PCR test, incomplete medical records for key variables, death upon admission, and known pre-existing chronic kidney disease.

The primary outcome was in-hospital mortality.

2.4. Data Collection

Data were extracted from medical records using a standardized case report form. The form included:

Sociodemographic data: age, gender.

Clinical data: reason for admission, referring service/institution, known comorbidities (obesity, hypertension, diabetes, cardiovascular disease, chronic respiratory disease, liver disease, chronic kidney disease, HIV-related immunosuppression), regular medications (NSAIDs, ACE inhibitors, ARBs, diuretics, calcineurin inhibitors, beta-blockers, centrally acting antihypertensives, antidiabetics, lipid-lowering agents, antiretrovirals), hemodynamic and respiratory parameters (mean arterial pressure, urine output, oxygen saturation, FiO2, PEEP, temperature, heart rate, respiratory rate, peripheral oxygen saturation), lower limb edema, urinalysis, body mass index (BMI), qSOFA score [6], sepsis, septic shock [7], Glasgow Coma Scale (GCS), acute respiratory distress syndrome (ARDS), fluid balance (input/output).

Laboratory data: blood urea nitrogen, serum creatinine, sodium, potassium, calcium, chloride, phosphate, uric acid, hemoglobin, mean corpuscular volume,

mean corpuscular hemoglobin, platelet count, prothrombin time, activated partial thromboplastin time, blood glucose, C-reactive protein (CRP), transaminases, arterial blood gases (pH, HCO_3^-, PaO_2, $PaCO_2$), lactate, serum albumin, proteinuria, hematuria, urinary sodium, urinary potassium, renal ultrasound, thoracic computed tomography.

Therapeutic data: fluid and electrolyte management, oxygen therapy, sedation, neuromuscular blockade, orotracheal intubation, mechanical ventilation, vasopressor use, corticosteroids, antiplatelet agents, albumin, insulin, statins, diuretics, antihypertensives, antidiabetics, antivirals, low-molecular-weight heparin (LMWH), proton pump inhibitors (PPIs), antibiotics, and hemodialysis.

In-hospital events: shock, AKI progression, death.

2.5. Operational Definitions

Acute Kidney Injury (AKI): Defined and staged according to KDIGO criteria [8]. Serum creatinine was measured daily during the first week, every other day during the second week, and twice weekly thereafter until discharge, using the standardized Jaffe method.

Hypertension: Defined per the Eighth Joint National Committee (JNC 8) guidelines [9] as blood pressure ≥ 140/90 mmHg.

Hyperglycemia: Defined as blood glucose > 1.26 g/L [10].

Sepsis: Defined by the presence of at least two qSOFA criteria (systolic BP < 100 mmHg, respiratory rate > 22/min, GCS <15) [11], or by the combination of systemic inflammatory response syndrome (SIRS) and suspected or confirmed infection [12]. A qSOFA score ≥ 2 warrants urgent intervention.

Septic Shock: Defined as sepsis plus vasopressor requirement to maintain mean arterial pressure ≥ 65 mmHg and serum lactate > 4 mmol/L despite adequate fluid resuscitation [12].

Level of Consciousness: Assessed using the Glasgow Coma Scale (GCS): Stage I (vigil coma, GCS 13 - 14), Stage II (mild coma, GCS 10 - 12), Stage III (deep coma, GCS 7 - 9), Stage IV (brain death, GCS 3 - 6).

Metabolic Acidosis: Defined via the Henderson-Hasselbalch equation as plasma bicarbonate < 20 mmol/L, typically associated with compensatory reduction in $PaCO_2$; pH may be markedly or mildly decreased.

Acute Respiratory Distress Syndrome (ARDS): Defined per the Berlin 2012 criteria [13] as non-cardiogenic pulmonary edema causing hypoxemia, classified by PaO_2/FiO_2 ratio:

-Mild ARDS: PaO_2/FiO_2 201 - 300 mmHg with PEEP ≥ 5 cm H_2O

-Moderate ARDS: PaO_2/FiO_2 101 - 200 mmHg with PEEP ≥ 5 cm H_2O

-Severe ARDS: PaO_2/FiO_2 ≤ 100 mmHg with PEEP ≥ 5 cm H_2O

When PaO_2 is unavailable, SpO_2/FiO_2 ≤ 315 suggests ARDS, even in non-intubated patients [14].

2.6. Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics (version 25.0). Cat-

egorical variables are presented as percentages, and continuous variables as medians. Univariate analysis comparing groups based on the primary outcome (death) was conducted using Chi-square tests for categorical variables and Wilcoxon rank-sum tests for continuous variables. Multivariate analysis was performed using stepwise backward logistic regression. The final model included one variable per ten observed events. Only variables significant in univariate analysis were included. No imputation was performed for missing data. All tests were two-tailed, with statistical significance set at $p < 0.05$.

2.7. Ethical Considerations

Our study received approval from the ethics committee of the Teaching of Treichville hospital of Treichville.

3. Results

This study included 289 patients with confirmed COVID-19. Among them, acute kidney injury was observed in 107 cases (37% prevalence).

The mean age of patients with AKI was 61.3 ± 13.6 years; 45.7% were aged ≥ 65 years. Male predominance was noted (male-to-female ratio: 2.68). The primary reasons for ICU admission were acute respiratory distress (ARD, 71%) and dyspnea (12.1%). Comorbidities included hypertension (67.2%), diabetes (41.1%), and obesity (14.9%). The most common clinical findings were coma (96.2%), hypoxia (SpO_2 < 92%, 77.6%), sepsis (79.4%), and oligo-anuria (62.6%). Among patients with ARDS (71%), severity was classified as severe in 50.4% and moderate in 15.8%. The qSOFA score was severe in 63.5% and critical in 25.2%.

According to KDIGO criteria, AKI was stage 3 in 52.3%, stage 2 in 16.8%, and stage 1 in 30.5%. AKI was diagnosed prior to admission in 40.1%, between 24 - 72 hours post-admission in 42.9%, and >72 hours post-admission in 16.8% (Table 1).

Table 1. General characteristics of COVID-19-positive patients with acute kidney injury (AKI).

Variables	Total (n = 107)	Deceased (n = 68)	Survivors (n = 39)	P-value	Unadjusted OR (95% CI)
Age (years)					
Mean ± SD	61.33 ± 13.6	61.78 ± 13.74	60.54 ± 13.5	0.95	
<35	2.8% (3)	2.9% (2)	2.6% (1)	1	1.15 (0.1 - 13.12)
[35 - 65[	51.40% (55)	48.5% (33)	56.4% (22)	0.43	0.73 (0.33 - 1.61)
≥65	45.79% (49)	48.5% (33)	41% (16)	0.45	1.35 (0.61 - 3)
Male	72.90 % (78)	73.5% (50)	71.8% (28)	0.84	1.09 (0.45 - 2.63)
Reason for admission					
ARD	71.02 % (76)	82.4% (56)	51.3% (20)	0.001	4.43 (1.83 - 10.74)
Dyspnea	12.15% (13)	1.5% (1)	30.8% (12)	0.000	0.03 (0.00 - 0.27)
Acute pulmonary edema	5.61% (6)	4.4% (3)	7.7% (3)	0.47	0.55 (0.11 - 2.89)

Continued

Loss of consciousness	11.21% (12)	11.8% (8)	10.3% (4)	0.81	1.17 (0.33 - 4.16)
Comorbidities					
Hypertension	67.28% (72)	67.6% (46)	66.7% (26)	0.91	1.04 (0.45 - 2.42)
Diabetes mellitus	41.12 % (44)	44.1% (30)	35.9% (14)	0.40	1.41 (0.63 - 3.17)
Obesity	14.95% (16)	14.7% (10)	15.4% (6)	1	0.95 (0.32 - 2.84)
HIV infection	6.54% (7)	7.4% (5)	5.1% (2)	1	1.47 (0.27 - 7.95)
Clinical signs					
Hypertensive crisis	60.75% (65)	63.2% (43)	56.4% (22)	0.48	1.33 (0.66 - 2.96)
Fever	48.60% (52)	51.5% (35)	43.6% (17)	0.43	1.37 (0.62 - 3.03)
Coma	96.26% (103)	97.1% (66)	94.9% (37)	0.62	0.56 (0.08 - 4.15)
Oxygen saturation < 92%	77.60% (83)	80.5% (55)	71.8% (28)	0.4	1.66 (0.66 - 4.18)
Oligo-anuria	62.61% (67)	63.2% (43)	61.6% (24)	0.86	1.07 (0.76 - 1.50)
Obesity	29.90% (32)	29.4% (20)	30.8% (12)	0.88	0.94 (0.4 - 2.21)
Sepsis	79.43% (85)	82.4% (56)	74.4% (29)	0.46	1.61 (0.62 - 4.17)
qSOFA score					
Critical	25.23% (27)	30.9% (21)	15.4% (6)	0.12	2.46 (0.89 - 6.75)
Severe	63.55 (68)	58.8% (40)	71.8% (28)	0.18	0.56 (0.24 - 1.31)
Moderate	11.21% (12)	10.3% (7)	12.8% (5)	0.75	0.78 (0.23 - 2.65)
ARDS severity					
Severe ARDS	50.46% (54)	60.3% (41)	33.3% (13)	0.007	3.04 (1.33 - 6.92)
Moderate ARDS	15.88 (17)	20.6% (14)	7.7% (3)	0.13	3.11 (0.83 - 11.6)
Mild ARDS	4.67% (5)	1.5% (1)	10.3% (4)	0.05	0.13 (0.01 - 1.21)
AKI stage (KDIGO)					
Stage 1	30.8% (33)	26.5% (18)	38.5% (15)	0.196	0.58 (0.25 - 1.33)
Stage 2	16.8% (18)	11.8% (8)	25.6% (10)	0.114	0.39 (0.14 - 1.08)
Stage 3	52.3% (56)	61.8% (42)	35.9% (14)	0.01	2.88 (1.27 - 6.53)
Hemoglobin (g/dL)					
≥12	37.38% (40)	33.8% (23)	43.6% (17)	0.31	0.66 (0.29 - 1.48)
[8 - 12[	45.79% (49)	50% (34)	38.5% (15)	0.24	1.6 (0.72 - 3.57)
<8	16.82 (18)	16.2% (11)	17.9% (11)	1	0.88 (0.31 - 2.5)
Blood urea (g/L)					
[0.15 - 0.45[	13% (14)	5.9% (4)	25.6% (10)	0.009	0.18 (0.05 - 0.63)
[0.45 - 2[	70% (75)	70.6% (48)	69.2% (27)	0.88	1.07 (0.45 - 2.51)
≥2	16.8% (18)	23.5% (16)	5.1% (2)	0.029	5.69 (1.23 - 26.27)
Hypoalbuminemia	66.35% (71)	72.1% (49)	56.4% (22)	0.09	1.99 (0.87 - 4.55)

Continued

Metabolic acidosis	23.36% (25)	27.9% (19)	15.4% (6)	0.215	2.13 (0.77 - 5.9)
Antibiotic regimen					
Monotherapy	14.95% (16)	14.7% (10)	15.4% (6)	1	0.95 (0.32 - 2.84)
Dual therapy	36.44% (39)	27.9% (19)	51.3% (20)	0.016	0.37 (0.16 - 0.84)
Triple therapy	47.66% (51)	57.4% (39)	30.8% (12)	0.008	3.03 (1.32 - 6.95)
Norepinephrine use	20.56% (22)	30.9% (21)	2.6% (1)	0.001	2.83 (0.78 - 4.88)
Emergency interventions					
High-flow nasal oxygen (HFNO)	78.5% (84)	80.9% (55)	74.4% (29)	0.58	1.46 (0.57 - 3.73)
Non-invasive ventilation (NIV)	52.33% (56)	38.3% (41)	38.5% (15)	0.98	0.99 (0.44 - 2.22)
Neurosedation	37.38% (40)	57.4% (39)	2.6% (1)	0.000	3.93 (1.89 - 5.98)
Neuromuscular blockade	19.62% (21)	29.4% (20)	2.6% (1)	0.002	2.76 (0.71 - 4.82)
Orotracheal intubation (OTI)	38.31% (41)	58.8% (40)	2.6% (1)	0.000	3.99 (1.95 - 6.04)
Mechanical ventilation (MV)	35.51% (38)	54.4% (37)	2.6% (1)	0.000	3.81 (1.77 - 5.86)
Hemodialysis	36.4% (39)	79.5% (31)	20.5% (8)	0.009	3.25 (1.3 - 8.1)

Abbreviations: ARD = Acute Respiratory Distress; ARDS = Acute Respiratory Distress Syndrome; AKI = Acute Kidney Injury; HFNO = High-Flow Nasal Oxygen; NIV = Non-Invasive Ventilation; OTI = Orotracheal Intubation; MV = Mechanical Ventilation; OR = Odds Ratio; CI = Confidence Interval.

Anemia was observed in 62.5% of patients, with hemoglobin < 8 g/dL in 16.8%. Other laboratory abnormalities included hypoalbuminemia (66.3%) and metabolic acidosis (23.3%).

All patients received antibiotic therapy: triple therapy in 47.6% and dual therapy in 36.4%. Additional interventions included norepinephrine infusion (20.5%), oxygen therapy (78.5%), non-invasive ventilation (52.3%), orotracheal intubation (38.3%), mechanical ventilation (35.5%), and hemodialysis (36.4%) (Table 1).

Mortality occurred in 68 patients (63.5%). Survival was comparable between AKI and non-AKI patients during the first five days of ICU admission. However, from day 6 to day 30, survival was significantly better in the non-AKI group (p = 0.001) (Figure 1).

From day 1 to day 5, patients who developed AKI exhibited survival rates comparable to those without AKI, with no statistically significant difference (p = 0.073). Between day 5 and day 30, however, patients with AKI demonstrated significantly lower survival compared to those without AKI (p = 0.001).

Furthermore, survival was significantly better when AKI developed >72 hours after ICU admission (p = 0.026). Beyond day 27, survival rates converged regardless of AKI onset timing (Figure 2).

From day 1 to day 25, patients who developed AKI prior to admission and those who developed AKI within 24 - 72 hours after admission had lower survival compared to patients who developed AKI ≥ 72 hours after admission, with a statistically significant difference (p = 0.026). From day 27 onward, survival was

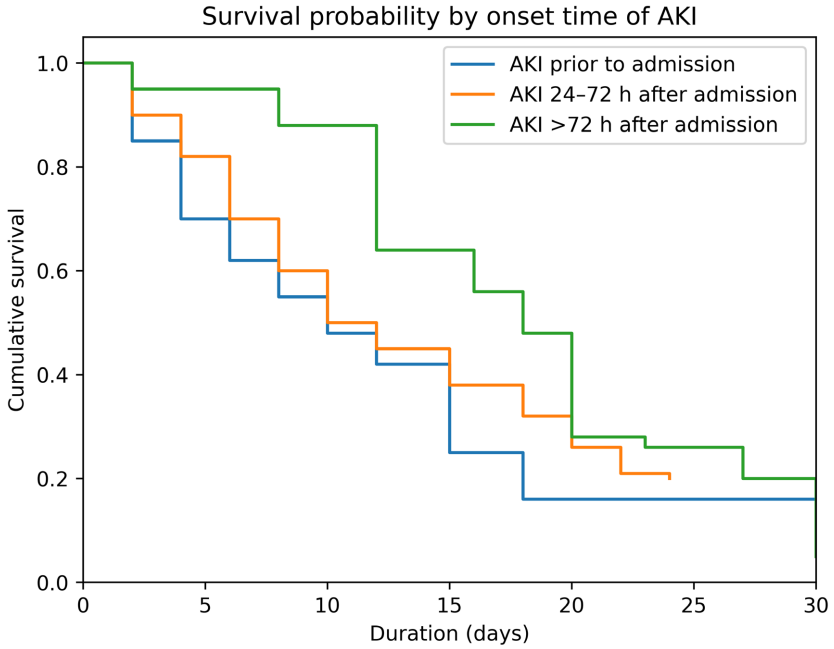

Figure 1. Survival curves of patients with and without acute kidney injury (AKI).

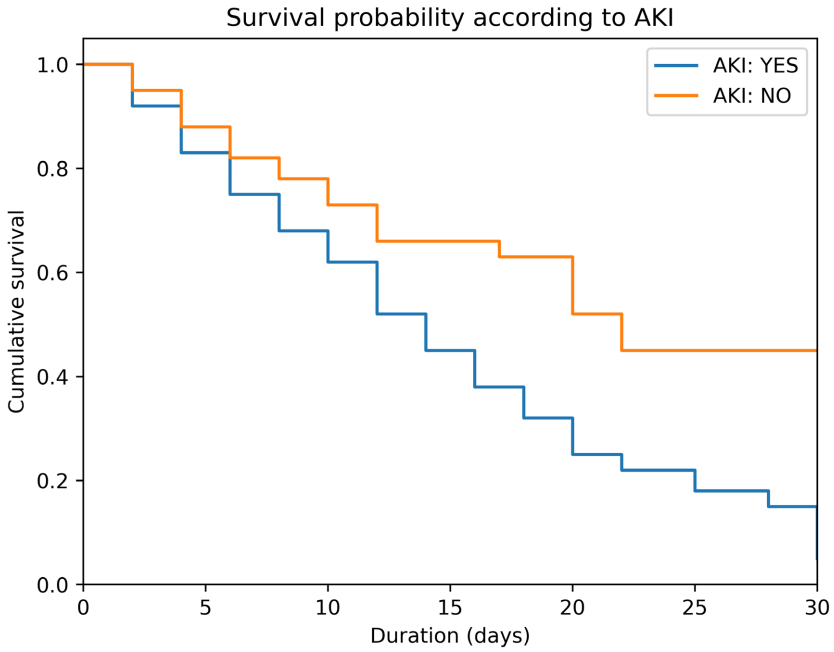

Figure 2. Survival curve according to the time of AKI onset.

similar regardless of the timing of kidney injury onset.

In univariate analysis, deceased patients were significantly more likely to have experienced ARD ($p = 0.001$), severe ARDS ($p = 0.007$), KDIGO stage 3 AKI ($p = 0.01$), blood urea > 2 g/L ($p = 0.02$), triple antibiotic therapy ($p = 0.008$), norepinephrine use ($p = 0.001$), neurosedation ($p < 0.001$), neuromuscular blockade ($p = 0.002$), orotracheal intubation ($p < 0.001$), mechanical ventilation ($p < 0.001$), and hemodialysis ($p = 0.009$) (Table 1).

Hemodialysis was indicated in cases of anuria lasting more than 24 hours, severe uremia exceeding 2 g/L, severe metabolic acidosis, and acute pulmonary edema refractory to diuretics. This was intermittent hemodialysis, not continuous hemodialysis.

In multivariate analysis, the following factors were independently associated with increased risk of death: acute respiratory distress (OR = 5.06; $p = 0.006$), KDIGO stage 3 AKI (OR = 5.15; $p = 0.003$), orotracheal intubation (OR = 4.37; $p < 0.001$), and mechanical ventilation (OR = 4.01; $p < 0.001$) (Table 2).

Table 2. Factors associated with risk of death — multivariate logistic regression analysis.

Variables	P-value	Adjusted	95% CI	
			Lower	Upper
ARD	0.006	5.06	1.6	15.99
Blood urea ≥ 2 g/L	0.1	5.07	0.73	35.22
Severe ARDS	0.842	0.84	0.16	4.45
KDIGO Stage 3 AKI	0.003	5.15	1.73	15.34
Triple antibiotic therapy	0.13	2.57	0.75	8.76
Norepinephrine use	0.1	8.35	0.67	45.93
Neurosedation	0.9	0.002	0.000	5.97
Neuromuscular blockade	0.66	0.09	2	45.7
Orotracheal intubation	0.0001	4.36	2.19	6.53
Mechanical ventilation	0.0001	4.01	1.87	6.15
Hemodialysis	0.07	0.41	0.31	2.31

4. Discussion

Although COVID-19 primarily manifests with respiratory symptoms, systemic complications involving the coagulation system, gastrointestinal tract, heart, and kidneys have been widely reported. Renal manifestations most commonly present as acute kidney injury (AKI), which is recognized as an independent predictor of poor prognosis in patients with SARS-CoV-2 infection.

Our study demonstrated that, starting from the sixth day of hospitalization, the presence of AKI significantly and negatively impacts patient prognosis. A retrospective study conducted between April 2020 and October 2021 in a private hospital in Kenya, involving 1366 hospitalized COVID-19 patients, similarly found that AKI was associated with a higher risk of mortality, with risk increasing proportionally with AKI stage [15].

In our cohort, more than six out of ten patients with COVID-19 and AKI died. Alfano *et al.* reported a mortality rate of 56.5% in a study conducted in Italy [16]. Another study from Pakistan documented a mortality rate of 62.1% among COVID-19 patients with AKI, compared to 31.4% in those without AKI [17]. Furthermore, a systematic review encompassing 142 studies and 49,048 COVID-19

patients—including 5152 cases of AKI—confirmed that AKI is independently associated with increased mortality risk [18]. Identifying risk factors for death may facilitate the development of targeted strategies to prevent renal injury, as AKI has been shown to increase in-hospital mortality risk by approximately five-fold [19]. Early identification of high-risk patients, implementation of preventive measures, and timely supportive interventions in predisposed individuals could improve outcomes and mitigate long-term sequelae.

In our study, seven out of ten patients were admitted due to acute respiratory distress (ARD), and multivariate analysis confirmed ARD as an independent predictor of mortality. A multicenter study in Saudi Arabia involving 340 ICU-admitted patients reported an ARD incidence of 81.2% [20]. Similarly, Alfano *et al.* identified ARD as the leading cause of death among COVID-19 patients with AKI [16].

More than half of our patients presented with KDIGO stage 3 AKI, and this advanced stage was independently associated with increased mortality (**Table 1** and **Table 2**). Ng *et al.* reported similarly elevated mortality rates in patients with AKI, whether requiring dialysis (adjusted HR 6.4; 95% CI, 5.5 - 7.6) or not (adjusted HR 3.4; 95% CI, 3.0 - 3.9), compared to those without AKI [4].

Interestingly, our data showed improved survival when AKI was diagnosed more than 72 hours after ICU admission (**Figure 2**). This may reflect more timely and aggressive clinical interventions initiated once AKI is recognized, potentially mitigating further organ damage.

In our cohort, 36.4% of patients received hemodialysis. Cheruiyot *et al.* reported a lower rate of 15.6% (10 out of 64 patients) [15]. Access to renal replacement therapy in this context is heavily influenced by local resource availability and clinical decision-making. In our setting, two dialysis machines were available in the dedicated COVID-19 ICU, and nephrologists often adopted a "watchful waiting" approach before initiating dialysis. However, given the profound impact of factors such as baseline estimated glomerular filtration rate (eGFR) reduction and oliguria, it is clinically reasonable to assess individual probabilities of renal recovery and overall survival when discussing goals of care. The Renal Physicians Association recommends shared decision-making to evaluate whether to initiate dialysis, conduct a time-limited trial of dialysis, or transition to palliative or end-of-life care [21].

Critically ill COVID-19 patients receiving hemodialysis frequently develop hypoxemia, respiratory failure, and other extrapulmonary complications—including increased risks of shock, worsening AKI, and thromboembolic events. As the disease progresses, these patients often require mechanical ventilation and intensive monitoring in the ICU [22]. Contrary to our findings, some authors have suggested that ICU admission and respiratory support are not independent predictors of mortality or poor outcomes [22]. However, in our cohort, orotracheal intubation and mechanical ventilation were strongly associated with mortality (**Table 2**). This discrepancy may be explained by the fact that most critically ill

dialysis-dependent patients also require intubation and mechanical ventilation. Intubation itself has been associated with increased risks of nosocomial infection and mortality [22]. Therefore, a critical question remains: Is mortality driven by the act of intubation itself—or by the underlying severity of illness that necessitates such invasive respiratory support?

5. Conclusion

Acute kidney injury (AKI) is a significant negative prognostic factor in patients with COVID-19. Mortality appears to be primarily associated with the severity of SARS-CoV-2 infection itself, rather than with the use of respiratory support interventions.

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Authors' Contribution

KONAN SERGE DIDIER wrote this article, conducted the study and entered the data. He carried out the statistical analysis of the data. OUATTARA KOLO CLAUDE directed this work from the protocol to the final draft. YAO Hubert coordinated the study and publication of this article.

OUATTARA KOLO CLAUDE submitted the article online and adapted it to the journal's recommendations.

Management of Interview and Observation Data

All recorded data will remain strictly confidential and can only be consulted by the medical team in charge of the research. These data will be subject to computer processing. They can be consulted on request addressed to YAO KOUAME HUBERT.

Compensation

Participation in the study was not subject to financial compensation for the participants.

Project Duration and Funding

This study was funded by the authors with their own funds.

Rights of the Participant

The participants were submitted to a confidential questionnaire, and in order to preserve their anonymity a unique number was assigned to them.

Participation in this study was entirely free and voluntary. Participants were free to accept or refuse to participate in our study. Those who accepted were also free, at any time, to end their participation, and, on simple verbal notice without

giving an explanation

Dissemination of Results

The results of this study had been submitted only to BMC journal. The manuscript is not under consideration by another journal and has not been previously published.

Clinical Trial Number

Not applicable.

Ethics

The study was conducted in accordance with good clinical practice and national research guidelines. The full study protocol was approved by the Ethics and Scientific Committee of the Treichville University Hospital, in accordance with the Declaration of Helsinki. Informed consent from patients was obtained for their inclusion in the study. To respect the confidentiality of patient records, names were not mentioned, and data collection was carried out during our daily practice.

Consent to Publish

Consent to Publish declarations: not applicable.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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