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Original Article

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Should We Weigh More on Home Dialysis Methods During Pandemic Periods: One Center Experience

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ABSTRACT

Objective: This study aims to determine the difference in the coronavirus disease 2019 incidence between our patient group performing home dialysis, including home hemodialysis and peritoneal dialysis, and our patient group performing in-center hemodialysis.

Methods: The study consists of the patients followed up in our center: 58 scheduled hemodialysis, 9 home hemodialysis, and 54 peritoneal dialysis patients. All the patients were closely followed for the coronavirus disease 2019 symptoms between March 2020 and May 2020. The follow-up intervals of our patients who underwent peritoneal dialysis and home hemodialysis were increased from 1 month to 2 months; all of them were contacted over the phone at the beginning of the pandemic and 2 months later, and the patients were questioned in terms of the coronavirus disease 2019 symptoms. Relevant descriptive statistics were presented. Binary logistic regression model was applied to compare the development of coronavirus disease 2019 in the patient group who performed home dialysis (home hemodialysis and peritoneal dialysis) and in the patient group who performed in-center hemodialysis via the glm function in R that fits generalized linear models. Age and the number of critical comorbidities (diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, and chronic obstructive lung disease) were employed as the other independent variables in the model.

Results: Three of the 58 patients who underwent dialysis in our center were followed up in our pandemic service with the diagnosis of coronavirus disease 2019. Coronavirus disease 2019 positivity was not detected in any patient who applied dialysis methods at home. The number of critical comorbidities appeared as the only significant variable in explaining the development of COVID-19 ($P = .0569<0.10$). The non-reflection of the difference of the applied methods (in-center hemodialysis vs. home dialysis (home hemodialysis and peritoneal dialysis)) in coronavirus disease 2019 development to the statistics may be due to the somewhat low number of total observations.

Conclusion: In our study, we observed no peritoneal dialysis or home hemodialysis patient diagnosed with coronavirus disease 2019 in our center during the pandemic period. Home dialysis methods may prove to be the gold standard treatment, especially during the pandemic period.

Keywords: COVID-19, end-stage renal failure, hemodialysis, home hemodialysis, pandemic, peritoneum dialysis

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INTRODUCTION

Coronavirus disease 2019 (COVID-19), which started in December 2019 in Wuhan, China, is a disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In addition to the symptoms such as flu-like ones, high fever, dyspnea, and dry cough, severe pneumonia may accompany the course of the COVID-19 disease. COVID-19 affected the whole world in a short time, and it was declared as a pandemic by the World Health Organization (WHO) on March 11, 2020.[1] In the same day, approximately 2.5 months after the first case seen in China, the first COVID-19 case was diagnosed in Turkey.

COVID-19 has high morbidity and mortality, especially both in the elderly and in the patients with comorbidity.[1] Considering the advanced age of most of the chronic kidney patients under renal replacement therapy (RRT), the accompanying comorbidities such as diabetes mellitus (DM), hypertension (HT), cardiovascular disease, chronic obstructive pulmonary disease (COPD), and the suppression in the immune system, this patient population constitutes an important risk group for COVID-19.[2] It has been reported that the mortality rate in this patient group is higher than that in the general population in the past epidemics.[1]

Socialization of the in-center hemodialysis (ICHD) patients due to their dependence on dialysis centers requires special attention to this patient group during the pandemic period. Hemodialysis (HD) centers can be a potential risk factor in the spread of the disease due to the fact that many patients are in the same environment at the same time, they come into contact with healthcare personnel who may be carriers of the disease-causing agent, and they have common areas of use such as clothing and the transportation vehicles. For this reason, in order to minimize the risk of transmission of infection, especially during pandemic periods, patients should be screened as to whether they developed symptoms or not in each session, the positive/suspicious cases should be separated from the healthy groups, and additional measures should be taken for HD patients.

Peritoneal dialysis (PD) and home hemodialysis (HHD) are the dialysis methods applied by the patients themselves and for which they are primarily responsible for the treatment. It can be considered that they are the luckiest group among the patients under RRT during the pandemic period due to the ease of social isolation and the non-usage of immunosuppressives as in renal transplant patients. Therefore, the low risk of the transmission of infection should be revealed and emphasized adequately while informing the patients with chronic kidney disease (CKD) about the dialysis methods at home during the RRT training phase. In parallel with this assessment, we tried to reveal the importance of home dialysis methods by predicting that the risk of the transmission of infection will be less in the patient group performing dialysis at home. Our information about the COVID-19 infection in the literature is composed mostly of the patients who received HD treatment, and especially HD treatment in the centers. Information on the incidence of COVID-19 in HHD and PD patients is rather limited. This study aims to determine the difference in the COVID-2019 incidence between home dialysis and ICHD patients.

MAIN POINTS

- Information on the incidence of COVID-19 in HHD and PD patients is rather limited.
- Home dialysis is a method performed in an isolated environment at home.
- Home dialysis proved to be the gold standard treatment, during the pandemic period.

METHODS

The analysis period of our study extends from March 2020, the start date of the pandemic in Turkey, to May 2020, when the cases started to decrease. The study included the patients who entered HD in our hospital, 58 of whom are ICHD patients, 9 of whom are HHD patients, and 54 PD patients; all are over the age of 18 and were followed up by our clinic. All of our dialysis patients were trained on the prevention from the COVID-19 pandemic. Regarding the performed study, the relevant approvals were received from the Ministry of Health of the Republic of Turkey (approval no: 2020-05-03T21-12-41) and from the Ethics Committee of Ankara City Hospital (approval no: E1-20-476; date: May 14, 2020).

At the onset of the pandemic, the files of all our PD patients were examined and the appointments of the appropriate PD patients were postponed. Patients with dialysis inadequacy and/or ultrafiltration problems were questioned by telephone with the tele-medicine method, and their prescriptions were written out remotely. All patients were screened over the phone and were questioned in terms of the most common symptoms in COVID-19, the contact with their family or surrounding patients diagnosed with COVID-19, and application to the other centers due to COVID-19. Demographic data, accompanying comorbidities, and dialysis durations of all the patients were carefully recorded. For the reproducibility of the research, we shared the data set of the study in a data repository.[3]

Statistical Analysis

We have used chi-square test of independence in order to determine whether there is a significant relationship between two categorical variables. A P value of $< .10$ was accepted to reveal a statistical significance. We have used R programming language in data analysis (R Core Team, 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

During the pandemic, we followed up 2422 (1592 suspected and 830 certain) COVID-19 cases who were admitted to the medical wards in our hospital and 684 (555 suspected and 129 certain) COVID-19 cases who were admitted to the intensive care unit (ICU) between March 2020 and May 2020. In this 2-month period, the number of COVID-19(+) ICHD patients who got the scheduled (standard thrice weekly) HD treatment and followed up in our pandemic wards and ICUs was 70. Three of these 70 ICHD patients were the patients who get HD treatment in our own center (Figure 1). In the study, no COVID-19 positivity was detected in any of our patients who received PD or HHD treatment.

Likewise, among the patients who were tested positive for COVID-19, no PD and HHD patients were found who are followed up in another unit.

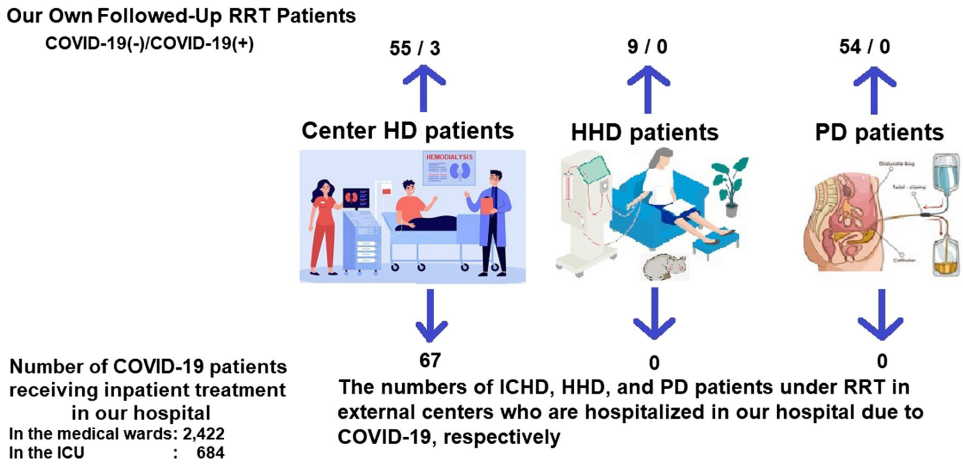

Figure 1. Visual summary of the distribution of the patients. HD, hemodialysis; HHD, home hemodialysis; ICHD, in-center hemodialysis; ICU, intensive care unit; PD, peritoneal dialysis; RRT, renal replacement therapy.

We also analyzed the granular information such as age, gender, the duration of CKD, the duration of RRT, the disease comorbidities, and the smoking of the patients (Table 1). Although we handled the patients of different ethnicities as well, we did not include it here since the ratio of non-Turkish patients among all the patients was relatively small.

DISCUSSION

The novel COVID-19, caused by the SARS-CoV-2 virus, is an infectious disease with very high contagiousness and is transmitted by droplets thrown out by coughing or sneezing or via contacts with others.[4] The number of individuals affected by the disease is increasing day by day. Common symptoms of the COVID-19 infection are generally fever (44-98%), cough (68-76%), myalgia (18%), and fatigue (18%).[5,6] It may be accompanied by dyspnea, loss of appetite, headache, abdominal pain, and diarrhea. In more severe cases, pneumonia, acute respiratory distress syndrome, shock, and multi-organ failure may be observed. However, in some of the infected individuals, the asymptomatic or insidious symptoms may be observed, instead.[6]

The largest COVID-19 case series, including 44 672 cases, has been published in China recently, and in this study, the total mortality rate was determined as 2.3%. In the study, it was determined that the mortality is higher in advanced age (mortality rates are 1.3% in the 50-59 age group, 3.6% in the 60-69 age group, 8% in the 70-79 age group, and 14.8% in the ≥80 age group); the mortality was 10.5% in the patients with cardiovascular disease, 7.3% in the presence of DM, 6.3% in the patients with chronic respiratory disease, 6% in the presence of HT, and 5.6% in those with malignancy.[5] However, this extensive study lacks the incidence or mortality data of CKD patients. Considering the above-mentioned very same comorbidities accompanying CKD, it can be predicted that the COVID-19 incidence and the eventual mortality will be high in CKD patients.

The presence of silent carriers and the gathering of many patients in a closed environment in HD centers can cause the virus to spread easily. Considering that most of them enter HD in the center use the transport vehicles in groups and are relatively close to each other during HD, it is obvious that the infection transmission risks are high.[7] It can be said that dialysis patients experience infective diseases more severely due to the advanced age, the comorbidities (e.g., DM, HT, cardiovascular disease, previous cerebrovascular event, and COPD), and impaired immune systems. As is known, infection is the second most common cause of mortality in the end-stage renal disease (ESRD) after the first common cause, that is, the cardiovascular diseases.[8]

In a study conducted in HD centers in Wuhan, the COVID-19 infection was detected in 10% of the patients and 6.4% of the healthcare personnel.[9] Again, according to another study from Italy in Lombardy, 18 HD patients (30%) were infected in an HD unit with 60 patients during the COVID-19 pandemic.[10] This study also included only ICHD patients.

When we look at the COVID-19 incidence data in PD and HHD, we see relatively very low figures. In Milan, the epicenter of the pandemic in Italy, in 2 of the largest Nephrology Clinics where 330 HD patients and 50 PD patients were followed up, 20 HD (6%) and only 1 PD (5%) patients were diagnosed with COVID-19.[11] In the paper of Sachdeva et al[12] published in July 2020, it was determined that only 11 (2.6%) of the 419 ESRD patients hospitalized for COVID-19 were PD patients. In another single-center study performed in the United States, 2 (3.3%) of the 59 ESRD patients hospitalized for COVID-19 were reported to have PD.[13] Studies show that PD patients have lower COVID-19 incidence than the ICHD patients among RRT modalities.

During the pandemic, between March 2020 and May 2020, we followed up 1592 suspected and 830 certain COVID-19 cases

Table 1. The Granular Descriptive Statistics of the Analyzed Patients

Variables	ICHD (n = 58)	HHD (n = 9)	PD (n = 54)
Age (mean ± SD)			
COVID(−)	57.0 ± 14.7	40.9 ± 9.9	53.6 ± 13.2
COVID(+)	54.3 ± 18.6	-	-
Gender, n (%)			
F	27 (46.55)	5 (55.55)	25 (46.30)
M	31 (53.45)	4 (44.45)	29 (53.70)
CKD duration (year) (mean ± SD)	9.1 ± 7.3	7.3 ± 5.1	7.1 ± 5.9
RRT duration (year) (mean ± SD)	6.4 ± 5.6	3.5 ± 2.5	3.1 ± 3.6*
Comorbidities, n (%)			
DM			
Yes	15 (25.8)	3 (33.3)	14 (25.9)
No	41 (70.6)	6 (66.6)	40 (74.0)
Unknown	2 (3.4)	0 (0)	0 (0)
HT			
Yes	40 (68.9)	5 (55.5)	45 (83.3)
No	18 (31.0)	4 (44.4)	9 (16.6)
Unknown	0 (0)	0 (0)	0 (0)
CAD			
Yes	12 (20.6)	0 (0)	9 (16.6)
No	45 (77.5)	9 (100)	45 (83.3)
Unknown	1 (1.72)	0 (0)	0 (0)
CHF			
Yes	6 (10.3)	1 (11.1)	3 (5.55)
No	51 (87.9)	8 (88.8)	51 (94.4)
Unknown	1 (1.72)	0 (0)	0 (0)
COLD			
Yes	2 (3.44)	1 (11.1)	1 (1.85)
No	55 (94.8)	8 (88.8)	53 (98.1)
Unknown	1 (1.72)	0 (0)	0 (0)
Smoking, n			
Yes	9	3	14
No	47	6	39
Unknown	0	0	1
Ex-smoker	2	0	0

*The existence of some ≈0 values in the data resulted in the "SD > mean" case.
CAD, coronary artery disease; CHF, congestive heart failure; COLD, chronic obstructive lung disease; COVID-19, coronavirus disease 2019; DM, diabetes mellitus; HHD, home hemodialysis; HT, hypertension; ICHD, in-center hemodialysis; PD, peritoneal dialysis.

who were admitted to the medical wards in our hospital, and besides these 2422 cases, we also followed up 555 suspected and 129 certain COVID-19 cases who were admitted to the ICU. All in all, we followed up 3106 COVID-19 cases. Of these cases, a total of 70 cases were identified to receive HD treatment. Three of these 70 ICHD patients were the patients who get HD treatment in our own center. In our study, among the patients diagnosed with COVID-19, no patients were detected to be treated with PD or HHD.

Home dialysis methods, including PD and HHD, are effective RRT modalities, and both PD and HHD have similar effects on quality of life.[14] Despite the reports showing that home dialysis is more cost-effective than ICHD in developed countries, ICHD is preferred more.[14]

When it comes to the data of Turkey, the prominent pattern of increase in the rate of patients having PD till 2008 has been replaced by a downward trend after 2008. According to the 2018 registry data, the percentage distribution of the patients under RRT was realized such that 74.82% of them have HD and 3.94% of them have PD. The distribution of patients having HD was revealed as 95.06% ICHD and 0.92% HHD.[15]

The RRTs performed at home have many advantages. First of all, as stated above, they provide the opportunity to manage patients remotely, thus reducing the risk of transmission of infections during an epidemic. In this context, Advancing American Kidney Health Initiative underlines that home dialysis should be promoted as an opportunity for patients to be included in their treatment. Flexibility not only applies to dialysis but also to diet and more commonly lifestyle. Better protection of residual renal function (RRF), saving the time efficiently, limiting the travel from home to center and then from center to home, and having lower cost are among the other advantages of the RRTs performed at home.[16] PD provides flexibility and autonomy similar to HHD. Studies show that patients who start ESRD treatment with PD and have to switch to ICHD later on have better long-term outcomes than the patients treated with ICHD alone in ESRD treatment.[17] Therefore, PD and HHD are, in all respects, excellent initial modalities for the patients starting programmed dialysis.[17]

As in Turkey and the United States, the rate of home dialysis methods in the world is very low compared to ICHD. However, with the overwhelming pandemic, the danger arising from the high risk of transmission of COVID-19 infection in ICHD has turned the eyes back to the home dialysis methods. In the pandemic, consensus views on the importance of home dialysis have begun to be expressed. The recommendations of Canadian Society of Nephrology (CSN) on this issue were published in April 2020.[18] According to the CSN, the patients wishing to switch from ICHD to PD for any reason, including reducing the risk of COVID-19, have been suggested to be considered for

emergency PD catheter placement. In order to reduce the risk of COVID-19 transmission by reducing the contacts with clinics and hospitals, CSN also recommends that all the patients needing RRT be advised that home dialysis should be preferred over ICHD.

Dialysis treatments at home generally do not require additional nursing support, so social distance is maintained. Follow-up visits can be done every 2-3 months during the pandemic[14]; even the necessary information can be received by phone. During the pandemic, except for emergencies, we learned about the clinical situations of our PD patients by talking over the phone at the end of the first month. Based on their clinical situations, we wrote the compliant PD prescriptions and organized their general treatment. We started outpatient clinic controls of stable patients that we do monthly, every 2 months. At the end of the second month, we observed that the patients were euvolemic and their total RRF did not decrease, their solute clearance was good, and there were no negative changes in laboratory aspects.

As recommended by the Canadian Nephrology Association, we postponed elective procedures such as routine peritoneal equalization tests and clearance measurements in all patients to avoid pandemics. Likewise, just as the Canadian Nephrology Association has postponed the transfer set change for 6-9 months,[18] we did not change the transfer sets except for emergencies.

As a result, within the scope of all the protective measures we have taken, we did not find any COVID-19 positivity in any of our patients who underwent dialysis at home, even during the peak of the pandemic.

Home dialysis methods have come to the forefront among renal replacement therapies (RRTs) due to the minimal risk of the infection transmission as they are performed in an isolated environment at home and due to the non-usage of immunosuppressive agents as in renal transplant patients. In our study, besides the clinical and survival advantages of PD and HHD, the absence of PD or home HD patients diagnosed with COVID-19 proved that these 2 treatments may prove the gold standard treatment that should be emphasized especially during a pandemic period. As nephrologists, we are of the opinion that we should learn the methods of protecting our patients under RRT in the fight against the new waves of the COVID-19 pandemic or a possible pandemic due to another cause, and that considering the relationship between pandemic and RRT modalities, we should give the home dialysis methods the value they deserve.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ministry of Health of the Republic of Turkey (Approval Number: 2020-05-03T21-12-41) and from the Ethics Committee of Ankara City Hospital (Approval Date: May 14, 2020; Approval Number: E1-20-476).

Informed Consent: Informed consent was obtained from the patients who participated in this study.

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Data Availability Statement: The data that support the findings of this study are openly available in Mendeley Data.[3]

Conflict of Interest: The authors have no conflict of interest to declare.

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REFERENCES

1. Basile C, Combe C, Pizzarelli F, et al. Recommendations for the prevention, mitigation and containment of the emerging SARS-CoV-2 (COVID-19) pandemic in haemodialysis centres. *Nephrol Dial Transplant*. 2020;35(5):737-741. [CrossRef]
2. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020;395(10223):507-513. [CrossRef]
3. Koksal Cevher S. [Dataset] "Home dialysis in COVID-19 pandemic", V1. *Mendeley Data*. 2020. [CrossRef]
4. Kliger AS, Silberzweig J. Mitigating risk of COVID-19 in dialysis facilities. *Clin J Am Soc Nephrol*. 2020;15(5):707-709. [CrossRef]
5. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497-506. [CrossRef]
6. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med*. 2020;382(18):1708-1720. [CrossRef]
7. Meijers B, Messa P, Ronco C. Safeguarding the maintenance hemodialysis patient population during the coronavirus disease 19 pandemic. *Blood Purif*. 2020;49(3):259-264. [CrossRef]
8. Syed-Ahmed M, Narayanan M. Immune dysfunction and risk of infection in chronic kidney disease. *Adv Chronic Kidney Dis*. 2019;26(1):8-15. [CrossRef]
9. Li J, Xu G. Lessons from the experience in Wuhan to reduce risk of COVID-19 infection in patients undergoing long-term hemodialysis. *Clin J Am Soc Nephrol*. 2020;15(5):717-719. [CrossRef]
10. Rombolà G, Heidempergher M, Pedrini L, et al. Practical indications for the prevention and management of SARS-CoV-2 in ambulatory dialysis patients: lessons from the first phase of the epidemics in Lombardy. *J Nephrol*. 2020;33(2):193-196. [CrossRef]
11. Cozzolino M, Piccoli GB, Ikizler TA, Ronco C. The COVID-19 infection in dialysis: are home-based renal replacement therapies a way to improve patient management? *J Nephrol*. 2020;33(4):629-631. [CrossRef]
12. Sachdeva M, Uppal NN, Hirsch JS, et al. COVID-19 in hospitalized patients on chronic peritoneal dialysis: a case series. *Am J Nephrol*. 2020;51(8):669-674. [CrossRef]

13. Valeri AM, Robbins-Juarez SY, Stevens JS, et al. Presentation and outcomes of patients with ESKD and COVID-19. *J Am Soc Nephrol*. 2020;31(7):1409-1415. [CrossRef]
14. Hager D, Ferguson TW, Komenda P. Cost controversies of a "home dialysis first" policy. *Can J Kidney Health Dis*. 2019;6:2054358119871541. [CrossRef]
15. *National Nephrology, Dialysis and Transplantation Registry Report of Turkey*. 2018. Available at: http://www.nefroloji.org.tr/folders/file/REGISTRY_2018.pdf, Accessed 10 June 2020.
16. Piccoli GB, Cupisti A, Aucella F, et al. Green nephrology and eco-dialysis: a position statement by the Italian Society of Nephrology. *J Nephrol*. 2020;33(4):681-698. [CrossRef]
17. Heaf JG, Løkkegaard H, Madsen M. Initial survival advantage of peritoneal dialysis relative to haemodialysis. *Nephrol Dial Transplant*. 2002;17(1):112-117. [CrossRef]
18. Home Dialysis Workgroup Members, Copland M, Hemmett J, et al. Canadian Society of Nephrology COVID-19 rapid response team home dialysis recommendations. *Can J Kidney Health Dis*. 2020;7:2054358120928153. [CrossRef]