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Original Research Article

# Comparison of Serum and Plasma Electrolyte Levels

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## Abstract

**Aim:** To compare electrolyte levels in serum and plasma in a group of 55 people over a year.

**Methods:** A longitudinal observational study was conducted in the Department of Biochemistry, Shree Narayan Medical Institute & Hospital, Saharsa, Bihar on 55 people who were followed for a year. Blood samples were taken at the start of the study and periodic intervals throughout. Sodium, potassium, calcium, magnesium, chloride, and bicarbonate levels in serum and plasma were calculated and compared between both groups using standard laboratory techniques. Descriptive statistics, the t-test, and correlation analysis were used to analyse the data collected.

**Results:** The mean serum and plasma electrolyte levels were not substantially different at baseline. However, there were statistically significant variations in potassium, sodium, calcium, magnesium, chloride, & bicarbonate levels between the serum and plasma groups throughout the study. Excluding bicarbonate, which was higher in the plasma group, all electrolytes were found to be significantly higher in the serum group than in the plasma group.

**Conclusion:** Our findings reveal that there are substantial distinctions in electrolyte levels between serum and plasma and that these differences can change over time. When interpreting laboratory results, clinicians should be familiar with these distinctions as they may affect the treatment and diagnosis of certain conditions. More research is needed to investigate the clinical relevance of these differences.

**Keywords:** Electrolytes, Serum, Plasma, Sodium, Potassium, Calcium, Magnesium, Chloride, Bicarbonate.



## Introduction

Electrolytes are ions that convey an electrical charge and thus are required for normal cell and organ function in the human body. They are involved in a variety of physiological processes, including fluid and electrolyte stability, blood pH regulation, and nerve impulse transmission. Electrolyte imbalances can cause a variety of clinical symptoms such as muscle spasms, weakness, and irregular heartbeats. As a result, accurate electrolyte measurement is critical in the detection and cure of a variety of medical conditions. [1]

Serum and plasma are two biological fluids used to measure electrolytes. Serum is a clear, yellowish fluid that remains after blood coagulation and contains all of the components of blood except cells and clotting factors. Plasma, on the other hand, is the liquid component of blood that contains all of the blood's components, including cells and clotting factors. However both serum and plasma can be used to measure electrolytes, there is some disagreement about which fluid is more accurate and reliable. [2]

Several studies have been performed to investigate electrolyte level dif rendifferencein in serum & plasma, but the outcomes have been inconsistent. Some studies have found that serum has higher levels of certain electrolytes, while others have found no significant distinctions between the two fluids. These disparities could be attributed to differences in sample collection and processing methods, as well as distinctions in the residents studied. [3]

Due to the possible clinical implications of these differences, it is critical to conduct additional research and gain a better knowledge of the connection between serum and plasma electrolyte levels. The goal of this analysis is to compare electrolyte levels in serum and plasma over one year in a group of 55 people. The findings of this study may have implications for laboratory results interpretation and the surveillance of electrolyte imbalances in clinical practice

## Materials & Methods:

This was a one-year comparative prospective study conducted by the Department of Biochemistry, Shree Narayan Medical Institute & Hospital, Saharsa, Bihar for one year. 55 adults were recruited for this forthcoming longitudinal observational study. Blood samples were accumulated at the start of the study and at regular intervals throughout the year, and serum and plasma electrolyte levels were calculated using standard laboratory techniques. Sodium, potassium, calcium, magnesium, chloride, and bicarbonate were the six electrolytes measured. Each electrolyte's mean and standard deviation in serum and plasma were calculated, and t-tests were used to determine the average electrolyte levels in serum and plasma at each time point. Correlation analysis was used to determine the connection between the two fluids. This study followed the Helsinki Declaration, was authorised by the institutional review board, and all participants handed over written informed approval.

### Inclusion criteria/case definition

- Adults aged 18 years or above
- Patients who were approved to participate in the research after providing written informed consent.
- Patients who do not have a history of electrolyte imbalances or chronic renal failure.

### Exclusion criteria:

- Women who are pregnant or nursing.
- Patients who have a record of chronic liver disease, heart failure, or any other long-term illnesses.
- Patients who were taking electrolyte-altering medications, like diuretics or corticosteroids.
- Patients who were not able to give informed approval or adhere to the study protocol.

### Statistical Methods:

This study's statistical analysis included frequency distribution, t-tests, and correlation analysis. The standard deviation and mean values of each electrolyte in serum and plasma samples were calculated using descriptive statistics. The t-test was used to contrast electrolyte levels in serum and plasma at each observation period. The relationship between electrolyte levels in serum and plasma over a period was determined using correlation analysis. All statistical analyses were carried out with the help of basic software packages, and a p-value of less than 0.05 was considered to be statistically significant.

### Clinical Data:

This study's clinical data collection included characteristics such as age, sex, and medical records, as well as laboratory results on electrolyte levels in both serum and plasma for each participant. Sodium, calcium, potassium, magnesium, chloride, and bicarbonate levels were all measured.

Clinical data were collected at the start of the study and at periodic intervals throughout the year. The data collected were analyzed to figure out the time course of electrolyte levels in serum and plasma.

## Results

### Knowledge:

The mean and standard deviation of each electrolyte were computed in both serum and plasma samples. Sodium, potassium, calcium, and chloride levels were comparatively high in serum than in plasma, while magnesium and bicarbonate levels were higher in plasma than in serum. For sodium, potassium, calcium, and bicarbonate, the differences in mean electrolyte levels between serum and plasma were statistically substantial (p 0.05).

### Attitude:

For all six electrolytes measured, there was a substantial positive relationship between serum and plasma electrolyte levels. The correlation coefficients for magnesium ranged from 0.50 to 0.87 for sodium, suggesting a significant correlation between the electrolyte levels in the two fluids.

### Practices:

Over the one-year study period, electrolyte levels in both serum and plasma remained fairly stable, with no significant changes in any of the electrolytes evaluated.

Overall, these findings indicate that there are substantial differences in the concentrations of certain electrolytes between serum and plasma, as well as a strong positive correlation between the two fluids' electrolyte levels. These results provide strong evidence for the interpretation of electrolyte levels in clinical practice and highlight the need for additional research to determine the best fluid for measuring electrolyte levels in various patient populations.

**Table 1: Summarising the given data**

| Electrolyte | Serum (mmol/L) | Plasma (mmol/L) |
|---|---|---|
| Sodium | 141.5 ± 3.2 | 139.9 ± 3.6 |
| Potassium | 4.1 ± 0.4 | 3.7 ± 0.4 |
| Calcium | 2.4 ± 0.2 | 2.2 ± 0.2 |
| Magnesium | 1.9 ± 0.3 | 2.1 ± 0.3 |
| Chloride | 101.3 ± 3.1 | 99.6 ± 3.4 |
| Bicarbonate | 25.1 ± 1.5 | 26.2 ± 1.5 |

This table displays the mean electrolyte levels in serum and plasma, as well as the standard deviation for each evaluation. According to the data, there are substantial differences in the average levels of certain electrolytes between serum and plasma, with serum having higher levels of sodium, potassium, calcium, and chloride and plasma having higher levels of magnesium and bicarbonate.

## Discussion:

The current study aimed to compare electrolyte levels in serum and plasma samples from 55 participants over a year. The findings indicate that the average levels of several electrolytes differ significantly between serum and plasma. [4-6]

Serum samples had significantly higher mean levels of sodium, potassium, calcium, and chloride than plasma samples. These findings are consistent with previous analysis and can be attributed to the existence of clot activators in serum samples, which can cause potassium and other intracellular substances to be released into the extracellular fluid during clot formation.

In cocomparisonthe mean levels of magnesium and bicarbonate in plasma

samples were significantly higher than in serum samples. This is due to the influence of anticoagulants in plasma samples, which restrict intracellular substances from being released during sample collection.

Overall, these findings emphasise the significance of considering sample type when measuring electrolyte levels. Based on the clinical situation, measuring electrolyte levels in serum or plasma samples may be more appropriate. Because anticoagulants are not present in serum samples, they may be preferred for measuring the total saturation of electrolytes in the blood. Plasma samples, on the other hand, maymaybere appropriate for measuring ionised electrolyte concentrations. [7]

It should be acknowledged that the current research has several drawbacks, include in limit edited sample size and the absence of a control group. Furthermore, the study did not look into the effect of various anticoagulants on electrolyte levels in plasma samples. More studies are needed to examine these factors and truly comprehend the clinical relevance of electrolyte level differences between serum and plasma. [8]

## Conclusion

To summarise, this study discovered substantial variations in the average rates of several electrolytes between serum and plasma samples, emphasising the importance of sample type selection in clinical electrolyte testing. Based on the clinical situation, measuring electrolyte levels in serum or plasma samples may be more appropriate. More research is necessary to understand the clinical implications of these differences, as well as to look into the effectiveness of various anticoagulants on electrolyte levels in plasma samples.

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