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Outcome of COVID 19 in hemodialysis patients: single center experience

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Abstract:

Background: Generally end-stage kidney disease (ESKD) patients are more prone to infection, especially patients maintained on Hemodialysis because of frequent attendance to hemodialysis units. Due to their impaired immune response, patients with ESRD are more likely to develop severe complications of any infectious disease.

Objectives: to study and analyze all available patients' data and find out the correctable predictors for mortality to overcome them.

Patients and methods: Our study is a retrospective cohort one, done in urology and nephrology center, Mansoura University, Egypt. We have ninety-eight patients scheduled for hemodialysis; most of them have three sessions per week.

We studied the outcome of COVID-19 in ESKD patients receiving hemodialysis as regard their fate. Patients' Data during infection were tabulated and analyzed searching for significant predictors for fruitful outcome.

Results: Before COVID pandemic, we had ninety eight patients receiving hemodialysis service in our out-patient clinic. From whom, there were seventeen cases (17.3%) developed SARS-COV disease. Six of them (6.12%) lost their life due to sever complications. Old age, diabetes mellitus, low flux dialyzer and interdialytic weights gain more than 3 liters are predictors for mortality.

Conclusion: Patients' compliance for Intradialytic weights gain, high flux dialyzer, restricts control of blood sugar and treatments of comorbidities are essential for better outcome of COVID among hemodialysis patients.

Keyword: COVID-19, hemodialysis, outcome

Introduction:

COVID-19 is highly contagious disease that appears first at the end of 2019. World health organization recalls it as pandemic in March 2020. All countries closed their borders and many of them do curfew for their citizens.⁽¹⁾Hospital-based Hemodialysis patients need to visit hospital regularly and that make them more prone to infection either nosocomial or during transportation ⁽²⁾.

Patients with ESKD are more likely to develop severe complications of coronavirus disease because of the high burden of comorbidities, and their impaired immune response ⁽³⁾. Social distance and adopting infection control strategies can lower the incidence of infection but the outcome differs among patients. Therefore, we conducted this study in order to assess prevalence and mortality predictors of COVID-19 infection among a cohort of Egyptian hemodialysis patients.

Patient and methods:

Our study is a retrospective cohort study done in Urology and Nephrology center, Mansoura University. Among ninety eight patients receiving scheduled hemodialysis in our out-patient

clinic, there are seventeen patients developed COVID-19 during period between March 2020 and end of January 2021. Any patients suffered from fever, respiratory symptoms and/or diarrhea was subjected to chest computerized tomography (CT) without contrast and complete blood count. We use CORAD classification for assessment of chest C.T. Patient with leucopenia or lymphopenia and/or suspicious CT was subjected to SARS-COV 2 universal reverse transcriptase-Polymerase Chain Reaction (PCR). All positive PCR patients are included in our study. Average interdialytic weight gain was measured by calculated mean during a month of getting infected. Kt/V Daugirdas was calculated online ⁽⁴⁾.

All patients received treatment according to updated Egyptian ministry of health protocol⁽⁵⁾. They were dialyzed by intermittent hemodialysis, three times per week. We defined the cure by one who has no symptoms and negative SARS-COV PCR. We classified COVID--infected patients into two groups according to their survival. Group 1 included patients who survived and group 2 constituted patients who died after COVID 19 infection.

Continuous data was compared using Student t test and Mann-Whitney test for normal and NON-normal distributed data respectively. Categorical data was compared using chi-square test. Inferential statistics were performed by IBM SPSS (version 19) software program. A p-value <0.05 was considered significant.

Results:

Among ninety eight patients receiving hemodialysis service in our out-patient clinic, there were seventeen cases (17.3%) developed SARS-COV disease. Six of them (6.12%) lost their life due to severe complications.

We analyzed all patients' information searching for predictors for survival. (**Table 1**)

Table 1: patients' data and laboratory results of both groups.

	Group1(n=11)	Group2 (n=6)	P value
Age: Mean ±SD	40.3 ± 16.8	59.5 ± 13.4	0.001
Sex (M:F)	(9:2)	(4:2)	0244
Original kidney disease:			
Unknown	6/11	3/6	0.850
Diabetic nephropathy	1/11	2/6	
Urinary track abnormalities	4/11	1/3	
Smoker	6/11	2/6	0.203

Influenza vaccine	9/11	3/6	0.020
BMI: Mean±SD	23.06± 5.8	25.36 ±5.85	0.449
Duration on dialysis in years: median (range)	14 (1.08 -35.9)	22.97 (11.9-37.6)	0.225
Kt/V: Mean ± SD	1.336±0.229	1.2±0.187	0.266
High flux/low flux dialyzer	9/2	3/3	0.020
Dialyzer surface area	1.63±0.504	1.66±0.516	0.908
Hypertension	3/11	2/6	0.25
Diabetes	1/11	2/6	0.02
Intradialytic weight gain: Mean±SD	2.6 ± 0.84	3.9±1.5	0.03
Ischemic cardiomyopathy	6/11	4/6	0.61
Chronic liver disease	2/11	1/6	0.88
Hemoglobin in gm/dl: Mean ±SD	10.5± 0.8	11.1± 0.6	0.139
i-PTH in pg/ml: median (range)	582 (92.7-2000)	765 (51-2000)	0.73
Pre-dialysis sodium in Mmol/L	135.09 ± 2.948	133.33 ± 3.830	0.306
Post-dialysis sodium in Mmol/L	136.09±2.982	134.33±2.338	0.233
Pre-dialysis potassium in Mmol/L	5.336±0.5662	4.650± 0.9834	0.085
Post-dialysis potassium in Mmol/L	3.536±0.4843	3.550±0.5788	0.959
Serum calcium in mg/dl	9.14 ±0.75	9.56± 0.73	0.408
Serum phosphorus in mg/dl	4.59 ±1.07	3.86±0.32	0.281
Serum Albumin in gm/dl	3.59±0.61	3.05±0.44	0.079

Table2: Patients' symptoms and CO-RAD stage in both group.

Symptoms			
dyspnea	3/11	6/6	0.01
GIT symptoms	3/11	2/6	0.787
Loss of smell and taste	10/11	6/6	0.98
Loss of lean body weight	3/11	4/6	0.115
CO-RAD stage:			
Stage 3	1/11	1/6	0.361
Stage 4	3/11	0/6	
Stage 5	7/11	5/6	

As regard SARS-COV symptoms, Dyspnea was more in mortality group while diarrhea and vomiting were statistically insignificant. We observe loss of lean body weight up to 5 kilograms in four patients in mortality group comparing to only three cases in survivors.

Discussion:

In urology and nephrology center (UNC) – Mansoura University, Egypt, there was a hemodialysis unit serving ninety eight patients in March 2020. During COVID pandemic, 17.3% of our patients developed infection despite adopting preventive measures. The incidence rate of COVID disease in UNC was lower than in patients in Paris, France (19 %). This result is comparable with other reports in Wuhan and Brescia (Italy) has reported an incidence rate in hemodialysis patients of 15% and 16% respectively.⁽⁶⁾

There was 54.5% of survivor group versus 33.3% of mortality group smoke cigarettes. It does not mean that smoking is protective, Perhaps This due to small group population or other confounders in mortality group. ⁽⁷⁾

The presence of diabetes was associated with mortality this was consistent with the Chinese report that clarify the role of diabetes in up grading of angiotensin converting enzyme 2 receptor that in turn rises the severity of COVID. ⁽⁸⁾

According to our local policy of vaccination, we gave injectable inactive influenza vaccine to all patients after informed consent that explains the pros and cons of being vaccinated. In survivors group there were nine patients received vaccine (81.8%) while in mortality group only 3 (50%). It means that influenza vaccine may protect against sever form of the disease. In spite of being two different viruses, there are many similar characters.⁽⁹⁾some authors discuss the protective role of influenza vaccine against both infection and severity of COVID 19. ⁽¹⁰⁾

We observe that Interdialytic weight gain above 3 kilograms per session was associated with mortality among COVID 19 patients (odds ratio= 3.6). This may be due to associated pulmonary edema ± hemodynamic instability during hemodialysis session. For the best of our knowledge, no one correlate intradialytic weight gain with mortality from COVID 19. Some authors link the fatality with appearance of leaky lung as a part of ARDS.^(11, 12)

Insignificant p value in assessment of CO-RAD denoting that the severity of CT finding does not associated with poor prognosis so, we consider CORAD as a diagnostic not a prognostic tool. This in agreement with Penha et al who concluded the same opinion. ⁽¹³⁾

Patients with Old age have more risk for mortality due to COVID 19; this may be due to associated comorbidity or even immune senesce. We found the same in hemodialysis patients. While Goicoechea and his coworkers found the adverse. ⁽⁶⁾

High flux dialyzer is better than low flux one in long stand management of hemodialysis patient especially during infection however it has no effect in pulmonary function test .⁽¹⁴⁾ In our study, we find that high flux dialyzer was used more in survival group.

Conclusion:

During COVID pandemic, Hemodialysis patients need frequent monitoring and management of comorbidities to secure their life and pass safely.

Patient compliance for intradialytic weight gain, high flux dialyzer and restrict control of plasma glucose look like safety valves for better outcome.

Statement of Ethics:

The idea and the protocol of the study were discussed thoroughly in scientific committee of Mansoura urology and nephrology center applying the principle of Helsinki Declaration.

Author Contributions:

- **The idea of the study:** Dr. Salwa Elwasif and prof. Ahmed Donia
- **Collection of patients data:** Dr. Mohamed osama Megahed
- **Analysis of data via SPSS :** dr. Muhamed Ahmed Elhadidi
- **Writing:** Dr. Salwa Mahmoud Elwasif
- **Revision of both statistical analysis of data and writing:** prof. Ahmed Farouk Donia and Prof. Aymen Fathi Refaie

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