ORIGINAL ARTICLE

COVID-19 and CKD Patients: An Experience at a Tertiary Care Hospital in Rajasthan, India

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ABSTRACT

Background: The COVID-19 (Novel corona virus) continues to wreck havoc across China, European countries, USA and now seems to have gained a strong foothold in India. The aim of this study was to explore the association between chronic kidney disease (CKD) and the severity of COVID-19 infection.

Methods: The present study is a hospital-based, descriptive, retrospective study conducted in the Department of Nephrology, S M S Medical College, Jaipur, a tertiary care center in Rajasthan (India).

Results: Out of 50 cases 29 cases of CKD infected with COVID 19 died. The association between age more than 60, CKD stage, need of ventilator, Oxygen support and mortality was found statistically significant. Inflammatory markers were higher in expired patients as compared to patients who survived.

Conclusion: We concluded that CKD patients with COVID-19 infection have a higher mortality risk. Thus, CKD patients infected with SARS-CoV-2 must be carefully monitored and managed to lower the risk of death.

Keywords: CKD; COVID-19; Mortality

INTRODUCTION

On December 31, 2019, the China Health Authority alerted the World Health Organization (WHO) to several cases of pneumonia of unknown etiology in Wuhan City in Hubei Province in central China. The cases had been reported since December 8, 2019, and many patients worked at or lived around the local Huanan Seafood Wholesale Market although other early cases had no exposure to this market. On January 7, a novel coronavirus, originally abbreviated as 2019-nCoV by WHO, was identified from the throat swab sample of a patient. This pathogen was later renamed as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Coronavirus Study Group and the disease was named coronavirus disease 2019 (COVID-19) by the WHO. In January 30, 2019, 7736 confirmed and 12,167 suspected cases had been reported in China and 82 confirmed cases had been detected in 18 other countries. In the same day, WHO declared the SARS-CoV-2 outbreak as a Public Health Emergency of International Concern (PHEIC)[1].

Due to COVID-19 being a relatively new and understudied disease, the data available is limited. However, from the cases that emerged, it was observed that comorbidities increase the severity of infection. Based on current information and clinical expertise, the elderly, especially those in long-term care facilities and people of any age with serious underlying medical conditions are at a greater risk of getting COVID-19. The elderly, a vulnerable population, with chronic health conditions such as diabetes and cardiovascular or lung disease are not only at a higher risk of developing severe illness but are also at an increased risk of death if they become ill. People with underlying uncontrolled medical conditions such as diabetes; hypertension; lung, liver, and kidney disease; cancer patients on chemotherapy; smokers; transplant recipients; and patients taking steroids chronically are at increased risk of COVID-19 infection[2].

The prevalence of CKD in-patients diagnosed with COVID-19 has been reported as 1–2%[3-4]. CKD is associated with an increased risk of both in-patient and outpatient pneumonia[5]. Moreover, mortality due to pulmonary infection in patients with CKD is approximately tenfold higher than that of the general population[6]. The aim of this study was to explore the association between CKD and the severity of COVID-19 infection.

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MATERIALS AND METHODS

Design and setting

This study was a hospital-based, descriptive, retrospective study conducted in the Department of Nephrology, S M S Medical College, Jaipur, a tertiary care center in Rajasthan (India).

A sample size of 50 was calculated based on a CKD prevalence rate in covid-19 of 1-2 %, according to Cheng Y et al[3] with permissible error of 20% using the statistical formula,

n = 4pq/L2 (p = prevalence; q = 100 - prevalance; L = p x permissible error).

In the present study, 50 CKD patients with COVID-19 attending our hospital were included. Informed consent from each subject was taken.

Inclusion criteria

All the patients enrolled in this study were diagnosed COVID-19 positive according to the guidance provided by ICMR. The inclusion criteria were as follows: clinical diagnosis criteria of (1) fever or respiratory symptoms and (2) the need for clinical hospitalization (severe acute respiratory infection); and (3) the exclusion of other diseases, (4) to determine RT-PCR testing positive in all cases.

Exclusion criteria

Paediatric and non-CKD patients were excluded from the study.

METHODS

The demographic characteristics, clinical symptoms, laboratory data, and medications were extracted from medical records.

Laboratory data consisted of complete blood count, liver and renal function tests, and the measurement of C-reactive protein, ferritin, lactate dehydrogenase.

Estimated glomerular filtration rate was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation[7].

Statistical analysis

Data was recorded as per proforma. The data analysis was computer based; SPSS-22 was used for analysis. For categoric variables chi-square test was used. For continuous variables independent samples' *t*-test was used. *p*-value <0.05 was considered as significant.

RESULTS

Table 1: Baseline characteristics of CKD with COVID patients

Variable		
Age		53.52±13.51 Yrs (22-79Yrs)
Male : Female		34 : 16
Diabetes n(%)		22(44.00%)
Hypertension n(%)		41(82.00%)
RRT n(%)		37(74.00%)
Fever n(%)		44(88.00%)
Cough n(%)		34(68.00%)
SOB n(%)		37(74.00%)
Diarrhea n(%)		23(46.00%)
Bodyache n(%)		48(96.00%)
Kidney disease	Diabetic kidney disease n(%)	22(44.00%)
	Chronic glomerulonephritis n(%)	24(48.00%)
	Chronic interstitial disease n(%)	4(8.00%)
CKD stage (3:4:5)		14:10:26

Table 2: Laboratory investigastion CKD with COVID patients

Laboratory investigation	
Blood urea mean±SD (IQR) (mg/dl)	164.56±41.70(139.00-250.00)
Serum creatinine mean±SD (IQR) (mg/dl)	6.17±2.43(3.10-10.80)
CRP mean±SD (IQR) (mg/l)	91.12±28.00(68.00-113.00)
LDH mean±SD (IQR) (mg/dl)	337.09±56.69(289.00-383.00)
Ferritin mean±SD (IQR) (ng/ml)	1014.64±260.04(842.00-1158.00)

Table 3: Outcome of CKD with COVID patients

Variable		
Chest CT Severity	Mild n(%)	16(32.00%)
	Moderate n(%)	9(18.00%)
	Severe n(%)	25(50.00%)
Death n(%)		29(58.00%)
Oxygen need n(%)		45(90.00%)
Ventilator need n(%)		22(44.00%)

Table 4: Co-relation between laboratory investigation and outcome in CKD with COVID patients

Laboratory investigation	Out come		p-value
	Death	Survived	
Blood urea mean±SD (mg/dl)	164.236±49.09	128.33±29.95	<0.05
Serum creatinine mean±SD (mg/dl)	9.23±2.43	4.02±2.34	<0.05
CRP mean±SD (mg/l)	95.32±29.04	78.36±27.09	<0.05
LDH mean±SD (mg/dl)	396.32±56.57	324.95±53.04	<0.05
Ferritin mean±SD (ng/ml)	1109.37±262.97	883.86±194.64	0.001
IL-6 mean±SD (pg/ml)	136.39±50.44	115.33±63.45	<0.05
Haemoglobin mean±SD (gm/dl)	7.90±0.92	8.80±1.18	<0.05

Table 5: Association between general characteristic and outcome in CKD with COVID patients

Variable		Out come		p-value
		Death (n=29)	Survived(n=21)	
Chest CT Severity	Mild n (%)	3	13	0.02
	Moderate n (%)	6	3	
	Severe n (%)	20	5	
CKD stage	3 n (%)	5	9	0.01
	4 n (%)	6	4	
	5 n (%)	18	8	

DISCUSSION

This study presents an information reported mortality rate of CKD patients with COVID-19. According to the available literature review, limited studies have analyzed the mortality of CKD patients with COVID-19. Based on the data of the relevant studies extracted from the literature, our research found that COVID-19 infection was closely associated with mortality in CKD patients. Although cardiovascular disease is the leading cause of death in CKD, the death rate associated with pulmonary infection in CKD patients is also high[8,9]. Our findings confirm this, as the CKD patients with COVID-19 infection had a higher mortality rate (58.00%). This is probably because in CKD patients, the levels of pro-inflammatory cytokines are increased, and this leads to an increase in oxidative stress that eventually produces an inflammatory immune response. The resulting immune system damage may increase susceptibility to bacterial and viral infections, and this might be the main reason for the increased risk of pulmonary inflammation[10]. We also observed that inflammatory markers (CRP, LDH, Ferritin) were significantly higher in died patients as compared to survived patients.

We found that among CKD patients complicated with COVID-19, those older than 60 years had a higher mortality rate than those who less than 60 years old. This is probably because elderly patients are more likely to have other complications (such as hypertension, diabetes, coronary artery disease and COPD). These comorbidities will increase the risk of death associated with COVID-19 in the elderly, so the specific conditions associated with the increased risk of death in CKD patients is not clear. Moreover, the high mortality rate in elderly patients is probably related to the higher incidence of these comorbidities, rather than CKD[11].

Our study has several limitations:

One of the main limitations is that the data were not adjusted for confounding factors, such as gender, race, and BMI, which may have affected the results.

Secondly, CKD patients with COVID-19 may have other chronic diseases (such as hypertension, diabetes, COPD, and cardiovascular and cerebrovascular diseases) that may have affected the results, but the related data were not considered in the analysis.

CONCLUSION

We concluded that CKD patients with COVID-19 infection have a high mortality risk. Thus, CKD patients infected with SARS-CoV-2 must be carefully monitored and managed to lower the risk of death.

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