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CORRELATION BETWEEN MATERNAL SERUM SODIUM LEVELS AND THE SEVERITY OF PREECLAMPSIA: A CASE-CONTROL STUDY IN A TERTIARY CARE HOSPITAL

Obstetrics & Gynaecology

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ABSTRACT

Background: Preeclampsia (PE) is a major contributor to maternal morbidity and mortality worldwide. While its hallmark features are hypertension and proteinuria, electrolyte imbalances like hyponatremia are increasingly recognized as markers of disease severity. **Objective:** To evaluate the incidence of hyponatremia in preeclamptic patients and its correlation with the severity of the disease. **Methods:** A case-control study was conducted with 400 pregnant women (200 with PE and 200 normotensive controls) between 28 and 36 weeks of gestation. Serum sodium was measured using the ion-selective electrode technique. Hyponatremia in pregnancy was defined as \leq130 mEq/L. **Results:** In the PE group, 12.5% of patients had severe hyponatremia compared to 5% in the control group. A statistically significant correlation was found between lower serum sodium levels and the presence of severe features of preeclampsia (P<0.001). **Conclusion:** Maternal hyponatremia is a significant marker for the severity of preeclampsia and should be monitored to improve clinical risk assessment.

KEYWORDS

INTRODUCTION

Preeclampsia affects 2% to 8% of pregnancies globally and is a primary driver of maternal mortality in low-resource settings.(1)Characterized by new-onset hypertension and multi-organ dysfunction after 20 weeks of gestation, its pathogenesis is rooted in abnormal placentation and subsequent systemic endothelial dysfunction.{2,3} While a physiological drop in serum sodium (to approximately 135 mmol/L) is expected due to pregnancy-induced "resetting" of the osmostat, pathological hyponatremia (<130 mEq/L) can lead to cerebral edema, mimicking or exacerbating eclamptic seizures.{4,5} Understanding the correlation between sodium levels and disease severity is essential for improving clinical triage and management.

MATERIALS AND METHODS

This study was conducted at the Department of Obstetrics and Gynecology, JLN Medical College & Hospital, Ajmer (Feb 2023–Feb 2024). We enrolled 400 singleton pregnancies between 28–36 weeks: 200 normotensive controls (Group A) and 200 preeclamptic cases (Group B). Preeclampsia and its "severe features" were defined according to ACOG criteria.(2) Serum sodium was analyzed using the ion- selective electrode (ISE) technique. Statistical significance was set at P<0.05.

RESULTS

Table 1: Distribution of Serum Sodium Levels

Sodium Level (mEq/L)	Normotensive (n=200)	Preeclampsia (n=200)	P Value
Normal (136–145)	120 (60%)	90 (45%)	0.001
Mild (130–135)	44 (22%)	40 (20%)	
Moderate (121–129)	26 (13%)	45 (22.5%)	
Severe (<120)	10 (5%)	25 (12.5%)	

Hyponatremia was significantly more common in preeclamptic women (55%) compared to controls (40%) (p=0.001).

Table 2: Correlation Between Serum Sodium and Severity of Preeclampsia

Sodium Level	Without Severe Features	With Severe Features
Normal	69	21
Mild	15	25
Moderate	25	20
Severe	16	9

A statistically significant association was observed between low sodium levels and severe preeclampsia (p<0.001).

Severity Correlation: Among patients with normal sodium, only 10.5% (21/200) had severe PE features. However, in the mild hyponatremia subgroup, 62.5% (25/40) exhibited severe features. This association was highly significant (P<0.001), indicating that as sodium levels drop, the clinical severity of preeclampsia increases.

DISCUSSION

Our findings demonstrate that hyponatremia is not merely an incidental finding in pregnancy but a robust marker of preeclampsia severity. This aligns with the observations of Razavi et al., who noted that hyponatremia is often associated with the most severe forms of the disease, including HELLP syndrome and acute kidney injury.{12}

The pathophysiology behind this correlation is likely multifactorial. In preeclampsia, systemic endothelial damage leads to increased capillary permeability and "third-spacing" of fluid. This results in a contracted effective intravascular volume, which triggers the non-osmotic release of Arginine Vasopressin (AVP).{15} Elevated AVP levels cause excessive water reabsorption in the renal collecting ducts, leading to dilutional hyponatremia. Furthermore, the "reset osmostat" phenomenon, which is physiological in normal pregnancy, appears to be pathologically exaggerated in preeclamptic states.{14}

Clinical significance cannot be overstated. Hyponatremia significantly lowers the seizure threshold. In a preeclamptic patient, a rapid drop in sodium can cause cerebral edema, potentially leading to a misdiagnosis of eclampsia or worsening the prognosis of actual seizures.{5,13} Our data suggest that clinicians should maintain a high index of suspicion for severe disease when serum sodium falls below 130 mEq/L. This study emphasizes the need for routine electrolyte monitoring—a simple, cost-effective tool—to identify patients at risk of rapid deterioration, thereby allowing for timely intervention and delivery.

CONCLUSION

Maternal serum sodium levels are inversely correlated with the severity of preeclampsia. Monitoring electrolytes should be a standard component of the management protocol for hypertensive disorders of pregnancy to prevent neurological complications and optimize maternal outcomes.

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