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Biochemistry

ESTIMATION OF SERUM ELECTROLYTES IN CASES OF COVID 19 PATIENTS AND HEALTHY ADULTS: A COMPARATIVE STUDY

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ABSTRACT **Introduction-** COVID 19 remains the enigmatic cause of significant distress. Invasion of virus is through binding angiotensin-converting enzyme 2 (ACE2) on a cell membrane . Electrolyte balance of the body is maintained by renin angiotensin aldosterone system. Also , some patients with COVID-19 presents with gastrointestinal symptoms, such as diarrhea and vomiting. This may results in electrolyte disturbances in patients. The effects of COVID-19on RAS and the gastrointestinal system probably lead to disruptions of homeostasis of electrolytes. Electrolytes in body like sodium (Na), potassium (K). Chloride (Cl) plays an important physiological role in maintaining acid base and water balance of cells of the body. **Aims and objectives-** The objective of the study was to estimate serum electrolytes level in patients with covid 19 and compare the same with that of normal healthy adults. **Material and Methods-**This is case control study included total 32 males and 18 females in the age group of 20 to 75 years. The results were compared with 50 age and sex matched healthy controls. Estimation of serum electrolytes was done with the collected venous blood samples using the ion selective electrode technique in an electrolyte analyzer on Easylyte machine by transasia pvt ltd **Result and observation-** We have found that covid 19 is associated with low levels of electrolytes like Na, K, Cl. Near normal mean serum chloride levels and statistically significant decrease in mean serum sodium as well potassium were the findings observed in our study group when compared with controls **Conclusion-** Our study implies that serum electrolytes levels (sodium and potassium) are significantly decrease in covid cases. The electrolytes derangement in these patients play a critical role in patients management. We need to assess water , fluid status of each patient. Hence a monitoring of electrolyte status is essential to improve the health related quality of life in these patients.

KEYWORDS : Covid 19, serum electrolytes ,Electrolyte analyzer, Ion selective electrode.

INTRODUCTION

Whole world is facing a challenge of coronavirus disease 2019 (COVID-19) pandemic, the first case of which found in in the city Wuhan of China in December 2019,caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) .[1] WHO (World health organization) declared covid 19 as a global pandemic on 11th march 2020. [2] This is an acute respiratory tract infectious disease which may presents as asymptomatic infection to clinically mild to severe type of disease. Electrolytes in body like sodium (Na), potassium (K). Chloride (Cl) plays an important physiological role in maintaining acid base and water balance of cells of the body. Electrolyte balance of the body is maintained by renin angiotensin aldosterone system. This is also invovled in maintaining the blood pressure.

The rennin-angiotensin system (RAS), which regulates the control of blood pressure and electrolyte balance in the body also plays a role in regulating angiotensin-converting enzyme [3,4]. Invasion of virus is through binding angiotensin-converting enzyme 2 (ACE2) on a cell membrane [5]. SARS-CoV-2 binds ACE2 and enhances the degradation of ACE2 and, thus, decreases thecounteraction of ACE2 on RAS. This leads to increased reabsorption of sodium and water, therebyincreasing blood pressure and excretion of potassium .[6] Also , some patients with COVID-19 presents with gastrointestinal symptoms, such as diarrhea and vomiting[7] ,which may further leads to electrolyte disturbances in these patients. The effects of COVID-19 on RAS and the gastrointestinal system probably lead to disruptions of homeostasis of electrolytes. Previous studies shoows some electrolytes disturbances in terms of Na, K and Cl levels in patients with covid19.[3,4]

Therefore the present study was planned to evaluate the changes in serum electrolyes levels in covid 19 patients on initial admission and to correlate these values with controls.

AIMS AND OBJECTIVES- To estimate serum electrolytes level in patients with covid 19 .
To compare the same with the serum electrolytes levels of normal healthy adults.

MATERIAL & METHODS

The study was done at Government medical college & Hospital, Jalgaon, Maharashtra. A total 50 cases of covid 19 were taken as study samples, admitted in department of medicine. The patients with confirmed covid 19 infection, positive for RTPCR (Real time polymerase chain reaction) assay of 2019-nCoVRNA were included as study group. 50 healthy normal age and sex matched subjects were taken as control group. Exclusion criteria was those with chronic kidney disease and age > 75years. Serum electrolytes were estimated in both on the group by ion selective electrode method on Easylyte machine by transasia pvt ltd.

RESULTS

Table 1GENDER DISTRIBUTION AMONG CASES AND CONTROLS

GENDER	CASES		CONTROLS	
	NO	%	NO	%
MALE	32	64	30	60%
FEMALE	18	36	20	40%
TOTAL	50	100	50	100%

Table 2ELECTROLYTES IN CONTROL AND COVID PATIENTS

PARAMETER	NORMAL RANGE	CONTROL (n=50)	COVID (n=50)	t test	p-value
Serum Sodium	135 –145meq/l.	142.79±5.59	138.17±6.81	-3.62	< 0.00046
Serum Potassium	3.5 – 5.2 meq/l.	4.59±1.03	3.99±0.58	-3.58	< 0.005
Serum Chloride	96 – 106 meq/l.	102.7±9.54	102.12±6.87	-0.34	< 0.72

Table 1 shows gender distrubution in study groups. It is evident that number of males (32/50) were more as compared to females (18/50) and (female to male ratio 1.77). Maximum number of patients in our study was in the age group of 31 to 40 years with mean age in cases was 36.72±7.78 years and mean age in controls was 34.68±6,83 years.

Table 2 shows values of serum electrolytes in cases and controls. The sodium and potassium values were significantly decrease in covid patients as compared to controls with mean sodium in cases as 138.17±6.81meq/l and potassium as 3.99±0.58 meq/l. The serum chloride values were also decrease though stastistically not significant in cases, was found to be 102.12±6.87 meq/l in cases.

DISCUSSION

The present study was done to evaluate the changes in serum electrolyes levels in covid 19 patients and to correlate these values with controls.

In our study majority of our patients were men (32/50) i.e. 64% and in age group of 31-40. Similar results were found by other authors 70% by Sharma et al [8], whereas Huange et al [9] & Chen et al [7] 73% each . Covid 19 infection showing male predominance, which may be attrributed to increase frequency of travelling by males for occupational purposes.

Various studies shows COVID-19 is associated with hyponatremia [10,11,12]. Hyponatraemia can occur due to increased expression ofthe ACE2 receptor in the proximal tubule. In an individual withsevere hyponatraemia, it was shown that SARS-CoV-2 causes asyndrome of inappropriate secretion of antidiuretic hormoneand manifestations of hyponatremia [13]. Our results are in accordance with these since mean Na level was significantly decreased in the study group.

We also found that serum potassium levels were significantly decreased in covid 19 patients with mean K levels in cases was 3.99±0.58 meq/l and in control group 4.59±1.03 meq/l. Gastrointestinal loss of fluids can cause hypokalemia in these patients as many patients presents with nausea and diarrhea as clinical presentation [14].

In covid 19 disease the pathophysiology of hypokalemiais SARS CoV 2 binds to its host receptor, angiotensin converting enzyme 2 (ACE2) and likely reduces ACE2 expression thus leading to increased angiotensinogen II, which causes increased potassium excretion by the kidneys, ultimately leading to hypokalemia. [15]

We have found that covid 19 is associated with low levels of electrolytes like Na, K, Cl. The electrolytes derangement in these patients play a critical role in patients management. We need to asess water , fluid status of each patient. Electrolyte correction should be maintain in these patients, particularly hypokalemia. As hypokalemia known to worsen acute respiratory distress syndrome (ARDS) and acute heart injury, which are common complications of covid 19 [1], speicially in patients with preexisting lung and heart disease. It is advisable to assess electrolyte status in patients on admission and serial monitoring of electrolyte disturbances throughout the course of illness. Fluid and electrolyte moinitoring have important implications in patients management of covid 19.

CONCLUSION-

Our study implies that serum electrolytes levels (sodium and potassium) are significantly decrease in covid19 cases as compared to control group. The electrolytes derangement in these patients play a critical role in patients management. We need to assess water , fluid status of each patient. Hence a monitoring of electrolyte status is essential to improve the health related quality of life in these patients.

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