

Serum Sodium and Potassium Levels in Preeclampsia: A Clinical Study

¹Mrinal Gupta, ²Navanil Roy

ABSTRACT

Introduction: Preeclampsia is a disorder marked by the onset of hypertension and a significant amount of protein in the urine which begins after 20 weeks of pregnancy.

Aim and objectives: To evaluate the role of serum sodium and potassium levels as a predisposing factor in the etiology of preeclampsia in pregnant women living in Bhilai, Chhattisgarh.

Material and methods: It was a retrospective cross-sectional study, conducted in the Department of Biochemistry at Shri Shankracharya Institute of Medical Science and Hospital, Bhilai, Chhattisgarh a tertiary care institute.

Results: The mean serum sodium level in preeclamptics was 123.9 ± 3.03 mmol/L and in normotensives was 140.6 ± 1.73 mmol/L which was statistically significant (p -value < 0.05). The mean serum potassium levels in preeclamptics were 2.49 ± 0.23 mmol/L and in normotensives was 3.96 ± 0.32 mmol/L which was statistically significant (p -value < 0.05).

Conclusion: Serum sodium level was observed to be reduced in preeclampsia compared to normotensive pregnant women. Early diagnosis and counseling of preeclampsia should be done at regular intervals for such cases to prevent any antenatal complications.

Keywords: Antenatal care, Hypertension, Preeclampsia.

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INTRODUCTION

Preeclampsia is a hypertensive disorder of pregnancy which is one of the most common etiologies of fetal and maternal mortality and morbidity.¹ It is a disorder affecting various systems of the body and affects approxi-

mately 5 to 7% of all pregnancies worldwide and is one of the least understood disease of pregnancy.² In India, the incidence of preeclampsia is reported as much as 8 to 10%. Last trimester of pregnancy is the period when preeclampsia develops most commonly, but can develop any time in the second half of pregnancy, during labor, or even up to 6 weeks after delivery. The normal sodium level is in the range of (137 to 145 mmol/L), and that of the potassium is (3.5 to 5.0 mmol/L).

Preeclampsia in pregnancy and its complications are the major cause of maternal mortality and morbidity after obstetric hemorrhage, pre-existing chronic disorders, sepsis, and abortions.^{3,4} It is defined as diastolic blood pressure (DBP) more than 90 mmHg on two occasions more than 4 hours apart or a single reading of diastolic BP more than 110 mmHg.^{5,6} Such disorders occur during pregnancy in women with either pre-existing hypertension or in others who develop hypertension only during pregnancy, mostly in the second trimester of pregnancy. This hypertension is associated with proteinuria and edema it is termed as preeclampsia.

In preeclampsia, there are changes in cell membrane sodium transport leading to extravascular accumulation of sodium and reduced sodium level in plasma.⁷ However, other studies did not find any significant change in serum sodium levels of preeclamptic subjects compared to normal pregnant women.⁸

MATERIALS AND METHODS

It was a retrospective cross-sectional clinical study, carried out in the Department of Biochemistry at Shri Shankaracharya Institute of Medical Science and Hospital, Bhilai, Chhattisgarh a tertiary care institute.

The results of 30 blood samples each of normotensives and preeclamptics women which came in the clinical lab for analyzing serum sodium and potassium levels from 1 December 2017 to 31 January 2018 were included in the study. Four mL of blood sample was centrifuged at 3500 rpm for 7 minutes to separate the serum and readings were taken. The device used for measuring serum sodium and potassium level was accurex enlite semi-automated electrolytic analyzer.

Statistical analysis was done using statistical package for the social sciences (SPSS) 17.0 for windows, the mean

¹Demonstrator, ²Assistant Professor

¹Department of Biochemistry, Dr Baba Saheb Ambedkar Medical College and hospital, New Delhi, India

²Department of Biochemistry, Shri Shankaracharya Institute of Medical Sciences Junwani, Bhilai, Chhattisgarh, India

Corresponding Author: Navanil Roy, Assistant Professor, Department of Biochemistry, Shri Shankaracharya Institute of Medical Sciences Junwani, Bhilai, Chhattisgarh, India, e-mail: navnilroy@yahoo.co.in

and standard deviation was calculated to estimate the significance. The significance between the cases and controls was measured by students 't' test. A p-value less than 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

In the present study, a total of 60 pregnant women was taken, consisted of 30 preeclamptic women and 30 normotensive women. In our study, the mean age of women in the normotensive group was 27.86 ± 4.46 years with a range of 21 to 37 years. Mean age of women in the preeclamptic group was 27.5 ± 4.88 years with a range of 20 to 39 years (Table 1).

In our study, the mean value of systolic blood pressure in the normotensive and preeclamptic group was 121.8 ± 5.15 mm of Hg and 147.6 ± 5.85 mm of Hg respectively, whereas the mean value of diastolic blood pressure in the normotensive and preeclamptic group was 84.06 ± 4.44 mm of Hg and 97.8 ± 6.39 mm of Hg respectively (Table 1).

The mean serum sodium level in preeclamptics was 123.9 ± 3.03 mmol/L and mean serum sodium levels in normotensives was 140.6 ± 1.73 mmol/L. On applying student t-test it was found that the difference in serum levels of potassium in both the groups was statistically significant (p-value <0.0001) (Graph 1).

The mean serum potassium level in preeclamptics was 2.49 ± 0.23 mmol/L and mean potassium levels in

normotensives was 3.96 ± 0.32 mmol/L. On applying student t-test it was found that the difference in serum level of potassium in both the groups was statistically significant (p-value < 0.0001) (Graph 2).

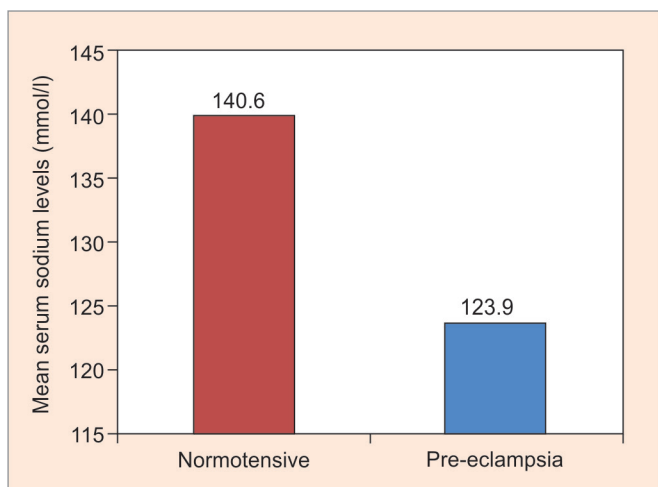
The etiology of preeclampsia is yet to be fully understood in spite of numerous studies that have been conducted. It is accompanied by a disturbance in electrolyte balance in pregnant females because of substantial alterations in intracellular water concentration. This is related to changes in the cell membrane, which appears to be responsible for various pathological changes in preeclampsia. According to some studies, alterations involve changes in transport of sodium ion both on the systemic and intracellular levels, but the mechanisms are not yet understood completely.⁹

As seen from the results, there was a statistically significant decrease in mean serum sodium as well as potassium levels in preeclamptic women compared to normotensive women. In a similar type of study conducted by Dhokikar et al. in 2015 in Mumbai not much difference is observed in serum sodium (138 ± 4.03 mEq/L) and serum Potassium (4.0 ± 0.5 mEq/L).¹⁰

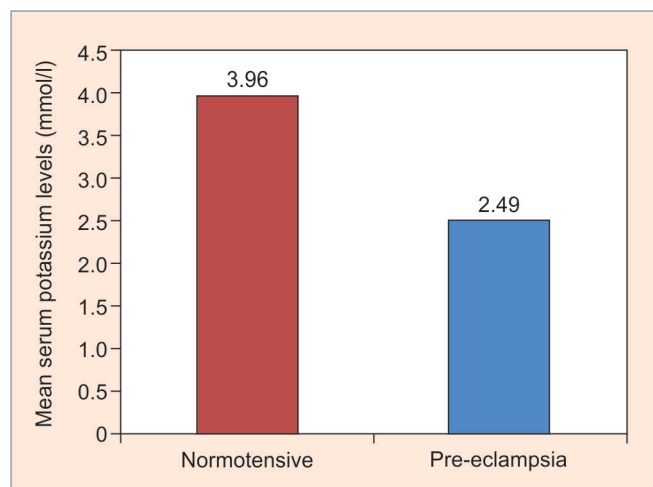
In a study conducted by Indumati et al. in 2011 in Karnataka, it was observed that serum sodium and potassium levels were 130.84 ± 3.03 and 3.57 ± 0.27 respectively. Serum sodium level was decreased in the preeclamptic cases as compared to those in the normal pregnancy cases

Table 1: Descriptive information of subjects

Variable	Normotensives	Preeclamptics
	Mean \pm SD	Mean \pm SD
Age in years	27.86 \pm 4.46	27.5 \pm 4.88
Gestational age in weeks	32.6 \pm 2.8	30 \pm 2.3
Blood pressure		
Systolic	121.8 \pm 5.15	147.6 \pm 5.85
Diastolic	84.06 \pm 4.44	97.8 \pm 6.39



Graph 1: Mean serum sodium levels in normotensives and preeclamptics



Graph 2: Serum potassium levels in normotensives and preeclamptics

($p < 0.001$), but there was no change in the serum potassium levels ($p < 0.457$) as found in our study.¹¹

In a study conducted by Tabassum, Jameil et al. in 2015 in Riyadh, Saudi Arabia, found the level of serum sodium significantly increased in preeclamptics (138.27 ± 2.99 mEq/L) which is quite opposite of our findings, while that of potassium significantly decreased (3.56 ± 0.38 mEq/L).¹² Caughey et al. in their study have highlighted the importance of ethnicity in the occurrence of preeclampsia which can be related to increased baseline levels of electrolytes in patients of different ethnic background.¹³

In a study conducted by Darkwa and Djagbletey et al. in Ghana found the level of serum sodium and potassium significantly reduced (p -value < 0.001) in preeclamptic [136.13 (4.17) mmol/L] and [3.45 (0.54) mmol/L] respectively.¹⁴

CONCLUSION

We hypothesize that when intervention education and communication (IEC) activities, as well as awareness campaigns, are conducted at community levels to diagnose preeclampsia; serum sodium and potassium levels should also be measured so that preeclamptic women can get better patient care and outcome.

Limitation of the study

The study was conducted with a very small sample size, further studies with a bigger sample size and patients from different geographical regions should be taken up to prove our hypothesis.

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