Prevalence and Characteristics of Regular Hemodialysis Patients with COVID-19 at USU Hospital in 2020-2021 at the University Hospital of North Sumatra

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Abstrak

Tujuan: Pada tahun 2019, wabah penyakit Coronavirus (COVID-19) akibat infeksi virus Corona 2 (SARS-CoV-2) menyebar dengan cepat ke negara lain. Pasien-pasien ini berisiko lebih tinggi tertular infeksi COVID-19. **Metode:** Desain penelitian ini adalah penelitian deskriptif dengan pendekatan cross sectional retrospektif yang bertujuan untuk mengetahui prevalensi dan karakteristik pasien HD Reguler Covid 19 di RS USU Medan. Data penelitian diambil dari rekam medis pasien kemudian diolah menggunakan aplikasi SPSS. **Hasil:** Pemeriksaan URR memiliki perbedaan yang signifikan antara kedua kelompok, dimana kelompok hidup memiliki nilai yang lebih tinggi daripada kelompok mati. Kelompok hidup memiliki rata-rata kadar hemoglobin, trombosit, dan albumin yang lebih tinggi, sedangkan tingkat kreatinin lebih rendah daripada kelompok mati. **Kesimpulan:** Nilai URR lebih tinggi pada kelompok hidup dibandingkan dengan kelompok mati. Nilai URR yang tinggi menggambarkan optimalitas HD yang lebih baik dan dikaitkan dengan peningkatan kualitas hidup dibandingkan dengan nilai URR yang rendah. Hasil penelitian menunjukkan bahwa kadar hemoglobin, trombosit, albumin, CRP, dan kreatinin memiliki perbedaan yang bermakna dimana tingkat kreatinin lebih rendah daripada kelompok mati.

Kata kunci: COVID-19; Hemodialisis; Prevalensi Hemodialisis

Abstract

Objective: *In 2019, the outbreak of the Coronavirus disease (COVID-19) due to infection with the Coronavirus 2 (SARS-CoV-2) spread rapidly to other countries. These patients are at higher risk of contracting COVID-19 infection.* ***Method:*** *The design of this study is a descriptive study with a retrospective cross-sectional study approach which aims to determine the prevalence and characteristics of Regular HD patients with Covid 19 at USU Hospital Medan. The research data was taken from the patient's medical record and then processed using the SPSS application.* ***Result:*** *URR examination had a significant difference between the two groups, where the living group had a higher value than the dead group. The living group had higher average levels of hemoglobin, platelets, and albumin, while the creatinine level was lower than the dead group.* ***Conclusion:*** *The URR value was high in the living group compared to the dead group. A high URR value describes better HD adequacy and is associated with an improvement in quality of life compared to a low URR value. The results showed that the levels of hemoglobin, platelets, albumin, CRP, and creatinine had significant differences. The creatinine level was lower than the dead group.*

Keywords: *COVID-19; Hemodialysis; Prevalence of Hemodialysis*

INTRODUCTION

In 2019, the outbreak of the Coronavirus disease (COVID-19) due to infection with the Coronavirus 2 (SARS-CoV-2) started in Wuhan, China, and spread rapidly to other parts of China and other countries. The coronavirus disease 2019 (COVID-19) that causes acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has had an adverse impact worldwide. Patients with chronic kidney disease undergoing hemodialysis have a higher risk of adverse effects.

As of September 2, 2020, COVID-19 has been found in 216 countries, with a total of 25,602,665 confirmed cases. The first COVID-19 cases in Indonesia were confirmed on March 2, 2020, totaling 2 people. In Indonesia, the number of deaths due to COVID-19 is 7,750 cases. The case fatality rate (CFR) due to COVID-19 in Indonesia is 4.2%. This figure is still relatively high when compared to the global CFR, which is 3.85%.

Information regarding the epidemiology of COVID-19 in patients on regular hemodialysis in Indonesia, especially in the city of Medan, is still limited. These patients are at higher risk of contracting COVID-19 infection because of the many co-existing conditions and because of repeated physical presence in health care facilities and the physical proximity of patients during hemodialysis.

While at USU Hospital there were 186 confirmed cases as of December 31, 2020. The 42 Hemodialysis procedures with Covid 19 were included.

The purpose of this study was to determine the prevalence and characteristics of regular hemodialysis patients with COVID-19 at the University of North Sumatra Hospital.

METHODS

Design

The research was conducted from August to December 2021 at the USU Hospital Medan Medical Record Installation. The design of this study is a descriptive study with a retrospective cross-sectional study approach which aims to determine the prevalence and characteristics of Regular HD patients with Covid 19 at USU Hospital Medan. The subjects of this study were all regular HD patients at USU Hospital Medan. Patients with incomplete data will be excluded from the study. The research data was taken from the patient's medical record and then processed using the SPSS application. The research was conducted at the Internal Medicine Polyclinic of the University of North Sumatra Hospital. Research time is 1 year after obtaining approval from the Research Ethics Committee of the University of North Sumatra.

Participants

Participants involved in this study were patients who underwent regular HD and suffered from Covid 19. Exclusion criteria for traveling (temporary) HD patients at USU Hospital Medan and incomplete medical record data.

Data processing and analysis plan

The research data was taken from the patient's medical record and then processed using the SPSS application. This research has been approved in advance by the Hospital Ethics Commission of the University of North Sumatra.

RESULT AND DISCUSSION

The research method is descriptive with a case series design, using primary data in the form of secondary data from

the Medical Records of the University of North Sumatra Hospital in 2020-2021. The subjects that will be included in the study are regular hemodialysis patients with covid 19 at the University of North Sumatra Hospital. This research was carried out for 1 year. Sampling was carried out by total sampling that met the research criteria.

Table 1. Demographic and Comorbidity Data

	Total (N = 28)	Life (n=21)	Die (n = 7)	pvalue2
Age, years	53 (14-65)	53 (14-64)	54 (39-65)	0.473
Gender, n (%)				
Woman	7 (25)	7 (33.3)	0 (0)	0.141
Man	21 (75)	14 (66.7)	7 (100)	
Blood pressure				
systole	130 (110-165)	130 (110-160)	150 (130-165)	0.061
diastole	90 (70-95)	90 (70-95)	90 (80-95)	0.976
HD old, month	12 (1-72)	18 (1-72)	3 (1-60)	0.155
URR	75.41 (63.5-84.38)	76 (63-84)	70.5 (63-78)	0.00
History of Hypertension, n (%)	26 (92.9)	20 (95.2)	6 (85.7)	0.444
History of Diabetes, n (%)	14 (50)	9 (42.9)	5 (71.4)	0.385
History of Other Diseases	3 (10.7)	2 (9.5)	1 (14.3)	
Heart Disease, n (%)	1 (3.6)	1 (4.8)	0 (0)	1.00
Follicular lymphoma grade II, n (%)	1 (3.6)	1 (4.8)	0 (0)	1.00
Glomerulonephritis, n (%)	1 (3.6)	0 (0)	1 (14.3)	0.25

Table 1 shows that from a total of 28 patients, 7 people (25%) died. Male patients were found more than female with a ratio of 3:1. There was no difference in the general mean between living and dead patients. Almost all patients had comorbid hypertension, followed by diabetes mellitus in half of the patients. URR examination had a significant difference between the two groups, where the living group had a higher value than the dead group.

Patients with chronic kidney disease (CKD) are a vulnerable group for COVID-19 infection with severe symptoms. CKD patients undergoing hemodialysis (HD) have a higher risk of infection and risk of death than the general population.[27] Chronic dialysis conditions are known to trigger immune system dysfunction so that they become less responsive to SARS-CoV-2 infection. In addition, patients undergoing HD in health centers have a higher risk of exposure to SARS-CoV-2 due to frequent visits to the health unit, crowded HD units, as well as travel using public transportation. [28]

A systematic review by Alfano et al. involving 145 articles found the prevalence of COVID-19 in dialysis patients was 0-37.6%. A total of 35-88.2% of them need to be hospitalized with an average length of stay of 16.2-22 days. In addition, COVID-19 in HD patients also increases admissions to the intensive care unit (ICU) and is associated with high mortality rates. The reported mortality rate of COVID-19 patients on dialysis is 42.8-100%.[29]A prospective study by Carriazo et al., in Madrid found that in a 1-year follow-up, 35.7% of HD patients with COVID-19 died, of which 11% occurred during initial admission, 25% occurred later, especially in the first 3 months after diagnosis. [30] This

figure was found to be even greater. compared to the data obtained in this study, which is 25%. In this study, the URR value was high in the living group compared to the dead group. A high URR value describes better HD adequacy and is associated with an improvement in quality of life compared to a low URR value.

In the study, the majority of patients had comorbid hypertension, followed by diabetes mellitus (DM). This is in accordance with the research findings of Valeri et al. who stated that the presence of COVID-19 in chronic kidney disease patients on dialysis had a high mortality rate. Of the 59 patients on dialysis, hypertension and diabetes mellitus (DM) were found in 98% and 69% of patients, respectively. The group of patients who died had an older age with a median of 75 years than the living group with a median of 62 years, while in this study the median age was found to be younger, both in the living and dead groups. [31]

The unfavorable prognostic effect of male sex and the metabolic syndrome on SARS-CoV-2 infection has been associated with a low-grade chronic inflammatory state and a disordered immune response, which triggers a "cytokine storm" so that SARS-CoV-2 infection becomes lethal. Old age is also associated with a proinflammatory and procoagulant condition called inflammation," shedding light on the strong correlation between age and mortality from COVID-19. Premature aging in hemodialysis patients caused by uremic conditions, intestinal dysbiosis, and oxidative stress. [40]

The death rate for COVID-19 infection varies between countries, ranging from 35.4 per million population (Southeast Asia) to 904.4 per million population (America). Chronic kidney disease is associated with an increased risk of COVID-19 infection. Patients undergoing hemodialysis (HD) are patients with immune dysregulation due to uremia, comorbidities, and biocompatibility related to dialysis procedures so that the incidence of viral infections, especially COVID-19, is found to be high among HD patients. A systematic review and meta-analysis of 29 international studies, on 3,261 confirmed cases of COVID-19, taken from 396,062 HD patients, found that the incidence of COVID-19 infection was 7.7% and the mortality rate was 22.4%. higher than the general population. The increased risk of COVID-19 was found to be 15.4 times that of the normal population, patients are also older than the general population. The mean age of the patients was slightly greater (63.5 years) in the non-Asian patients compared to the Asian patients (61.8 years). Several risk factors for high mortality in HD patients, including greater age, male sex, underlying heart or lung disease, diabetes and hypertension and use of mechanical ventilation. Cough is associated with risk of death in HD patients and fever predicts death in HD patients. Other prognostic factors include vintage dialysis, thrombocytopenia, lymphopenia, and elevated LDH or CRP levels. including greater age, male sex, underlying heart or lung disease, diabetes and hypertension and use of mechanical ventilation. Cough is associated with risk of death in HD patients and fever predicts death in HD patients. Other prognostic factors include vintage dialysis, thrombocytopenia, lymphopenia, and elevated LDH or CRP levels. including greater age, male sex, underlying heart or lung disease, diabetes and hypertension and use of mechanical ventilation. Cough is associated with risk of death in HD patients and fever predicts death in HD patients. Other prognostic factors include vintage

dialysis, thrombocytopenia, lymphopenia, and elevated LDH or CRP levels.

Albalate conducted a study with 90 HD patients of which 37 (41.1%) patients were infected with COVID19. Fever was the most common symptom, 50% of patients had lymphopenia and 18.4% < 95% O2 saturation. Sixteen (43.2%) patients required hospitalization and 6 (16.2%) died.35 The Ghonimi study showed that 76 out of 1064 dialysis patients were diagnosed with COVID-19 (mean age 56±13.6 years, 56 hemodialysis and 20 years). peritoneal dialysis, 56 patients were male). During the study period, 7.1%

of all dialysis patients were infected with COVID-19. Male patients had twice the incidence of COVID-19 as women (9% versus 4.5%, respectively; p<0.01). The most common symptoms were fever (57.9%), cough (56.6%), and shortness of breath (25%). Pneumonia was diagnosed in 72% of dialysis patients with COVID-19. High severity was manifested with 25% of patients requiring intensive care, 18.4% with ARDS, 17.1% requiring mechanical ventilation, and 14.5% requiring inotropes. The average length of stay in the hospital was 19.2 ± -12 days. Death due to COVID-19 is 15%.[36]

Table 2. Laboratory Basic Data

	Total (N = 28)	Life (n=21)	Die (n = 7)	p value
SpO2, %	98 (94-99)	98 (95-99)	98 (94 – 99)	0.319
Hemoglobin, g/dL	9.25 (7-13.5)	9.3 (7.7-13.5)	8.9 (7.0-11.0)	0.00
Leukocytes, x 103/mL	11.8 (4.48-28.62)	11.7 (4.48-18.03)	17.6 (5.39 – 28.62)	0.124
Platelets, x 103/mL	251 (80 – 451)	267 (127 – 451)	205 (80 – 416)	0.00
Albumin, g/dL	3.05 (2.28-3.5)	3.1 (2.28 – 3.5)	2.9 (2.3 – 3.2)	0.00
CRP, mg/dL	75.7 (12.4 – 252.8)	67 (12.4 – 252.8)	120 (20 – 211.60)	0.047
D-dimer, ng/mL	1000 (20.87 – 15.710)	900 (20.87 – 2680)	2730 (250 – 15710)	0.111
Urea, mg/dL				
Pre HD	133.45 (56.12 – 305)	131.2 (59.6 – 224.5)	197.7 (56.12 – 305)	0.277
Post HD	40.95 (18 – 76)	34.1 (19.1 – 60.5)	52 (18 – 76)	0.053
Creatinine, mg/dL	9,625 (0.84-24.19)	8.9 (0.8 – 19.7)	9.9 (3.8 – 24.1)	0.00

Laboratory examinations in both groups are shown in table 2. The results showed that the levels of hemoglobin, platelets, albumin, CRP, and creatinine had significant differences. The living group had higher average levels of hemoglobin, platelets, and albumin, while the creatinine level was lower than the dead group. In the dead group, there was an increase in CRP levels almost two times higher than in the living group.

Higher white blood cell counts, longer PT time, and higher D-dimer levels

were also found in hemodialysis patients with poor prognosis after corona virus infection. These results suggest that severe inflammatory damage and activation of the coagulation system results in a poor prognosis. Hepatocyte damage was also observed in hemodialysis patients who died from COVID-19. In addition, hemodialysis patients are also accompanied by cardiomyocyte damage, which is mainly manifested by elevated troponin I levels. However, only a few hemodialysis patients with elevated

troponin I develop acute myocardial infarction. However, the report by Zou et al, showed that after treatment with antibacterial, antiviral, anticoagulation, and inhibition of platelet aggregation, these patients eventually recovered. [39]

Dialysis patients are a particularly vulnerable population and hemodialysis centers are a high risk area in the COVID-19 epidemic. "Idiopathic" lymphopenia and/or elevated levels of C-reactive protein should lead the clinician to a diagnosis of COVID-19 and, if possible, should be followed by diagnostic testing by reverse transcriptase-polymerase chain reaction and strengthening of contamination barrier measures. [37] The incidence rate, based on PCR testing, varies between 2% and 20%, with considerable regional variation. The mean cumulative incidence is <10% in dialysis patients, based on IgG antibody testing, whereas T-cell immunity shows a higher cumulative incidence than antibody serology reflects. The case fatality rate in the HD cohort varied between 20% and 35% in previous reports, which is more than twice as high for COVID-19 in the general population, identifying HD patients as a high-risk population. [38]

Table 3. Symptoms and Results of Chest X-ray Examination

	Total (N = 28)	Life (n=21)	Die (n = 7)
Symptom			
Fever, n (%)	16 (57.1)	12 (57.1)	4 (57.1)
Shortness of breath, n (%)	16 (57.1)	10 (47.6)	6 (85.7)
Cough, n (%)	20 (71.4)	15 (71.4)	5 (71.4)
Nausea Vomiting, n (%)	1 (3.6)	1 (4.8)	0 (0)
Chest X-ray Results			
No Heart and Lung Abnormalities, n (%)	3 (10.7)	3 (14.3)	0 (0)
Cardiomegaly, n (%)	24 (85.7)	17 (81)	7 (100)
Aortic Elongation, n (%)	20 (71.4)	13 (61.9)	7 (100)
Pulmonary Hypertension, n (%)	7 (25.0)	4 (19)	3 (42.9)
Bronchopneumonia, n (%)	22 (78.6)	15 (71.4)	7 (100)
Pulmonary Edema, n (%)	6 (21.4)	3 (14.3)	3 (42.9)
Pleural Effusion, n (%)	1 (10.7)	1 (4.8)	0 (0)

The clinical picture and the results of the patient's chest radiograph are presented in table 3. The most common complaints found in patients were cough, followed by shortness of breath and fever. However, in the dead group, shortness of breath was the predominant complaint. The results of the patient's chest X-ray showed that the most common lung abnormalities were bronchopneumonia and cardiomegaly. Both were found in all patients who died. The findings of pulmonary edema were twice as high in the dead group as compared to the living group.

The main presenting symptoms at presentation were fever and cough with radiological features of bilateral or multifocal opacity in 59% of patients. [31] Another study by Arenas et al. found that HD patients with COVID-19 had symptoms of cough, shortness of breath, asthenia, and myalgia, pneumonia, and higher CRP levels than HD patients without COVID-

19.32 Study Du et al. found ground glass opacity as the most common chest radiographic finding in HD patients with COVID-19. [33] Similar results were found in this study where fever, cough, and shortness of breath were the predominant symptoms and the most common chest X-ray was bronchopneumonia. In the study of Valeri et al., the comparison of CRP levels in the two groups had similar results to this study.

CONCLUSION

In this study, there were more men than women with COVID-19 and regular hemodialysis. There was no difference in the general mean between living and dead patients. Almost all patients had comorbid hypertension, followed by diabetes mellitus in half of the patients.The URR value was high in the living group compared to the dead group. A high URR value describes better HD adequacy and is associated with an improvement in quality of life compared to a low URR value.

The results showed that the levels of hemoglobin, platelets, albumin, CRP, and creatinine had significant differences. The living group had higher average levels of hemoglobin, platelets, and albumin,

while the creatinine level was lower than the dead group. In the dead group, there was an increase in CRP levels almost two times higher than in the living group.

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CONFLICT OF INTEREST
There is no conflict of interest in this research.

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