

Original article:

Assessment of serum electrolytes in preeclampsia

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Abstract

Preeclampsia is an important and potentially dangerous disease in pregnancy. This can cause altered levels of different blood parameters. In turn, the mother can suffer. This study assessed the change in electrolytes in preeclampsia. 46 preeclampsia patients and 43 normal pregnant females were enrolled for study of serum potassium and sodium. With respect to patients, controls had lower sodium and higher potassium levels. The implications of this study are that sodium and potassium monitoring may help in detecting preeclampsia cases early.

Introduction

In pregnancy, preeclampsia can lead to serious problems (1). Preeclampsia involves multiple systems of the body (2). Proteinuria, edema and hypertension are important indicators of preeclampsia. To diagnose preeclampsia, edema after 20 weeks, daily proteinuria more than 300 mg/dl and BP more than 140/90 are required.

In the early phase of preeclampsia it is thought that blood flow to tissues is decreased. This can lead to stimulation of the rennin-angiotensin-aldosterone axis, causing altered levels of serum leading to hypertension(4, 5). As sodium and potassium also are important regulators of hypertension, our study aimed to analyse the pathophysiology of preeclampsia with electrolytes in the background.

Materials and methods

The study was undertaken in a tertiary care hospital of eastern India. 46 preeclamptic patients and 46 healthy age-matched normotensive nonproteinuric pregnant controls were selected. All subjects were primigravida and were randomly selected by a non-biased investigator from the patients of the Obstetrics OPD or IPD. Careful history and examination was performed to include or exclude subjects for the study. Informed consent was taken from all subjects. The institutional ethical committee approved the study. Exclusion criteria were multiple pregnancy, chronic hypertension, renal diseases, concomitant disease, addictions (smoking, alcoholism), history of abortion. 5 ml of venous blood was collected from the patients after overnight fasting. Sodium and potassium levels were estimated by ion selective electrolyte analyzer.

Statistical analysis was done by students unpaired t test using SPSS software.

Results

46 subjects were enrolled in each group, but 3 controls dropped out later during the study. So, the ultimate number of controls came down to 43. Age of patients ranged from 21 to 28, whereas that of controls ranged from 20 to 29. Gestational period ranged from 22 to 36 weeks.

Table 1. Serum sodium and potassium levels (mean + SD) in patients and controls

	Sodium (meq/l)	Potassium (meq/l)
Patients (n=46)	143 + 12.3	4.7 + 0.6
Controls (n=43)	134 + 9.8	3.6 + 0.2

For comparison of serum sodium between 2 groups:

The two-tailed P value equals 0.0003

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval: The mean of Group One minus Group Two equals 9.000

95% confidence interval of this difference: From 4.293 to 13.707

Intermediate values used in calculations:

$t = 3.8008$

$df = 87$

standard error of difference = 2.368

For comparison of serum potassium between 2 groups:

P value and statistical significance: The two-tailed P value equals 0.0405

By conventional criteria, this difference is considered to be statistically significant.

Confidence interval: The mean of Group One minus Group Two equals 0.200

95% confidence interval of this difference: From 0.009 to 0.391

Intermediate values used in calculations:

$t = 2.0798$

$df = 87$

standard error of difference = 0.096

Serum sodium was highly significantly increased in patients with respect to controls. Serum potassium was significantly decreased in the patient group compared to the control group.

Discussion

Preeclampsia is a pregnancy-specific disorder which is unique, both in its pathophysiology as well as management. On one hand, preeclampsia causes eclampsia, maternal mortality and morbidity; on the other hand preeclampsia leads to fetal problems like growth retardation and prematurity.

Some workers have shown significantly raised serum sodium levels in preeclampsia, but other studies have demonstrated normal sodium levels.[5] In our study, we found that serum sodium was highly significantly increased in patients with respect to controls. In preeclampsia there is reduced intrarenal production of cyclic GMP, endothelin and PGE2 ; this may be important in the the vasospasm, intrarenal thrombosis, sodium retention, and hypertension of preeclampsia(6). The “peripheral arterial vasodilation hypothesis” of sodium and water retention in pregnancy states that with increased endothelial damage, sodium retention and increased sensitivity to angiotensin lead to hypertension, oedema and proteinuria in preeclampsia-eclampsia (7,8).

So, it is not final that increased sodium levels has a definite role in the pathophysiology of preeclampsia, but the findings suggest a possible role, either as a predisposing or risk factor in already predisposed persons . This has to be proved, and there are still areas for further research. A longitudinal study in this regard may be helpful (9). On the other hand, potassium is thought to play a small role in the development of hypertension. But, a lot of evidence points in the direction that potassium deficit has an important role in hypertension and its problems

(10,11). In a clinical study, a diet low in potassium (10 to 16 mmol per day) coupled with the participants' usual sodium intake (120 to 200 mmol per day) caused sodium retention and an elevation of blood pressure; on average, systolic pressure increased by 6 mm Hg and diastolic pressure by 4 mm Hg in normotensive subjects, and systolic pressure increased by 7 mm Hg and diastolic pressure by 6 mm Hg in hypertensive subjects (12). In normal pregnancy hypokalemia may be due to increased aldosterone and other mineralocorticoid levels in plasma (13). Inadequate conservation of potassium by kidney and alimentary canal lead to potassium deficit; fecal potassium losses can be more than urinary losses (14). Chronic potassium loading is a potent stimulus to aldosterone production in a number of mammals (15). In arterioles, the sodium potassium balance is crucial to maintain normal blood pressure. So, if there are problems with this mechanism, it can lead to hypertension. The extrusion of Na and uptake of K appear to be mediated by a system having the properties of a Na,K-dependent adenosine triphosphatase(16). Varying sodium and potassium levels have been found by various workers(17-20). In our study, we found that serum potassium was significantly decreased in the patient group compared to the control group.

Conclusion:

Thus, we conclude that electrolyte levels in pregnancy might be important early indicators of preeclampsia, and this might aid early detection and treatment.

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