

Study on Renal Involvement in Pandemic Covid-19: A Single Center Study in Bangladesh

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Abstract

Original Research Article

Background: Covid-19 imposes a serious public health pandemic affecting the whole world, as it is spreading exponentially. Besides its high infectivity, SARS-CoV-2 causes multiple serious imbalances of severe acute respiratory syndrome as well as multiple organ dysfunctions including heart and kidney injury. Although the adverse impact of SARS-CoV-2 on pulmonary as well as cardiac systems have attracted remarkable attention, such impact on the renal system is still underestimated. **Aim of the Study:** The aim of this study was to evaluate the renal involvement among patients in a Covid-19 dedicated hospital. **Methods:** This was a prospective observational study which was conducted in the Department of Nephrology, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh during the period from July 2020 to June 2021. This was a Covid-19 dedicated hospital during the pandemic situation of Covid-19. The study was approved by the ethical committee of the mentioned hospital. Proper written consents were taken from all the participants before data collection. In total 116 admitted patients in the mentioned hospital diagnosed for detecting renal involvement more than 15 year's old were enrolled in this study as the study population. A predesigned questionnaire was used in data collection. Data were processed and analyzed by using MS Office and SPSS version 23 programs as per need. **Results:** In this study, in analyzing the mean \pm SD serum creatinine levels of the participants, at baseline stage it was found as 2.24 ± 1.49 where it was found as 3.06 ± 2.18 at follow up stage. We did not find any significant correlation between the readings and the P value was found as 0.486. In electrolytes assessment, at baseline stage, the mean \pm SD Na⁺, K⁺ and Cl were found as 132.49 ± 12.39 , 4.34 ± 0.75 and 97.28 ± 10.09 mmol/L respectively. On the other hand, at follow up stage, those readings (Mean \pm SD) were found as 138.30 ± 15.07 , 5.28 ± 3.17 and 105.99 ± 11.48 mmol/L respectively. In this study among all the participants, renal involvement was found in 70% cases. Besides this, hematuria and AKI were found in 32% and 11% participants respectively. **Conclusion:** The development of acute renal impairment is an important negative prognostic indicator for survival with Covid-19. Although hematuria, proteinuria and AKI often resolved in patients within few days after the onset of symptoms, renal complications in Covid-19 were associated with higher mortality. The frequencies of renal involvement among patients in pandemic Covid-19 are alarming.

Keywords: Renal involvement, Pandemic, Covid-19, SARS-CoV-2, Creatinine.

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INTRODUCTION

Covid-19 imposes a serious public health pandemic affecting the whole world, as it is spreading exponentially. SARS-CoV-2 causes multiple serious imbalances of severe acute respiratory syndrome as well as multiple organ dysfunctions including heart and

kidney injury. A few months after its first detection SARS-CoV-2 infection rapidly spread worldwide and were declared to be a pandemic by the WHO (World Health Organization) on March 11, 2020 [1]. Covid-19 usually triggers a systemic inflammatory syndrome which in some cases may become serious and lead to a multiorgan failure [2]. Among Covid-19 patients,

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laboratory abnormalities like lymphocytopenia (83% of cases), increased levels of C-reactive protein, alanine aminotransferase (ALT), thrombocytopenia (36%) and leukopenia (34%), creatinine kinase (CK), aspartate aminotransferase (AST), urea nitrogen (BUN) and D-dimer are usually found. [3] In such cases, the excessive inflammatory response would induce a cascade of reactions leading to blood clotting, with an increased risk of pulmonary embolisms and intravascular clots [4, 5]. Postmortem analysis usually found SARS-CoV-2 NP antigen in kidney tubules, complement C5b-9 deposition on the tubules and D68+ macrophage infiltration in tubulointerstitial, recommend that, the virus is a trigger for a direct cytopathic damage of kidney [6]. Like in other organs, Covid-19 infection induces micro-clots even in kidneys and that may result in filter clotting as well as blockage of organ function. Hematuria as well as proteinuria is present in most of the cases as markers of glomerular involvement [7]. In addition, it cannot be excluded that, some nonspecific antiviral agents, indiscriminately used in the hope they might act against Covid-19 viruses, are harmful to the kidney [8]. In some study it was reported that, renal replacement therapy is required in about 20% of Covid-19 related severe AKI [9, 10]. Kidney disease developed during SARS-CoV-2 infection is associated with an increased risk of mortality [11] and patients in the end-stage renal disease (ESRD) are at an increased risk for severe Covid-19. European centers report a mortality rate of 20-30% in Covid-19 patients undergoing chronic dialysis [12], mostly related to the direct Covid-19 invasion of kidneys followed by acute respiratory distress syndrome, strong cytokine storm and hypovolemia. Similar rates are reported from same centers in the USA [13, 14]. Some reviews focused on kidney damage developed during SARS-CoV-2 infection in kidney transplant recipients, considered vulnerable and at risk of serious complications because of the immunosuppressive therapy administered to prevent rejection [15, 16].

METHODOLOGY

This was a prospective observational study which was conducted in the Department of Nephrology, Suhrawardy Medical College, Dhaka, Bangladesh during the period from July 2020 to June 2021. This was a Covid-19 dedicated hospital during the pandemic situation of Covid-19. The study was approved by the ethical committee of the mentioned hospital. Proper written consents were taken from all the participants before data collection. In total 116 admitted patients in the mentioned hospital diagnosed for detecting renal involvement more than 15 year's old were enrolled in this study as the study population. The total intervention was conducted in accordance with the principles of human research specified in the Helsinki Declaration [17] and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR) [18]. Symptoms

including dry cough and chills or severe hypoxemia, fever, hemodynamic instability, acute hypercapnia and decreased level of consciousness in the absence of fever were considered as the clinical data. As laboratory data high levels of C-reactive protein (CRP), thrombocytopenia, and lymphocytopenia were considered. As imaging data pulmonary involvement in favor of Covid-19 on chest X-ray and/or computed tomography scan reports were taken. As the most dependable diagnosis RT-PCR test- results were considered. Patients with a history, signs, and symptoms of Covid-19, together with abnormal chest CT scan results and positive PCR test results were considered as definite cases. On the other hand, patients with a history, signs, and symptoms of Covid-19, abnormal chest CT scan results suggesting Covid-19 and negative PCR results were considered as the suspected cases. The patients' demographic characteristics, clinical symptoms, laboratory data, RT-PCR results for Covid-19, kidney ultrasonography and medications were extracted from the electronic medical records. The baseline serum creatinine level was defined as the initial serum creatinine level upon admission. A predesigned questioner was used in data collection. Two investigation reports were taken from all the participants; one at baseline and another at 3-7 day's follow up. All data were collected, processed and analyzed by using MS Office and SPSS version 23 programs as per need.

RESULT

In this study, among total 116 participants, 60% were male whereas the rest 40% were female. So male participants were dominating in number and the male-female ratio was 1:1.5. The mean \pm SD age of the total participants was 44.23 ± 16.73 years. In this study, in analyzing the urine R/M/E distribution among the participants we did not find any significant changes between two stages. But in assessing the WBC, RBC we found significant correlation between base-line as well as follow up readings and the P values were found as <0.0001 and 0.0003 respectively. In analyzing the Mean \pm SD serum creatinine levels of the participants, at baseline stage it was found as 2.24 ± 1.49 where it was found as 3.06 ± 2.18 at follow up stage. We did not find any significant correlation between the readings and the P value was found as 0.486 . In electrolytes assessment, at baseline stage, the mean \pm SD Na⁺, K⁺ and Cl⁻ were found as 132.49 ± 12.39 , 4.34 ± 0.75 and 97.28 ± 10.09 mmol/L respectively. On the other hand, at follow up stage, those readings (Mean \pm SD) were found as 138.30 ± 15.07 , 5.28 ± 3.17 and 105.99 ± 11.48 mmol/L respectively. We found significant correlations in comparing the readings of all electrolytes (Na⁺ K⁺ and Cl⁻) measuring. In this study among all the participants, renal involvement was found in 70% cases. Besides this, hematuria and AKI were found in 32% and 11% participants respectively.

Table 1: Age and gender distribution of participants (N=116)

Variables	n	%
Age distribution in years		
15-20 yrs.	6	5%
21-25 yrs.	12	10%
26-30 yrs.	14	12%
31-35 yrs.	15	13%
36-40 yrs.	6	5%
41-45 yrs.	4	3%
46-50 yrs.	19	16%
51-55 yrs.	12	10%
56-60 yrs.	8	7%
>60 yrs.	20	17%
Age, Mean \pm SD	44.23 \pm 16.73	
Gender distribution		
Male	70	60%
Female	46	40%

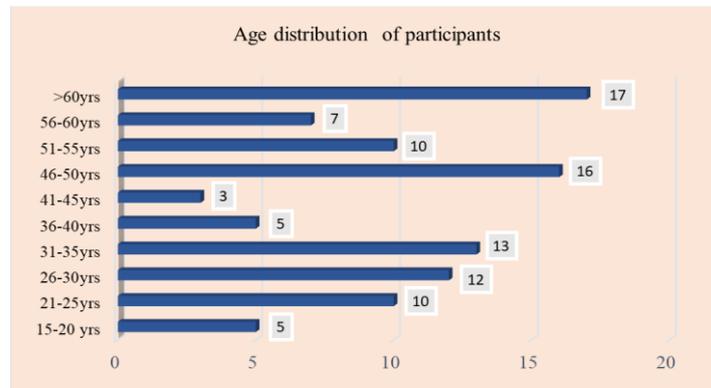


Figure 1: Age wise participants Distribution

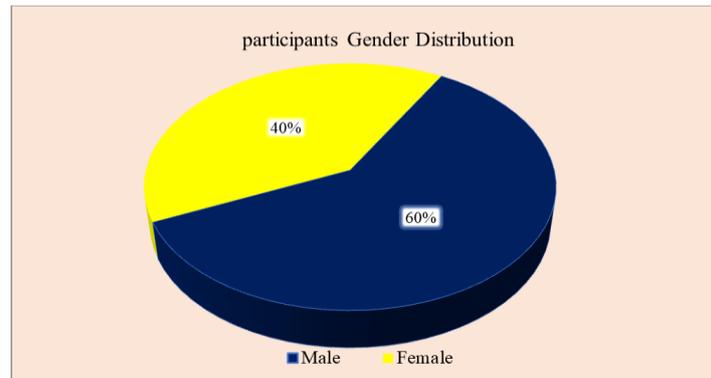


Figure 1.1: Gender wise participants Distribution

Table 2: Urine R/M/E distribution (N=116)

Variables	Baseline status	Follow up status	P value
	Mean \pm SD		
Albumin			
+	89	32	0.901
++	0	78	
Trace	4	3	
Nil	23	3	
WBC	3.12 \pm 1.81	4.88 \pm 2.41	<0.0001
RBC	96.16 \pm 12.48	102.17 \pm 12.35	0.0003

Table 3: S. Creatinine distribution (N=116)

Variables	Mean ± SD	P value
Base line status	2.24±1.49	0.486
Follow up status	3.06±2.18	

Table 4: S. Electrolytes distribution (N=116)

Variables	Baseline status	Follow up status	P value
	n/Mean ±SD		
Na ⁺	132.49±12.39	138.30±15.07	0.002
K ⁺	4.34±0.75	5.28±3.17	0.002
Cl ⁻	97.28±10.09	105.99±11.48	<0.0001

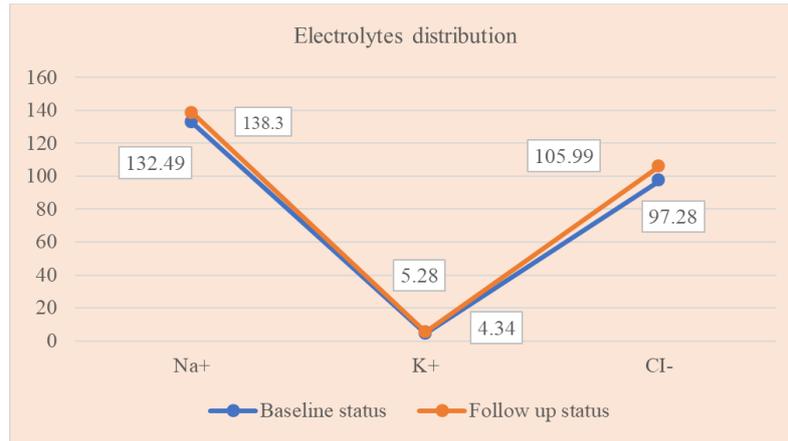


Figure 2: Electrolytes distribution by mean

Table 4: Direct and indirect renal involvement among participants (N=116)

Variables	n	%
Hematuria	37	32%
AKI	13	11%
Renal involvement	81	70%

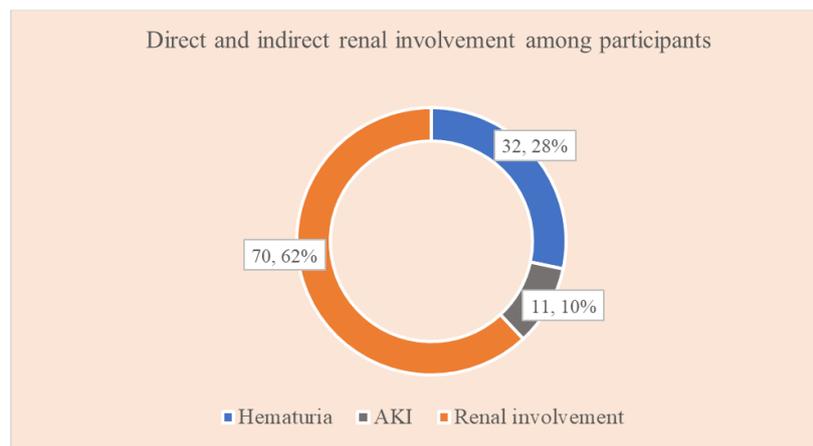


Figure 3: Direct and indirect renal involvement Distribution among the participants

DISCUSSION

The aim of this study was to evaluate the renal involvement among patients in a Covid-19 dedicated hospital. In a recent study [19] conducted in China it was reported that, renal abnormalities occurred in the majority of patients with Covid-19; although hematuria, proteinuria and AKI often resolved in such patients

within 3 weeks after the onset of symptoms, renal complications in Covid-19 were associated with higher mortality. In this study, among total 116 participants, male participants were dominating in number and the male-female ratio was 1:1.5. The mean ±SD age of the total participants was 44.23±16.73 years. In another similar study [20], 113 (56.5%) were male, the mean age was 60.5 years (SD=16.4, range, 20-96 years) and

in total, 189 patients had an RT-PCR for SARS-CoV-2 result on charts, of which 137 were positive (72.5%). In analyzing the mean \pm SD serum creatinine levels of our participants, at baseline stage it was found as 2.24 ± 1.49 where it was found as 3.06 ± 2.18 at follow up stage. Patients with elevated baseline levels of s. creatinine showed a significantly higher incidence of AKI as compared to cases with a normal baseline serum creatinine (11.9% vs. 4.0%) [21]. But in a study, it was reported that, level of s. creatinine increases up to 3 times than that at baseline in 7 days; RRT initiated [22]. In this study among all the participants, renal involvement was found in 70% cases. Besides this, hematuria and AKI were found in 32% and 11% participants respectively. It was found that, renal involvement in Covid-19 is more common and consists of a range of symptoms from mild proteinuria as well as hematuria to outright kidney failure, collapsing glomerulopathy and the need for renal replacement therapies [23,24]. In a study [20] they reported that, they found a shockingly-high incidence of AKI (63%) in patients admitted for Covid-19 and they added that alarming finding could be due to high number of critically ill cases admitted in the ICU units of their center. Generally, they found a 28% mortality rate and the development of AKI was actually a significant predictor of mortality in Covid-19. On the other hand, preliminary reports from China estimated AKI to occur in 0.5-7% of cases, and 2.9-23% of ICU patients [25, 26].

Limitation of the Study

Though it was a single centered study with a small sample size, so the findings of this study may not reflect the exact scenario of the whole country.

CONCLUSION & RECOMMENDATION

The development of acute renal impairment is an important negative prognostic indicator for survival with Covid-19. Although hematuria, proteinuria and AKI often resolved in patients within few days after the onset of symptoms, renal complications in Covid-19 were associated with higher mortality. The frequencies of renal involvement among patients in pandemic Covid-19 are alarming. For getting more specific findings we would like to recommend for conducting similar more studies with larger sized samples in several places.

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