Original research article

Comparative Study of Serum Electrolytes in Covid-19 and Healthy Patients in Tertiary Care Center, Karimnagar

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Abstract

Introduction- Electrolyte balance of the body is maintained by renin angiotensin aldosterone system. Some previous studies suggested that COVID-19 is associated with gastrointestinal symptoms, such as diarrhea and vomiting. This may results in electrolyte disturbances in patients. 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: Our study aimed to compare some electrolyte between covid 19 and non-covid patients retrospectively.

Material and Methods: This retrospective study included total 57 males and 43 females in the age group of 28 to 65 years. The results were compared with 100 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. Analysis was done using SPSS V 25 Software. Chi-square and t-test were used to see association and difference between two variable respectively.

Results: We have found that covid 19 is associated with low levels of electrolytes like Na, K, Cl. Chloride levels in both the groups was not statistically significant. But Hyponatremia and Hypokalemia were observed in cases group with high statical Signficance.

Conclusion: Study found that electrolytes deterioration in these patients play a critical role in patients management. Thus a monitoring of electrolyte is essential throughout their illness to manage covid patients to improve their quality of life.

Keywords: Electrolytes, Sodium, Potassium, Chlorine, Renin Angiotensin Aldosterone

Introduction

Covids are an enormous group of infections that are known to cause ailment going from the normal virus to more extreme illnesses like Middle East Respiratory Syndrome (MERS) and severe acute respiratory syndrome (SARS).In mid-2020, after a December 2019 episode in China, the World Health Organization distinguished SARS-CoV-2 as another sort of Covid. The episode immediately spread all throughout the planet.WHO (World health organization) declared covid 19 as a global pandemic on 11th march 2020.[1,2]

An early Chinese investigation of 103 COVID-19 cases discovered two strains, which they named L and S. The S type is more established; however the L kind was more normal in beginning phases of the episode.It is additionally not unexpected for an infection to change,

or transform, as it taints individuals and this infection has done as such. There are a few variations which have been named for the locales they were first found yet they have now spread to different regions and nations, some ending up being more contagious just as more lethal.

Here's no real way to tell how long the pandemic will proceed. There are many variables, including the public's endeavours to slow the spread, analysts' work to study the infection, their quest for a treatment, and the accomplishment of the immunizations.

The Rennin-angiotensin framework (RAS), which directs the control of circulatory strain and electrolyte balance in the body likewise assumes a part in controlling angiotensin-Converting enzymes [3,4]. SARS-CoV-2 ties ACE2 and improves the debasement of ACE2 and, accordingly, diminishes the balance of ACE2 on RAS. This prompt expanded reabsorption of sodium and water, resulted increase in blood pressure and discharge of potassium.[5] Also, a few patients with COVID-19 presents with gastrointestinal manifestations (diarrhoea and vomiting)[6], which may further leads to electrolyte disturbances in these patients.

In this manner the current investigation was wanted to assess the progressions in serum electrolytes levels in Covid-19 patients on introductory affirmation and to connect these qualities with controls.

Materials and Method

Study Design: Case-Control Study
Study Place: Department of Biochemistry and General Medicine CAIMS, Karimnagar.
Study Period: March to August 2020
Sample Size: A total 100 cases of covid 19 were taken as study samples, admitted in department of medicine.

Inclusion Criteria:
1. Age > 18 years.
2. The patients with confirmed covid 19 infections, positive for RTPCR (Real time polymerase chain reaction) assay of 2019-nCoVRNA were included as study group.

Exclusion Criteria:
1. Chronic kidney disease
2. Age > 75years.

Due to the limited data set bias or study risk or publication bias evaluation was not performed 100 healthy normal age and sex matched subjects were taken as control group. Serum electrolytes were estimated in both on the group by ion selective electrode on machine.

Statistical Analysis: Collected data from biochemistry laboratory were entered in the Microsoft Excel 2016 software and data was analysed by using software SPSS version 25. Qualitative data was presented by using proportion analysed by chi-square test & quantitative data by Mean and Standard deviation, difference between mean values observed by t-test for independence. P-value <0.05 was considered as significant at 5% level of Signficance.

Results

Present study conducted on 100 patients admitted with Covid-19 among which we observed the following results after analysis of the data.
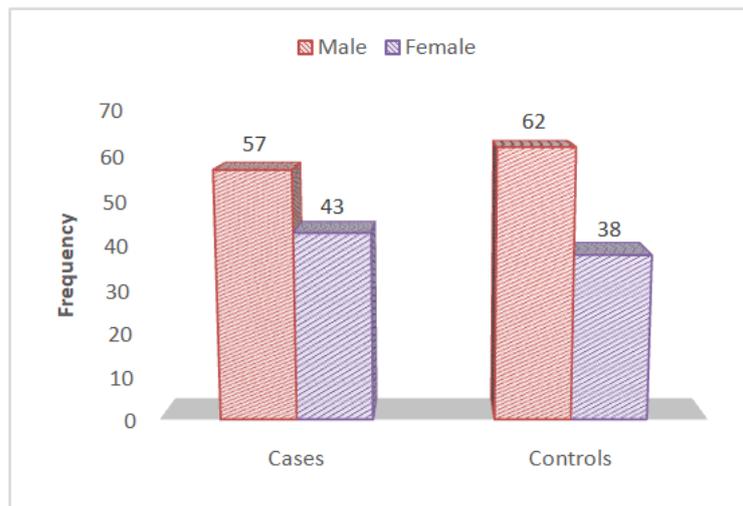

Figure 1: Distribution of Gender among the patients

In present study it was observed that, the ratio of male to female observed 1.32 :1 in cases, that of in control group it was 1.63 : 1 and also there was no significant difference (P-value = 0.42) between cases and control for gender distribution.

Table 1: Mean age distribution of the patients

Age	Mean	SD	t-test	P-value
Cases	46.86	7.00	0.1129	0.455
Controls	46.76	5.30		

Age distribution of the patients in both the group was not statistically significant (P-value =0.45). Mean age of both the group was nearly equal.

Table 2: Mean distribution serum electrolyte of the patients

Electrolytes		Cases	Control	Reduced %	t-test	P-value
Sodium (Na)	Mean	136.64	142.79	4.50%	-4.85	<0.001**
	SD	6.75	6.9			
Potassium (K)	Mean	3.996	4.89	14.86%	-3.5	<0.001**
	SD	0.781	0.918			
Chlorine (Cl)	Mean	106.30	107.362	0.9%	0.0061	0.95
	SD	7.52	6.2			

**highly significant at 5% level of Signficance

Mean distribution of serum electrolytes between cases and control showed that, there is significant decrease level of sodium and potassium was observed in the covid group

compared to the normal group but in chlorine some stability was observed in both the groups. Among the electrolytes taken potassium (K) showed maximum reduction (14.86%) in covid cases followed by sodium(Na) (4.50%) and Chlorine (Cl) (0.9%). The mean differences of these electrolytes between the groups were statistically highly significant for sodium and potassium and chlorine level was not statistically significant shown in above table no. 2

Discussion

The present study was conducted on 100 patients admitted to the hospital for covid suspects and suffered with covid among suspects to compare the changes in serum electrolytes levels in covid 19 patients.

Gender and Age: In present study observed maximum male who were covid positive, nearly 66% of the cases were lying in the age group of 31-50 years mean age of the covid patients was 46.86 years, in India study conducted by Sharma et al[7] (Jul 2020) and Bhandari S et al[8] (May 2020) observed that males were more compared to femalealso they are bellow <60 years of age. In other countries study conducted by Huange et al & Chen et al[9] observed similar results to our study. This predominance of male personals is because of more social contacts for various purposes like business, travelling etc.

Potassium Electrolyte:

Our study found that due to the clinical presentation like nausea and diarrhea, there was gastrointestinal loss of fluid was observed and it causes hypokalemia in covid patients compared to normal patients. In covid patients mean potassium level was 3.996 ± 0.78meq/ and that of in control group it was 4.89 ± 0.918meq/l and this difference was statistically highly significant. There was 14.86% reduction of potassium level was observed. Due to the gastrointestinal manifestation in a study conducted by Pan et al[10], reduce potassium level was observed in covid patients.

Sodium Electrolyte:

From the observation and analysis of the sodium electrolyte values showed that, it was lower than the normal level of sodium. Many studies on covid 19 shows that, it is associated with hyponatremia, this condition comes when sodium level in the blood is too low. It was shown that SARS-CoV-2 causes asyndrome of inappropriate secretion of antidiuretic hormoneand manifestations ofhyponatremia [11].

Chlorine Electrolyte

Present study showed that there was decrease in the chlorine level but it was not like other electrolyte like sodium and potassium. Chlorine level was almost equal in cases as well as in controls. Levels was decreased by only 0.9% in covid patients. Study conducted by Lippi et al[12]"No heterogeneity was observed for chloride, with no significant difference between severe and non-severe patients of Covid"
From these overall results we observed that low levels of electrolytes were associated with covid 19. This disturbance of electrolytes plays crucial role in management of covid 19 patients, to manage all these disturbances we need to assess fluid status of each and every patients, normal level of all electrolytes should be maintain mainly highly decreasing potassium level. Hypokalemia is known to deteriorate acute respiratory distress syndrome (ARDS) and acute heart injury. In patients with already existing lung and heart disease ARDS and acute heart injury are common complication of Covid 19.Thusfluid and electrolyte monitoring have important implications in patients management of covid 19.

Limitation of the Study
Our study has some limitations
1. In our study we have included only hospitalized patients so the data do not represent all the covid patients.
2. We have undertaken very few electrolytes for disease prognosis.
3. We did not assess the aetiology of electrolyte abnormalities

Conclusion
In our study it was observed the serum electrolytes like sodium and potassium were significantly decreased among cases. In this study covid 19 may have accelerated hypokalemia.Thus a monitoring of electrolyte is essential throughout their illness to manage covid patients to improve their quality of life.
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