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NEPHROLOGY - LETTER TO THE EDITOR

Patients with chronic kidney disease have a poorer prognosis of coronavirus disease 2019 (COVID-19): an experience in New York City

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Editor,

Since December 2019, coronavirus disease 2019 (COVID-19) has spread worldwide [1]. COVID-19 can cause acute kidney injury (AKI) [2]. A cohort study showed that development of AKI was associated with poor outcomes [3]. However, data regarding COVID-19 in patients with chronic kidney disease (CKD) are limited. We investigated if patients with CKD have a poorer prognosis of COVID-19. We also searched for prognostic factors associated with mortality in COVID-19 patients with CKD.

We analyzed Mount Sinai Health System (MSHS) medical records up to March 29, 2020, using Epic SlicerDicer software. We extracted data from patients who had positive results for the COVID-19 reverse-transcription polymerase chain reaction (RT-PCR) test. The 10th revision of the International Statistical Classification of Diseases code system was used to identify medical conditions. p values were calculated by using a 2-tailed χ^2 test, risk ratio (RR), and odds ratios (OR) were calculated with 95% confidence intervals (CI). MSHS waived institutional review board approval since this research used only deidentified, aggregate-level data. 3391 patients were positive for the COVID-19 RT-PCR test during the study period, with 210 (6.2%) CKD patients among them. The proportion of elderly patients was significantly higher in patients with CKD. Without adjusting age groups, patients with CKD had a higher risk of mortality and intubation (RR [95%CI]; 2.51 [1.82–3.47], $p < 0.001$ and 2.05 [1.40–3.01], $p < 0.001$, respectively). By stratifying the patients by age groups, we detected a significantly increased risk of mortality in patients age from 60 to 79 (1.80 [1.15–2.83]), but not in patients age 80 or older (1.15 [0.71–1.86]). In patients with CKD, we found a significantly higher rate of death in patients with atrial fibrillation (Afib) (OR [95%CI]; 2.13 [1.03–4.43]), heart failure (HF) (2.09 [1.16–3.77]), and ischemic heart disease (IHD) (2.87 [1.04–3.36]) (Table 1). Our study showed that CKD patients may have a higher risk of intubation and death. This tendency was consistent for each age group. A possible explanation of these findings is a proinflammatory state: patients with kidney dysfunction have deficits in immune cell populations [4], which may lead to increased lung inflammation.

Our study has several strengths. First, we included a relatively large number of patients, which allowed us to compare risks across age groups. Second, our patient population is largely white and African American, whereas existing studies are comprised mostly of Asian patients. Our study has several limitations. First, we did not access individual data; the results should be interpreted cautiously. Second, we did not stratify patients into CKD stages due to a limited number of cases; it remains unclear if there is a dose-dependent association between CKD stage and mortality. More studies of CKD patients are warranted. In conclusion, COVID-19 patients with CKD had a higher risk of mortality. Afib, HF, and IHD can be prognostic factors.

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Table 1 The odds ratio of medical conditions in patients with CKD stratified by status

Medical condition	Patients with CKD ($n=210$)		Odds ratio (95% CI)
	Deceased ($n=36$) (n, %)	Survived ($n=174$) (n, %)	
HTN	33 (91.7)	148 (85.1)	1.76 (0.58–5.37)
HLD	18 (50)	99 (56.9)	0.79 (0.44–1.44)
DM	26 (72.2)	96 (55.2)	1.88 (0.95–3.69)
IHD	17 (47.2)	51 (29.3)	1.87 (1.04–3.36)
HF	14 (38.9)	35 (20.1)	2.09 (1.16–3.77)
CVD	5 (13.9)	16 (9.2)	1.45 (0.63–3.33)
Afib	6 (16.7)	12 (6.9)	2.13 (1.03–4.43)
Obesity	7 (19.4)	25 (14.4)	1.34 (0.64–2.8)
PAD	7 (19.4)	17 (9.8)	1.87 (0.92–3.8)
ACEI	9 (25)	35 (17.2)	1.26 (0.64–2.48)

CKD chronic kidney disease, *HTN* hypertension, *HLD* hyperlipidemia, *DM* diabetes mellitus, *IHD* ischemic heart disease, *HF* heart failure, *CVD* cerebrovascular disease, *Afib* atrial fibrillation, *PAD* peripheral artery disease, *ACEI* angiotensin-converting enzyme inhibitor, *CI* confidence intervals

Author contributions TY had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: TY, HM. Acquisition, analysis, or interpretation of data: TY, TM. Drafting of the manuscript: TY, NC. Critical revision of the manuscript for important intellectual content: TY, HM, TM, SM, NC, SC. Statistical analysis: TY, TM, SM. Administrative, technical, or material support: TY, NC. Study supervision: SM, SC.

Compliance with ethical standards

Conflict of interest TY reports no conflict of interest. TM reports no conflict of interest. NC reports no conflict of interest. HM reports no conflict of interest. SC repots no conflict of interest. SM reports no conflict of interest.

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