



(RESEARCH ARTICLE)



Comparative assessment of renal complications in children during the COVID-19 pandemic

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Abstract

Although medically children are not at risk, but in the ongoing COVID 19 pandemic has serious implications for children. New evidence do not clearly define renal manifestations. Among the reasons for the lack of efficacy of the ongoing treatment of patients with renal complications, an incomplete understanding of its pathogenesis in children who have had a coronavirus infection plays a special role. Biochemical blood tests revealed the elevated blood and urine MC levels which in 1/5 of the patients with high parameters. Moderate proteinuria and transient macrohaematuria were observed in children in the COVID-19 group with renal complications. Children with moderate to severe ChKD with COVID-19 or with recurrent nephrotic syndrome are at risk of severe complications, including severe AKF or ChKF. This data indicates that the children with COVID-19 infection should be closely monitored for the development and progression of RF and special measures should be taken to prevent it.

Keywords: Macrohematuria; Proteinuria; Complications; Extrapulmonary manifestations

1. Introduction

Although medically children are not at risk, the ongoing COVID 19 pandemic has serious implications for children [1]. New evidence suggests that COVID-19 virus has extrapulmonary manifestations, but there were not clearly defined renal manifestations. Among the reasons for the lack of efficacy of the ongoing treatment of patients with renal complications, an incomplete understanding of its pathogenesis in children who have had a coronavirus infection plays a special role [2, 3]. It is not known whether the virus directly affects the kidneys or whether renal complications are a side-effect of the infection. However, it is a known fact now that people with renal complications can be more severely affected by the infection than the people without concomitant disease. Some evidence suggests that 59% of patients with a confirmed diagnosis of coronavirus have changes in their urine tests. The appearance of blood and protein was indicative of kidney damage, even in those with no previous urinary tract disease. In April 2020, experts from Wuhan Central Hospital published a study examining the effects of coronavirus on kidney function. It was found that 27.06% of hospitalized patients with coronavirus infection had kidney damage. A special mechanism of renal complications is the phenomena of membrane destruction leading to the involvement of more sites in the inflammatory process and their replacement by connective tissue which leads to the development of chronic renal failure, uremia and death [4-6]. The number of people in the world infected with coronavirus is increasing every day. The number of victims of this dangerous infection is rising, and the overall prognosis is not encouraging. It is under these difficult conditions that doctors and scientists have to investigate how the virus affects the body [7-9].

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Research aim

Early diagnosis of renal dysfunction, and evaluation of clinical and laboratory characteristics in children with renal complications formed against the background of COVID-19.

1.1. Study materials

55 patients with COVID-19 renal complications aged from 1 to 18 years. All children included in the study will constitute 2 main groups. Group I - 30 have patients with renal complications with COVID-19 infection previously. Group II - 25 patients without COVID-19 renal complications. The duration of hospital stays and viral infections were not related to gender.

- General and clinical examination including history, examination and blood and urine tests.
- PCR diagnostics for detailed examination.
- Biochemical including blood creatinine, urea, daily and minute urine output values, GFR.

1.2. Research results

During the Zimnitsky's test we registered a relatively higher percentage of children with impaired renal concentration function (35.2% and 25% in the 1st and 2nd groups respectively). Also hypersthenuria was noted in half of the examined children in Group 1 (50% and 17.8% in Group 2), in Group 1 children 17.6% had lower urine relative density (7.1% in Group 2). In one third of the examined children of Group 1 there was some decrease of diuresis (29.4%) and only in 1/5 of the children examined without renal complications against the background of COVID-19 (21.4%). On average 79.4% of children showed the acutely acidic reaction of urine in general urinalysis. In the tests urine pH <5.75 was diagnosed in one third of the examined children of Group 1 (32.3%). Microscopy of general analysis of urine showed the presence of the marked leukocyturia due to neutrophils (58.8% and 60.7%) in the majority of the compared groups, the mean values being 35.47±8.4 and 31.23±6,9 per field of view in Groups 1 and 2 respectively.

Table 1 Children with urinary syndrome and renal complications against COVID-19 compared groups

Indicators	1 group n=30	2 group n=25	P
Impairedrenalconcentrationfunction	35.2%	25%	<0.05
Hypersthenuria	50%	17.8%	<0.05
Hyposthenuria	17.6%	7.1%	-
Nicturia	23.5%	10.7%	<0.05
A reductionindiuresis	29.4%	21.4%	
A sharply acidic urine reaction	79.4%	17.8%	<0.001
UrinepH<5.75	32.3%	7.1%	<0.001
Leukocyturia	58.8%	60.7%	
Leukocyturiaandmicrohaematuria	32.3%	28.5%	
Moderateproteinuria	26.4%	21.4%	
Averageurinedensity	1018.12 ±568.45	1016.24±471.33	
Average leucocyte count;w/w	35.47±8.4	31.23±6.9	
Average number of red blood cells in urine; w/w	10.21±3.52	8.66±2.26	
Average level of proteinuria; %	0.089±0.007	0.056±0.008 .	<0.05

Concomitant leukocyturia and microhematuria in the total urine samples were found in about a third of the examined children in groups 1 and 2 (32.3% and 28.5% respectively, with an average of 10.21±3.52 and 8.66±2.26 erythrocytes per sight. Mild proteinuria of less than 1 g/l was observed in 26.4% and 21.4%, respectively, with a mean of

0.089±0.007% and 0.056±0.008%. Transient macrohematuria was seen in 32.3% of the children in the Group I and 10.7% in Group II. The biochemical blood and urine analyses showed that the blood UA level in Group I children was 94.1% higher than the normal values, while 76.4% of children had an average of 350-400 µmol/l, and in the remaining 20.5% of patients, the blood UA level was < 400 µmol/l. In Group II children only 2 children (7.1%) showed increased UA level. The mean level of blood UA in group 1 was statistically significantly higher than in group 2 (439.45±12.33 µmol/l and 297.14±19.55 µmol/l; p<0.001. Other biochemical parameters, namely creatinine, urea, were within the age norm, and were not specific. Cystoscopy showed a significant incidence of cystitis in children in the group with COVID-19 renal complications (52.9% and 21.4% in the group without COVID-19 renal complications).

Renal complications are thus common among hospitalised children with COVID-19. Renal complications in the patients with COVID-19 infection previously, are also having symptoms of a marked urinary syndrome. Biochemical blood tests revealed the elevated blood and urine MC levels which in 1/5 of the patients with high parameters. Moderate proteinuria and transient macrohaematuria were observed in children in the COVID-19 group with renal complications. Children with moderate to severe ChKD with COVID-19 or with recurrent nephrotic syndrome are at risk of severe complications, including severe AKF or ChKF. This data indicates that the children with COVID-19 infection should be closely monitored for the development and progression of RF and special measures should be taken to prevent it. Although we still do not know how much SARS-CoV-2 will spread worldwide and affect populations worldwide, the initial data presented in children are encouraging. However, because of the limited number of cases and clinical data, paediatricians need to keep their knowledge and awareness of the risks up to date.

2. Conclusion

As we know Covid-19 have impacted life of every human being, initially I was considered that children below age of 7 to 12 are not affected severely by SARS-Cov- 2 (Covid-19 virus). But our study showed that almost 79 % of children showed renal complications including hypersthenuria, acidic reaction of urine and a fraction of children showed leukocyturia due to neutrophils. Thus it is obvious that this Covid-19 infection is also can cause sever health problems in children especially related to kidney, so while treating child patients with covid-19, we should closely monitor kidney functions.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is not Conflict of Interest.

Statement of informed consent

A consent was taken from all participants include in this article.

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