

Journal Pre-proof



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PII: S0272-6386(20)30612-0

DOI: <https://doi.org/10.1053/j.ajkd.2020.03.009>

Reference: YAJKD 57113

To appear in: *American Journal of Kidney Diseases*

Received Date: 28 February 2020

Accepted Date: 26 March 2020

Please cite this article as: Wang R, Liao C, He H, Hu C, Wei Z, Hong Z, Zhang C, Liao M, Shui H, COVID-19 in Hemodialysis Patients: A Report of 5 Cases, *American Journal of Kidney Diseases* (2020), doi: <https://doi.org/10.1053/j.ajkd.2020.03.009>.

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COVID-19 in Hemodialysis Patients: A Report of 5 Cases

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Abstract

In December 2019, an outbreak of coronavirus disease (COVID-19) due to the novel SARS-CoV-2 virus began in China and spread rapidly worldwide. It is unknown whether hemodialysis patients represent a distinct group of patients with certain characteristics that may make them susceptible to infection or severe disease. In this Case Report, we describe the clinical and epidemiological features of COVID-19 in 201 maintenance hemodialysis patients in Zhongnan Hospital of Wuhan university, including 5 maintenance hemodialysis patients who contracted COVID-19 disease. Of the 5 patients with COVID-19, one had a definite history of contact with an infected person. The age range of the patients was 47–67 years. Diarrhea (80%), fever (60%), and fatigue (60%) were the most common symptoms. Lymphopenia occurred in all patients. Chest computerized tomography (CT) scans showed ground glass opacity in the lungs of all patients. Up to February 13, 2020, none of the patients had developed severe complications (acute respiratory distress syndrome, shock, multiple organ dysfunction) or died.

Key words Hemodialysis; COVID-19; coronavirus

Introduction

In December 2019, an outbreak of coronavirus disease (COVID-19) due to infection with the novel SARS-CoV-2 virus began in Wuhan, China, and spread rapidly to other areas of China and other countries (1-6). Phylogenetic analysis suggests that SARS-CoV-2 is a new human-infecting betacoronavirus, closely similar to bat coronaviruses, suggesting that bats might have been the original host of this virus (7). There are no antiviral drugs of proven efficacy or applicable vaccines. Supportive therapy is the main method for the management of symptomatic patients, many of whom require mechanical ventilation and other intensive care services. There is limited information regarding the epidemiology of COVID-19 in maintenance hemodialysis (MHD) patients. MHD patients may be at increased risk of COVID-19 because of many comorbid conditions(8). In this report we describe our experience with five MHD patients who developed COVID-19 disease at Zhongnan Hospital of Wuhan University.

Case Reports

Among 201 long-term hemodialysis patients in the dialysis center at Zhongnan Hospital of Wuhan University, five patients were diagnosed with COVID-19 pneumonia according to the criteria of the Chinese Centers for Disease Control, which included positive real time reverse transcriptase PCR testing for SARS-CoV-2 (rRT-PCR). Characteristics of the five patients are presented in Table 1. The age range of patients was 47 to 67 years and two of five patients were female. None of the patients had known exposure to the Huanan seafood market that appeared to be the epicenter of this infection. One had known exposure to an infected family member. The most common symptom of the five infected patients was diarrhea (4/5), followed by fever (3/5), fatigue (3/5) dyspnea (2/5) and abdominal pain (2/5). Only one patient had dry cough. No patients had rhinorrhea, sore throat, myalgia or other upper respiratory tract infection symptoms. All of the five patients had lymphopenia ($<1.0 \times 10^9 /L$). Only one patient had white blood cell and neutrophil cell count slightly above normal.

As shown in Figure 1, ground glass opacities on chest CT were the most common radiologic findings, followed by consolidation. All of the five patients were transferred to a designated hospital after diagnosis to continue hemodialysis. Two of them received intermittent nasal catheter oxygen inhalation as well as treatment with daily 40 mg methylprednisolone and intravenous immunoglobulin. Two patients were given antiviral treatment with abidol and ribavirin injection, respectively. Up to the end of this study, none of them had developed acute respiratory distress syndrome, shock, or other serious complications.

Discussion

We describe five adult MHD patients in our dialysis center who were diagnosed with mild COVID-19 disease, representing 2.5% of our dialysis population at the time. In addition one patient had respiratory symptoms and abnormal CT but negative rRT-PCR. All patients presented with lymphopenia, and the most common chest radiograph abnormality was ground glass opacity, which bears some resemblance to previous reports (9). Of note the prevalence of 2.5% may underestimate the actual prevalence of infected patients. Screening of all MHD patients began after the first patient was identified on Feb. 9, and screening consisted of a chest CT; rRT-PCR testing was only performed in those with an abnormal CT. In addition all patients had temperature measured prior to dialysis and those patients who had temperature exceeding $37.3 \cdot C$ or with respiratory symptoms had a chest CT and, if abnormal, testing for rRT-PCR. Therefore, some patients may have developed COVID-19 prior to screening and patients without an abnormal CT at the time of screening would have been missed, although no symptomatic patients were identified prior to Feb. 9.

It has been confirmed that T-cell immunity plays a key role in recovery from SARS-CoV infection (10). Because the uremia status is associated with extensive impairment of lymphocyte and granulocyte function, an abnormal immune system may alter their response to SARS-CoV infection(10). This is of particular concern given the densely populated and busy nature of dialysis facilities, creating a high risk of exposure. However, in our dialysis center, it does not seem to have spread widely. Since the outbreak of COVID-19

occurred in Wuhan, the city our dialysis center is located, we have taken a number of measures to avoid infection of patients and staff by the SARS-CoV2 virus beginning on Jan. 9. Patients were required to wear surgical masks or N95 masks throughout the hemodialysis treatment. No visitors were allowed. The staff members who conducted the dialysis treatments wore face shields, N95 face masks, eye shields, disposable gowns, caps, and gloves. In addition, chlorine disinfectants were used daily by staff to disinfect items and floors in the dialysis center. The circulating air UV air sterilizer disinfects 4 times a day for 2 hours each time.

In a retrospective study of 1099 patients with COVID-19 acute respiratory disease, fever and cough were the dominant symptoms, whereas vomiting and diarrhea were rare (13). Wang *et al.* found that the common symptoms of COVID-19 were fever, fatigue, and dry cough although many patients also presented with gastrointestinal symptoms, such as nausea and diarrhea (14). Of note the typical triad of fever, cough, and dyspnea was not present in any of the patients we report here and diarrhea was a common presenting symptom. Some symptoms of dialysis patients with COVID-19 disease may be difficult to distinguish from other symptoms common among patients on dialysis.

In summary, we describe five MHD patients who developed mild COVID-19 disease. In addition to fever and fatigue, diarrhea was also common in our dialysis patients. Further observations will be needed to more fully understand the full spectrum of clinical features and optimal diagnostic and treatment approached for of COVID-19 disease in hemodialysis patients.

Article Information

Support: There was no funding for this work.

Financial Disclosure: The authors declare that they have no relevant financial interests.

Acknowledgments: We thank all the medical, nursing, and technical staff from dialysis centers of Zhongnan Hospital, for their dedicated care of our dialysis patient during the COVID-19 epidemic.

Patient Consent for Publication: The authors declare that they have obtained consent from each patient reported in this article for publication of the information about him/her that appears within this Case Report.

Peer Review: Peer Review: Received February 28, 2020. Evaluated by 2 external peer reviewers, with direct editorial input from an Associate Editor and a Deputy Editor. Accepted in revised form March 26, 2020.

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Table 1 Patient clinical and laboratory characteristics

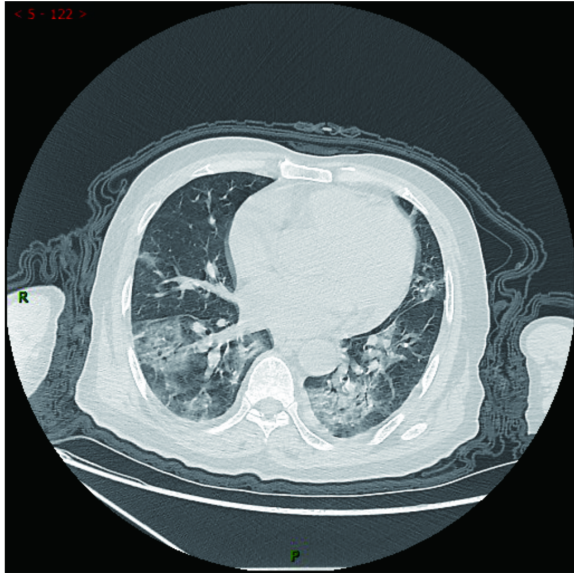
	Case 1	Case 2	Case 3	Case 4	Case 5
Clinical characteristics					
Age (years)	61	62	47	67	51
Sex	Male	Male	Female	Female	Male
Contact history with infected person	No	No	No	Yes	No
Other family members affected	No	No	No	Yes	No
Duration of dialysis (years)	7	3	5	1	1
Causes of renal failure	Hypertensive Nephropathy	Hypertensive Nephropathy	Chronic nephritis	Hypertensive Nephropathy	Hypertensive Nephropathy
Diabetes	No	No	No	Yes	No
Signs and symptoms					
Fever	Yes	No	Yes	Yes	No
Dry cough	No	Yes	No	No	No
Dyspnea	No	No	Yes	Yes	No
Fatigue	Yes	No	No	Yes	Yes
Diarrhea	Yes	No	Yes	Yes	Yes
Abdominal pain	No	No	Yes	Yes	No
Laboratory characteristics					
White blood cell count, $\times 10^9/L$	6.84	7.50	7.73	10.76	5.03
Neutrophil count, $\times 10^9/L$	5.69	5.65	6.28	9.24	4.29
Lymphocyte count, $\times 10^9/L$	0.63	0.84	0.80	0.92	0.49

Figure legend

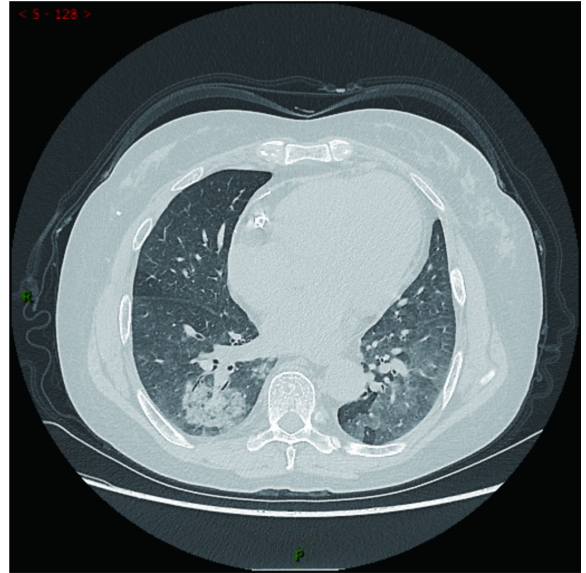
Figure 1 Chest computerized tomography (CT) scans (transverse plane) of Patient 1 and Patient 3. (A) Patient 1: Bilateral ground glass opacity, mainly in the lower lobes of both lungs, with air bronchogram sign. (B) Patient 3: Bilateral ground glass opacity of lower lung lobes and round shape consolidation opacity with air bronchogram sign in the right lower lung lobe.

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A



B



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