Original Article

COVID-19 among patients with end-stage kidney disease on maintenance haemodialysis: single haemodialysis centre experience from Bangladesh

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Abstract

Background: *Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection emerged in Wuhan, China in December 2019 and rapidly became pandemic. Unfortunately, there is a lack of evidence about the optimal management of corona virus disease-2019 (COVID-19) and even less is available in patients on maintenance haemodialysis than general population. So, the purpose of this study was to identify the incidence of SARS-CoV-2 infection among end-stage kidney disease (ESKD) patients in a haemodialysis unit in tertiary care hospital of Bangladesh.*

Methods: *A cross-sectional study was conducted at haemodialysis unit of Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) General Hospital, Dhaka, Bangladesh from April to August 2020. All patients, who were on maintenance haemodialysis, twice or thrice weekly, were screened by reverse transcriptase-polymerase chain reaction (RT-PCR) for SARS-CoV-2, irrespective of symptoms. All data were collected in case record forms and discharged/referred patients were followed-up over phone.*

Results: *During the study period, a total of 133 patients (males 70, 52.6%) were on regular maintenance haemodialysis in the study center. Most patients were in 5th and 6th decades of life. Twenty-one (15.8%) patients tested positive for SARS-CoV-2 by RT-PCR with female (16, 76.2%) predominance. Eighteen (18/21, 85.7%) patients had symptoms suggestive of SARS-CoV-2 infection and rest three (3/21, 14.3%) patients were diagnosed during routine screening. Common presentations were fever (42.9%), cough (66.7%) and respiratory distress (66.7%) and most had multiple symptoms. Blood group A (38%) and O (38%) showed the higher incidence of SARS-CoV-2 infection than blood group B and AB with equal mortality rate among them. Most patients (16/21, 76.2%) infected by SARS-CoV-2 were referred to COVID-dedicated hospitals, five (5/21, 23.8%) were shifted to intensive care unit (ICU) of BIRDEM General Hospital. Outcome was poor; 17 (17/21, 89%) patients died in hospitals and four (4/21, 19%) patients became free of SARS-CoV-2 infection. Caregivers/relative of four patients acquired COVID-19 in course of disease.*

Conclusion: *One-sixth of patients on maintenance haemodialysis acquired SARS-CoV-2 infection with nearly ninety percent fatality rates. Despite having risk factors for severe infection by SARS-CoV-2, dialysis patient must visit health care facilities. So, utmost care should be taken to reduce risk of COVID-19 among such vulnerable group of patients.*

Key words: *COVID-19, SARS-CoV-2 infection, end-stage kidney disease, maintenance haemodialysis, outcome.*

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INTRODUCTION

Corona virus disease-2019 (COVID-19) is declared pandemic by World Health Organization (WHO) on 11th March 2020 which is caused by a novel corona virus (nCoV), later named as severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2). The virus was identified as the cause of an outbreak of pneumonia of unknown cause in Wuhan City, Hubei Province, China, in December 2019. Globally 213 countries are reported to have the pandemic going on and the situation is evolving rapidly with global case counts and deaths increasing each day. WHO rates the global risk assessment as very high and community transmission is occurring in many countries, but it is uncertain how easily the virus spreads between people.[1] Mortality estimates in the general population range from 1.4% to 8%.[2-4] Mortality risk significantly increases if the patient requires admission to the intensive care units (ICU), standing between 16% and 78%.[3]

In Bangladesh, the first case was detected on 8th March, 2020 and the first death on 18th March, 2020. Since then 345,805 cases are detected and 4881 deaths occurred till the date. [5] The cases are increasing day by day.

Patients with end-stage kidney disease (ESKD) who receive maintenance haemodialysis must continue life-sustaining treatment, typically twice or thrice per week.[5] Patients with ESKD are immunocompromised, have multiple comorbid conditions and thus are particularly vulnerable for the development of severe SARS-CoV-2 infection. In addition, the nature of community in-center hemodialysis poses challenges to containment measures, when a dialysis patient develops SARS-CoV-2 infection. Overall, it must be recognized that dialysis patients are a highly susceptible population and that haemodialysis centers are a high-risk area and therefore, additional measures must be undertaken to mitigate the risk to dialysis patients in this pandemic.[6-8] There is limited information regarding the epidemiology of SARS-CoV-2 infection in maintenance hemodialysis patients. So, the purpose of this study was to identify the incidence of SARS-CoV-2 infection in Bangladeshi ESKD patients with their and outcome.

METHODS

This cross-sectional study was conducted in 133 patients of ESKD who received maintenance haemodialysis (MHD) at Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) General Hospital, Dhaka, Bangladesh from April to August 2020. The haemodialysis unit is a large room, which is partially subdivided by a wall. Haemodialysis patients typically dialyzed two or three times a week on morning, evening or night shifts. Regular pre-dialysis follow-up was done by physician before starting of haemodialysis. Dedicated nurses were regularly follow up the patients during haemodialysis three or four times.

Prior to the outbreak, physical distancing was implicated in the waiting room and pre-dialysis screening involved asking for any symptoms related SARS-CoV-2 infection like fever, cough, shortness of breath, diarrhoea, anosmia, sore throat or body ache. Then blood pressure was measured and referred to dialysis nurses for start of dialysis. None or less visitors were allowed in dialysis unit. All patients were advised to wear mask in dialysis unit along with their attendance and maintained adequate social/or physical distance among them.

At our unit, first case was detected on 18th April, 2020 after the pandemic started. After the first case, we advised every patient to do RT-PCR for SARS-CoV-2, irrespective of symptoms. For all patient, sample were collected from nasopharyngeal swab. The patient who became RT-PCR positive for SARS-CoV-2 were shifted to COVID-dedicated hospital or ICU of BIRDEM General Hospital. Time to time, patient's information was collected over telephone from their relatives.

Statistical analysis was performed by Statistical Package for the Social Sciences (SPSS) version 24. Statistical significance was set at 0.05 level.

RESULTS

During the study period, a total of 133 patients (males 70, 52.6%) were on regular maintenance haemodialysis in the study center. Most patients were in 5th and 6th decades of life (Table I). Diabetes mellitus and hypertension were the two most common comorbidities among the study participants (Table I). Among the 133 patients, 21 (15.8%) tested positive for SARS-CoV-2 by RT-PCR.

Table I Baseline characteristics of study population (N = 133)

Characteristics		Positive SARS-CoV-2 (n = 21)	Negative SARS-CoV-2 (n = 112)	*p* value
Sex				
	Male	4 (19.0%)	66 (58.9%)	0.00078
	Female	17 (81.0%)	46 (41.1%)	
	Male to female ratio	1:4.25	1.43:1	
Age (years)				
	Mean	59.62±12.90	55.21±11.25	0.0774
	Range	51-80	41-70	
Co-morbidities				
	Diabetes mellitus (%)	95.2	96.4	0.397
	Hypertension (%)	100	100	<0.00001
	Ischemic heart disease (%)	28.6	16.1	0.085
	Cerebrovascular disease (%)	9.5	5.4	0.23
	Bronchial asthma or chronic obstructive airway disease (%)	23.8	8.9	0.024

Among the 21 SARS-CoV-2 infected patients, most (16, 76.2%) were females. Eighteen (18/21, 85.7%) patients had symptoms suggestive of SARS-CoV-2 infection and rest three (3/21, 14.3%) patients were diagnosed during routine screening (according to local policy). Common presentations were fever (42.9%), cough (66.7%) and respiratory distress (66.7%) (Table II). Blood group A (38%) and O (38%) showed the higher incidence of SARS-CoV-2 infection than blood group B and AB (Figure 1). Regarding outcome, both A and O group showed equal mortality (Table III).

Most patients (16/21, 76.2%) infected by SARS-CoV-2 were referred to COVID-dedicated hospitals, five (5/21, 23.8%) were shifted to intensive care unit (ICU) of BIRDEM General Hospital. Outcome was poor; 17 (17/21, 89%) patients died in hospitals and four (4/21, 19%) patients became free of SARS-CoV-2 infection. Care givers/family members of four (4/21, 19%) patients acquired SARS-CoV-2 infections.

Table II Presenting features of patients with SARS-CoV-2 infection (N = 21)

Presenting symptoms*	Frequency	Percentage
Fever	9	42.9
Cough	14	66.7
Respiratory distress	14	66.7
Diarrhoea	1	4.8
Anosmia	2	9.5
Body ache	3	14.3
Sore throat	2	9.5
No symptoms	3	14.3

*multiple response

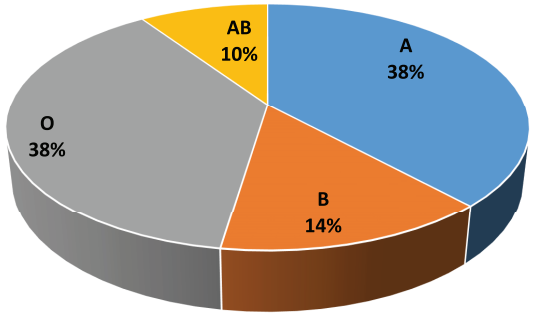

Figure 1 Blood group of SARS-CoV-2 infected patients (N = 21)

Table III Blood group with outcome in SARS-CoV-2 infected patients (N = 21)

Blood group	Frequency	Survived from infection	Died
A	8	2 (25%)	6 (75%)
B	3	0	3 (100%)
O	8	2 (25%)	6 (75%)
AB	2	0	2 (100%)

DISCUSSION

This report highlights the unique susceptibility of haemodialysis patients to infection with SARS-CoV-2. Despite the implementation of recommended symptom-based screening measures, nearly one month prior to the outbreak at Bangladesh, nosocomial transmission occurred in a crowed health care environment. During this outbreak, universal screening for SARS-CoV-2 infection showed that, 21 (15.8%) of haemodialysis patients had positive RT-PCR test results in nasopharyngeal swabs. Studies of SARS-CoV-2 infection in haemodialysis patients had been limited. A haemodialysis center in China that used a computed tomography (CT)-based screening algorithm for SARS-CoV-2 infection, reported a prevalence of 17% among the dialysis patients.[9] A large dialysis center in the United Kingdom reported that 19.6% of patient developed infection over a six-month period, with clustering of cases in specific dialysis shift.[10]

The symptoms of SARS-CoV-2 infection in dialysis patient may be difficult to distinguish from other symptoms common among patients receiving dialysis. Most of the patients of haemodialysis (18/21, 85.7%) presented of symptoms like fever, cough, respiratory distress, body ache, anosmia. The predominant presenting symptoms were cough (66.7%) and respiratory distress (66.7%) followed by fever (42.9%). In a retrospective study of 1099 patients with SARS-CoV-2 infection, acute respiratory distress, fever and cough were dominant symptoms, whereas vomiting and diarrhoea were rare.[11,12]

All our patients were hospitalized Some had mild symptoms and other had severe symptoms with multi-organ involvement. Among the positive patients, 4 (19%) of them became test negative for SARS-CoV-2. Rest of the patient died due to multiple complications. Risk factors in the general population, such as age, diabetes, obesity, coronary heart disease or chronic obstructive lung disease were not associated in this cohort. It was seen that, patients with a longer dialysis vintage had higher mortality per month on haemodialysis. The mortality rate (30.5%) in ESKD patients who were on haemodialysis was much higher than that observed in general population (1.4-8%) and even higher than the 26% ICU mortality rate.[2-4] This difference may be explained by the older age of the patients and the presence of multiple comorbid conditions, especially with the high cardiovascular comorbidity.[13] Regarding blood group, there was no significant different in susceptibility and mortality in SARS-CoV-2 infection in A and O blood group. Some studies showed that A blood group was associated with an increased risk of infection and poor outcome whereas O blood was associated with a decreased risk of infection.[14-15]

This study has several limitations. The sample size was small and a single center study. Outcome data were acquired via telephone.

In conclusion, one-sixth of patients on maintenance haemodialysis acquired SARS-CoV-2 infection with nearly ninety percent fatality rates. Despite having risk factors for severe infection by SARS-CoV-2, dialysis patient must visit health care facilities thrice or twice weekly, when physical distancing in challenging. Particular blood group had no protective role in infection.

Authors' contribution: MMK has designed the study, collected and analysed the data, drafted the manuscript. MAR revised and edited the manuscript. IJS, MGH, MD revised the manuscript. MAM was the overall supervisor of the research. All authors have read the final version to be submitted and approved it.

Conflict of interest: Nothing to declare.

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