Does the Covid-19 Effect on Kidney Functions? Question Need an Answers, Observational Study, Aljouf Region, Saudi Arabia

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Abstract

Background: Many of the published studies on COVID-19 have highlighted lungs as the main organ affected in this disease. Some studies suggest that it can lead to Acute Kidney Injury. Our goal in this study to evaluate the effect of covid-19 on kidney function.

A frequent monitoring of kidney functions in patients with COVID-19 can lead to early diagnosis of kidney disorders, and help in achieving the optimal therapeutic concentrations of drugs and reducing the risk of drug reactions.

Methods: The study was carried among the consecutive 82 COVID - 19 patients. These patients were symptomatic and diagnosed to be positive for corona virus. The data was extracted from the patient medical record files. Those patients were followed after discharge from hospital to repeat their investigations after three weeks.

Results: Of the 82 patients, 68 patients (82.9%) had high leukocytes, 18 (21.9%) patients had hematuria, 34 (41.4%) had proteinuria and 10 patients (12.1%) had serum creatinine levels of more than 1.3 mg/dl.

The follow-up three weeks after discharged Investigations revealed that 12 (14.6%) patients had moderately high leukocytosis, 6 (7.3%) patients with hematuria and 8 (9.1%) patients with proteinuria and one patient with high creatinine (2.4%).

Conclusion: The Corona virus is affect mainly the respiratory system but can affect other system related to it too. It has a little effect directly on kidney either because there is no real effect on it or the immunity of patients prevent effectiveness of virus.

Keywords: Covid-19, Corona, Kidney function

Introduction

The coronavirus cases were eventually reported to the World Health Organization country office in China on the 31st of December 2019. Many of the cases were reported and searches for the source have shown that one of the seafood markets, a wet market as the origin, the market was where a large variety of vertebrates and invertebrate animals wild court and farm raised are sold. On January 1st, markets were closed (1). Furthermore, on January 12th 2020, shares the genetic sequence of the novel coronavirus, which will be very important for the other countries as they developed specific diagnostic tests (2).

SARS CoV-2 (COVID -19) is a virus is a new type of coronaviruses that appeared suddenly in late 2019 in the city of Wuhan, China (3). Coronaviruses are common, you have likely had a coronavirus lots of times, it is one of the kinds of viruses that cause the common cold, but
they can also cause Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), two diseases that have very high case mortality rates. They are highly contagious, and the disease that SARS CoV-2 causes has been named as COVID-19(4).

The COVID-19 pandemic began in China, but new cases in China are very low, and now the majority of new cases are reported outside China. This raises the question; do we have a pandemic on our hands? And the answer is Yes.

Researchers have said they need to see evidence of sustained, domestic transmission in at least one more region outside of the Pacific region that includes China, Japan, and South Korea before using the word “Pandemic” (5). COVID-19 pandemic affects patients of all ages with multiple comorbidities, including chronic kidney disease. However, it had been reported that acute kidney injury or failing of the kidneys were seen in those patients with and without chronic kidney disease (6).

There is a wide range of the percentages of patients might be affected with acute kidney injury, ultimately requiring dialysis or kidney replacement therapies, and it has been quoted from several studies that have been published thus far that 22 even 40% of patients that are admitted to critical care units may require the use of dialysis therapies under the care of a nephrologist. The patients without the need for dialysis may develop acute kidney injury that may be their past the infection during the hospital course and these patients may even have chronic kidney disease after they have recovered from the virus (7). Several hospitals around the world, especially from cities of epicenters of COVID-19 pandemic such as hospitals from New York City have run into a shortage of both dialysis machines and dialysis staffing, which has made it difficult to provide these life-prolonging and life-sustaining therapies to patients that need them (8).

Despite several precautionary decisions made by the Saudi government to prevent the spread of infection, there are many cases are reported in most part of the Kingdom. According the global health reports, the virus primarily affects the respiratory system and which may lead to several outcomes including death. Many of the published studies on COVID-19 have highlighted lungs as the main organ affected in this disease.


The data from a Chinese cohort of 1,099 patients with COVID-19, suggest that only 0.5% had Acute Kidney Injury (9). The potential mechanisms of kidney injury can be due to cytokine damage, organ crosstalk and systemic effects.

A frequent monitoring of kidney functions in patients with COVID-19 can lead to early diagnosis of kidney disorders, and help in achieving the optimal therapeutic concentrations of drugs and reducing the risk of drug reactions.

**Methodology**

This observational analytical study was carried among the consecutive 82 COVID-19 patients. These patients were symptomatic and positive for polymerase chain reaction (PCR). The study was conducted from 26th April to June 2nd, 2020 from the hospitals of north region of the Kingdom of Saudi Arabia. Both male and female patients positive for coronavirus were eligible to be included in the study. The patients’ age ranged between 20-60 years. The data was extracted from the patient medical record files. The data that was extracted included demographic details like age and gender, biochemical parameters such as serum creatinine, complete blood count, and urine analysis from patient files. Those patients were followed after discharge from hospital to repeat their investigations after three weeks. The patients were tracked by their mobile numbers and WhatsApp reminder was sent for the follow-up.

The study protocol was approved by the Research Ethics Committee, Qurayat health affairs (approval no: 0043, dated, M.O.H, order no (0043) dated 23th April 2020. Informed consent was taken by the attending nurse in the presence of a relative as witness before specimen and data collection.

**Results**

All the patients that tested coronavirus positive were
Of the 82 positive symptomatic coronavirus patients, 68 patients (82.9%) had high leukocytes, 18 (21.9%) patients had hematuria, 34 (41.4%) had proteinuria and 10 patients (12.1%) had serum creatinine levels of more than 1.3 mg/dl.

### Table 1: Age, gender, hematology and renal parameters of patients at the time of diagnosis

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients (no)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20-60</td>
<td>---</td>
</tr>
<tr>
<td>Gender</td>
<td>Males</td>
<td>100%</td>
</tr>
<tr>
<td>Test of coronavirus</td>
<td>Positive</td>
<td>100%</td>
</tr>
<tr>
<td>Leukocytes</td>
<td>68 high</td>
<td>82.9%</td>
</tr>
<tr>
<td>Hematuria</td>
<td>18</td>
<td>21.9%</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>34</td>
<td>41.4%</td>
</tr>
<tr>
<td>Creatinine</td>
<td>10 above 1.3 mg/dl</td>
<td>12.1%</td>
</tr>
</tbody>
</table>

Patients were followed three weeks after discharged from hospital. The new investigations were carried out at the primary health care center where they were registered. The follow-up investigations revealed that 6 (14.6%) patients had moderately high leukocytosis, 3 (7.3%) patients with hematuria and 4 (9.1%) patients with proteinuria and one patient with high creatinine (2.4%).

### Table 2: Age, gender, hematology and renal parameters of patients after 3 weeks of discharge

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients (no)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>20-60</td>
<td>----</td>
</tr>
<tr>
<td>Gender</td>
<td>Males</td>
<td>----</td>
</tr>
<tr>
<td>Test of coronavirus</td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td>Leukocytes</td>
<td>12 patients high</td>
<td>14.6%</td>
</tr>
<tr>
<td>Hematuria</td>
<td>6 patients</td>
<td>7.3%</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>8 patients</td>
<td>10%</td>
</tr>
<tr>
<td>Creatinine</td>
<td>2 patient above 1.3 mg/dl</td>
<td>2.4%</td>
</tr>
</tbody>
</table>

**Discussion**

We report here a cohort of 82 patients with lab.-confirmed Covid-19 infection. Patients had upper respiratory tract infections symptoms. They were admitted to the hospitals in northern area, KSA, by March 2, 2020.

All of the patients are males, Perhaps because the men are more likely to go out and communicate with others outside the home, which puts them at risk of contracting this virus and thus transmitting it to others. While women are less likely to leave their homes and also during their exit they follow the instructions in addition to wearing the Hijab, which makes them less likely to be infected with this virus.

The new 2019 novel coronavirus is very unusual, since it was discovered in Wuhan, the capital city of China’s Hubei Province late last year, the virus has
killed thousands of people and infected millions(10). For every single person who is effected, it seems as if there is going to be up to three or four other persons who could also be affected.(11,12). The first confirmed case of what was then an unknown coronavirus was traced back to November 2019 in Hubei.

We found there is an effect on the kidneys like acute kidney injury in Dawei Wang, MD1; Bo Hu, MD1; Chang Hu, MD1; et al, “Patients’ clinical manifestations included fever, nonproductive cough, dyspnea, myalgia, fatigue, normal or decreased leukocyte counts, and radiographic evidence of pneumonia. Organ dysfunction (e.g., shock, acute respiratory distress syndrome (ARDS), acute cardiac injury, and acute kidney injury) and death can occur in severe cases”.(13). But in our study, we find a negligible effect on kidneys which may be related to the situations of patients their self. Also sever Acute respiratory distress syndrome can lead to other organ dysfunction.

Acute kidney injury (AKI) was detected in different MERS cases, with possible influence on disease severity (14,15, 16). AKI has neither been a typical feature of SARS, nor has it been a common observation in infected cases as a result of any other corona virus, including human HCoV-NL63, -229E, –OC43, and -HKU1. It is noteworthy that a high percentage (76%) of MERS-CoV cases were reported as having underlying chronic diseases such as DM, chronic CVD and chronic renal disorders.

The present study found most of clinical manifestations are in respiratory system which extended from mild to severe symptoms depend on the immune system of patients who are infected with coronavirus. Common symptoms at onset of illness were fever, myalgia, fatigability, and anorexia. Some of patients presented with diarrhea which is atypical symptoms.

Recently, it had been reported by various studies that the incidence of liver injury were ranging between 14.8% to 53%, which was a major indication by abnormal ALT/AST levels accompanied by slight elevation of bilirubin levels.40-51 The albumin was reported to be decreasing in severely reported cases and the level of albumin was reported to be between 26.3-30.9 g/L.46 The likelihood to develop liver injury in severe COVID-19 cases was remarkably higher compared to mild cases.40-42 In fatal cases of COVID-19, the incidence of liver injury could be reaching up to 58.06% and 78%.(17)

Acute kidney injury are commonly seen in patients with MERS-CoV and SARS-CoV infections, and electron microscopic examination showed viral particles in the renal tubular epithelial cells in SARS patients (15) and in the patient with MERS.(18) These findings may explain the deterioration in renal function in a substantial number of patients with SARS and MERS. The effect of SARS-CoV-2 on kidneys is yet to be explored, but emerging data suggest that the kidney may be an important target organ for SARS-CoV-2 (19)

But as their interpretation, The 2019-nCoV infection caused clusters of severe respiratory illness similar to severe acute respiratory syndrome coronavirus and was associated with high mortality and ICU admission. we believe that there are alternative explanations. In First, the effect of kidney function is clearly mild. Secondly, when kidney function for patients with different durations of symptoms are tested, there is no evidence that later presentation is associated with greater kidney function impairment.

There are some effect of infection for the organ other than respiratory, Hepatic dysfunctions in severe COVID-19 was observed to be along with activated coagulation and fibrinolytic pathways, relatively depressed platelet count, increased neutrophil counts and higher neutrophil to lymphocyte ratios, and elevated level of ferritin (14). Despite that those biomarkers are considered as non-specific biomarkers of inflammation, it is believed that they are fitting the paradigm of the medical condition severity that coincide with a failure of innate immunity (15).Such imbalance in the immunity favours NETosis and activating of coagulation and might as well changes systemic iron metabolism secondary to activate the macrophage. (20). Notably, this changing of immunity balancing happens with increasing of age, and old patients could consequently be predicted to fare worse, with a higher dependence on such pathways.(20)

Most significantly, other respiratory viruses yield the same increase of liver functional biological markers, which are reported to be in relation to hepatic damaging due to immunity interaction(s) that involve “intrahepatic cytotoxic T cells and Kupffer cells.(21) This phenomenon waxes and wanes in line with respiratory viral infection
and in the non-existence of hepatic viral amplification that could be explaining the reason of worsening outcome not observed in forty-two cases with chronic liver disease and COVID-19 who had outcome data.

**Conclusion**

COVID-19, a new and aggressive sometimes deadly respiratory illness that is believed to have started in a live animal market in China, has spread rapidly throughout that country and the world. This virus is affect mainly the respiratory system but can affect other system related to respiratory system. It has a little effect directly on kidney either because there is no real effect on it or the immunity of patients prevent effectiveness of virus.

**Conflicts of Interest:** No conflicts.

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