**ORIGINAL ARTICLE**

# Frequency of Electrolyte Imbalances (Sodium and Potassium) in Patients with Covid-19 Disease

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## ABSTRACT

**Objective:** To examine the frequency of electrolyte imbalance such as sodium and potassium deficiency in patients with coronavirus disease.

**Study Design:** Cross-sectional

**Place and Duration:** Medical Unit-II Holy Family Hospital, Rawalpindi, During from April 2020 to June 2020.

**Methodology:** Total 90 patients of both genders diagnosed to have severe covid-19 disease by real time PCR were enrolled in this study. Patients detailed demographics including age, sex, and were recorded after taking written consent. 5ml blood sample was taken from each patient and sent to laboratory to examine serum sodium and potassium level. Data was analyzed by SPSS 24.0.

**Results:** There were 52 (57.78%) male and 38 (42.22%) females with mean age 52.48±8.37 years. Hyponatremia was found in 38 (42.22%) patients and hypokalemia was found in 24 (26.67%) patients. Mortality found in 10 (11.11%) patients and 80 (88.89%) patients were discharged. Mortality was significantly higher in patients with sodium and potassium abnormalities as compared to patients with no electrolyte imbalances (p-value <0.05).

**Conclusion:** It is concluded that the frequency of electrolyte imbalances such as sodium and potassium deficiency was high in patients with severe covid-19 disease.

**Keywords:** SAR-covid 19, Serum Sodium, Serum Potassium Level, Mortality

## INTRODUCTION

Since 2019, the outbreak of coronavirus 2019 (COVID-19) in the city of Wuhan (China) is attributed to the extreme acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus infiltrates human cells by binding the enzyme 2 (ACE2) to the cell membrane, which is widely distributed in many important human organs, such as the heart , liver , kidney and lung [2-3]. Angiotensin-converting enzyme 2 is the primary counter-regulatory mechanism for the major axis of the blood pressure regulation and electrolyte balance essential to the RAS[4] axis. SARS-CoV-2 binds ACE2 and increases ACE2 degradation, thereby reducing ACE2's counteraction with RAS. This results in greater sodium and water reabsorption, thus increasing blood pressure and potassium (K+) excretion[5]. Moreover, gastrointestinal symptoms such as diarrhoea and vomiting often occur in patients with COVID-19[6]. Collectively, COVID-19 's effects on RAS and the gastrointestinal system are likely to cause disturbances in electrolytes and pH homeostasis.

Early COVID-19 studies have shown that electrolyte disorders, including sodium , potassium , chloride, and calcium defects, can also occur at presentation of patients[7-8]. Others have proposed that COVID-19 patients appear to show a higher percentage of Baseline Hypokalaemia relative to less serious types of disease[9]. Such electrolyte disorders have a tremendous impact, not only on patient care, but also on the detection of possible pathophysiological pathways that can lead to new therapeutic possibilities. However, small sample sizes and heterogeneity are small in electrolyte reporting. Therefore, we conducted present study to examine the frequency of electrolyte imbalances (sodium and potassium deficiency) among patients with severe covid-19 disease.

## MATERIALS AND METHODS

This cross-sectional/observational study was conducted at Medical Unit-II Holy Family Hospital, Rawalpindi, during from the period April 2020 to June 2020..A total 90 patient of both genders diagnosed to have severe covid-19 disease by real time PCR were enrolled in this study. Patients ages were ranging from 15 years to 70 years. Detailed demographics including age, sex, and body mass index (BMI) were recorded after taking written consent. Patients with mild covid-19 disease and those with no consent were excluded.

5 ml blood sample was taken from each patient and sent to laboratory to examine the serum sodium and serum potassium level. Serum sodium level <120 mmol/L was considered as severe hyponatremia and serum potassium level <2.5mmol/L was considered as hypokalemia. Mortality was examined. Association between mortality and electrolyte deficiencies were examined. All the data was analyzed by SPSS 24.0. Frequencies and percentages were recorded in tabulation form. Chi-square test was done to examine the association between hyponatremia, hypokalemia and mortality. P-value <0.05 was taken as significant.

## RESULTS

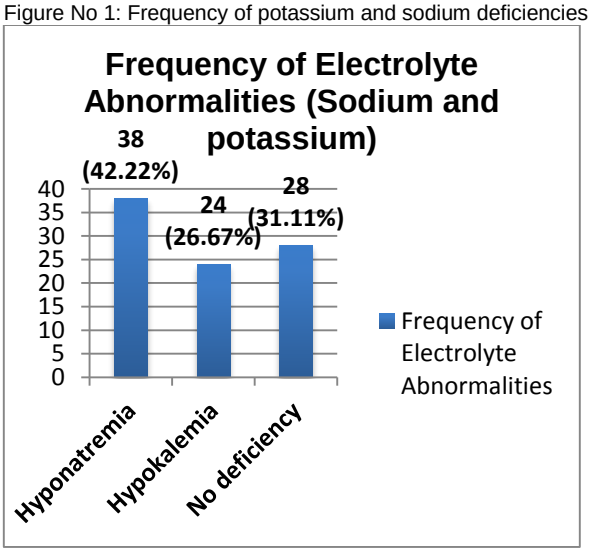
Out of 90 patients, 52 (57.78%) were males and 38 (42.22%) were females with mean age 52.48±8.37 years. Mean BMI of patients was 23.17±3.04 kg/m$^2$. (Table 1)

Table No 1:Baseline detail of all the patients

| Variables | Frequency No. | %age |
|---|---|---|
| Mean Age (Years) | 52.48±8.37 | |
| Mean BMI (kg/m) | 23.17±3.04 | |
| Gender | | |
| Male | 52 | 57.78 |
| Female | 38 | 42.22 |

We found that 38 (42.22%) patients had serum sodium level <120 mmol/L and considered as hyponatremia. Hypokalemia was found in 24 (26.67%) patients with serum potassium level <2.5 mmol/L. (Figure 1)

Figure No 1: Frequency of potassium and sodium deficiencies




Among all the studied patients 10 (11.11%) patients were died while 80 (88.89%) were discharged after complete recovery. (Table 2)

| Variables | Frequency No. | Percentage |
|---|---|---|
| Died | 10 | 11.11 |
| Discharged | 80 | 88.89 |

Table No 3: Association between mortality and electrolyte abnormalities

| Variables | Hyponatremia | Hypokalemia | No Deficiency | P-value |
|---|---|---|---|---|
| Mortality | | | | 0.0382 |
| Yes | 5 (13.16%) | 4 (16.67%) | 1 (3.57%) | |
| No | 33 (86.84%) | 24 (83.33%) | 27 (96.43%) | |

We found that, among 38 patients with hyponatremia 5 (13.16%) were died, out of 24 hypokalemic patients 4 (16.67%) patients were died and 1 (3.57%) patient was died among normal sodium and potassium level patients.Mortality was significantly high in patients with hyponatremia and hypokalemia as compared to patients with normal serum sodium and potassium level with p-value <0.05. (Table 3)

## DISCUSSION

Impairment and lack of trace elements and vitamins in electrolyte balance causes immune systems dysfunction and raise the risk of serious infection[10]. We conducted present study to examine the frequency of low serum sodium level (hyponatremia) and low serum potassium level (hypokalemia) in patients with severe corona virus disease. In this regard 90 confirmed cases of severe covid-19 disease were enrolled. Majority 57.78% were male while females were 42.28%. Mean age of patients was 52.48±8.37 years. Studies demonstrated that male patients were high in numbers who were affected with severe coronavirus disease and majority 60% patients were ages between 45 years to 65 years[11-12].

In present study we found that 38 (42.22%) patients had serum sodium level <120 mmol/L and considered as hyponatremia. Hypokalemia was found in 24 (26.67%) patients with serum potassium level <2.5 mmol/L. A study conducted by Tezcan ME et al[13] to examine the electrolyte imbalances among patients with severe coronavirus disease, in which out of 408 patients 55.8% patients had electrolyte imbalances and among them hyponatremia was the most common abnormality found in 35.8% patients and hypokalemia was found in 6.8% patients.

A study conducted by Lippi G et al[14] regarding electrolyte abnormalities among patients with severe covid-19 disease and they reported that patients with severe covid-19 had significantly low sodium level and potassium level as compared to patients with mild covid-19 disease with p-value <0.05.

Another study by Anna S et al[15] reported that out of 223 covid-19 patients, hyponatremia was found in 63% patients. A study by Frontera et al[16] reported that among 4645 patients of covid-19 disease hyponatremia was present in 1373 (30%0 patients.

In our study we found that patients with sodium and potassium abnormalities had significantly high rate of mortality as compared to patients with no abnormality (p-value <0.05). These results were comparable to some previous studies in which patients with severe electrolyte imbalance had significantly worst clinical outcomes as compared to patients with no abnormalities[17-18].

## CONCLUSION

We concluded from this study that the frequency of very low serum sodium level (hyponatremia) was 42.22% and hypokalemia was 26.67% in patients with severe covid-19 disease. Mortality was significantly higher in patients with electrolyte.

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