Section: Biochemistry

Original Research Article

ANALYZING THE ROLE OF ELECTROLYTES IN PREECLAMPSIA DEVELOPMENT

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Abstract

Background: Preeclampsia is a condition marked by high blood pressure, protein in the urine, and swelling. The aim is to evaluate the serum sodium and potassium levels in individuals with preeclampsia. **Materials and Methods:** A prospective cross-sectional clinical study was conducted to assess serum sodium and potassium levels in preeclamptic patients. The analysis included 100 blood samples from both normotensive and preeclamptic women. Serum sodium and potassium levels were measured, followed by statistical analysis. **Result:** The study analyzed 100 blood samples from normotensive and preeclamptic women who visited the clinical laboratory for serum sodium and potassium level assessments. The average serum sodium level in normotensive women was found to be 132.5 mmol/l, while in those with preeclampsia, it was 141.8 mmol/l. Conversely, the mean serum potassium levels were 3.68 mmol/l in normotensive women and 2.53 mmol/l in preeclamptic women. **Conclusion:** The findings of this study indicate that mean sodium levels are elevated in patients with preeclampsia, whereas mean serum potassium levels are higher in normotensive individuals.

INTRODUCTION

Preeclampsia is a condition marked by high blood pressure (SBP ≥140 mm Hg and DBP ≥90 mm Hg), protein in the urine, and swelling, typically observed after 20-24 weeks of pregnancy. Additional complications may include visual disturbances, hemolysis, elevated liver enzymes, reduced platelet count, abnormal fetal growth, and premature delivery.[1]

While the exact cause of preeclampsia is not fully understood. The pathophysiology of preeclampsia is thought to involve both maternal and fetal factors. Several theories propose that improper placental implantation and abnormal trophoblastic invasion may contribute to its development.[2]

Electrolytes such as Calcium (Ca2+), Magnesium (Mg2+), Sodium (Na+), and Potassium (K+) are crucial in the context of preeclampsia, as they significantly influence the function of vascular smooth muscles, with Ca2+ being particularly vital. Preeclampsia and its associated complications are leading causes of maternal mortality and morbidity, following obstetric hemorrhage, pre-existing chronic conditions, sepsis, and abortions. Low potassium levels and high dietary sodium intake may elevate blood pressure in patients with preeclampsia. Additionally, magnesium deficiency could be a contributing factor to the onset of preeclampsia and the premature birth of low birth weight infants, with a deficiency during pregnancy increasing the risk of neonatal death.[3-6]

This study aims to evaluate serum sodium and potassium levels in individuals with preeclampsia.

MATERIALS AND METHODS

The prospective cross-sectional study was conducted in the department of biochemistry at Government medical college and hospital, Bettiah. From march 2023 to December 2024. The study sample consisted of blood samples collected for clinical investigation and aimed at examining serum sodium and potassium levels in women with preeclampsia. All cases were operated at our hospital.

Prior to initiating the research, ethical approval was obtained from the institute's Ethical Committee, and informed consent was secured from participants after a thorough explanation of the study.

The analysis included 100 blood samples from both normotensive and preeclamptic women, collected in the clinical laboratory for serum sodium and potassium level assessment.

A 5 mL blood sample was centrifuged at 3500 rpm for 7 minutes to isolate the serum, and measurements

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were taken using semi-automated electrolytic analyzer.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows, where the mean and standard deviation were calculated to determine significance. The differences between the cases and controls were evaluated using the Student's t-test, with a p-value of less than 0.05 deemed statistically significant.

RESULTS

Table 1

Mean (±SD) serum and potassium levels in normotensives and preeclampsia subjects.		
Parameters	**Control**	**Case**
Serum Sodium levels in mmol/l	132.5 ± 3.3	141.8 ± 2.7
Serum Potassium levels in mmol/l	3.68 ± 0.28	2.53 ± 0.16

This study analyzed 100 blood samples from both normotensive and preeclamptic women who visited the clinical laboratory to assess serum sodium and potassium levels during the study period. The average serum sodium concentration in normotensive women was found to be 130.6 mmol/l, while in those with preeclampsia, it was significantly higher at 143.5 mmol/l. Additionally, the mean serum potassium levels were 3.57 mmol/l for normotensive women, compared to 2.67 mmol/l for women with preeclampsia.

DISCUSSION

Preeclampsia has long been regarded as a serious condition impacting women and their pregnancies, dating back to ancient times. The various complications linked to this condition have instilled fear in expectant mothers and captured the attention of obstetricians worldwide. Preeclampsia is characterized by a complex interplay of factors leading to multiorgan dysfunction, with no single factor being strictly necessary or sufficient for its onset. Therefore, measuring electrolyte levels in preeclampsia serves as a valuable indicator for examining the physiological and pathological changes that occur during pregnancy.[7-9]

In this study, we analyzed 100 blood samples from both normotensive and preeclamptic women who visited the clinical laboratory for serum sodium and potassium level assessments. The average serum sodium level in normotensive women was found to be 132.5 mmol/L, while in those with preeclampsia, it was 141.8 mmol/L. Additionally, the mean serum potassium levels were 3.68 mmol/L for normotensive women and 2.53 mmol/L for those with preeclampsia.[10-12]

Dhokikar et al. reported minimal differences in serum sodium (138 ± 4.03 mEq/L) and serum potassium (4.0 ± 0.5 mEq/L) levels. Tabassum et al reported serum sodium levels were significantly elevated in individuals with preeclampsia (138.27 ± 2.99 mEq/L), while potassium levels were notably reduced (3.56 ± 0.38 mEq/L). The study indicated that serum sodium levels in preeclamptic patients were significantly higher compared to those in healthy pregnant women. Although the exact mechanism behind sodium retention in preeclampsia remains unclear, it is believed to be associated with vasoconstriction, which reduces the glomerular filtration rate and activates the renin-angiotensin-aldosterone system. This results in decreased intracellular fluid and an increase in extracellular fluid volume. Additionally, lower serum potassium levels may contribute to reduced sodium excretion, likely due to alterations in sodium reabsorption in the proximal tubule or loop of Henle in the kidneys, which can lead to elevated blood pressure. Furthermore, it has been noted that a potassium-deficient diet, combined with an individual's typical sodium intake, may result in sodium retention and consequently hypertension.[13]

CONCLUSION

The current study found that preeclampsia patients had higher average sodium levels, while normotensive individuals exhibited greater average serum potassium levels.

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