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Serum Electrolytes Levels in Third Trimester Pregnant Women: A Case-Control Study in Diyala Province in Iraq

Noor Nayyef Oudah [a], Alaa Shawqi Abdulbari [b*], Najwa J. Hameed, [c]

[a] *Department of Medical Lab. Technologies / Bilad Al-Rafidain University College / Iraq*
[b] *Department of Pharmacy/ Al-Esraa University college/ Iraq*
[c] *Department of chemistry/ College of science/ Diyala University / Iraq*

Abstract

Mineral ions known as electrolytes govern the osmolality of interior biological systems and losing them can be deadly. Electrolyte imbalances have been linked to a wide range of pregnancy health issues, including contractility of smooth muscle, spasms of the muscles, and body aches, as well as heart palpitation, breathing difficulties, cardiac dysrhythmia (which can cause cardiac arrest or paralysis of the lungs), chronic kidney disease, and hypertension. As the third trimester is the critical period in pregnant accompanied with complications like preeclampsia this study designed for investigating electrolytes levels (calcium, potassium, sodium, phosphate, chloride) in 3rd trimester of normal Iraqi pregnant women compared with non-pregnant women as control group. This study is the first case-control study on pregnant women carried out in Diyala Province in Iraq highlighting electrolytes imbalance associated with pregnancy, it was carried out in Al-Batool Hospital during the month of February 2021in Diyala/ Iraq, on 30 pregnant women in 3rd trimester (27.04 ± 2.130 years), as well as a control group of 30 non-pregnant women, where serum electrolyte are measured for each group. When compared to the control group, the results of the current study demonstrate a significant decrease in serum calcium, potassium, and sodium in the third trimester pregnant group, while there are no significant differences in chloride and phosphate levels between two groups. This research found a significant difference in serum electrolytes concentrations in last stages of pregnancy women, particularly for potassium and calcium, Electrolytes testing may be included as one of the standard and universal tests conducted during pregnancy to prevent fetal-maternal morbidity and mortality due to electrolytes.

Keywords: pregnancy; serum electrolyte; potassium; calcium.

1. Introduction

During normal pregnancy, a woman's body goes through a variety of changes. Alterations in the heart, blood vessels, blood, metabolism, kidney, and lung function are all examples of normal changes [1,2]. During gestation, blood sugar, respiratory rate, and cardiac output rise, while estrogen and progesterone levels rise, effectively stopping the menstrual cycle for the duration of the pregnancy [3,4]. The kidneys are responsible for a number of changes that ensure during gestation [5]. Electrolyte imbalances have been linked to a wide range of pregnancy health issues, including smooth muscular contractility, muscle spasms, and bodily aches, as well as heart palpitation, breathing difficulties, cardiac dysrhythmia (which can result in cardiac arrest or lung paralysis), renal failure, and hypertension [6]. An increase in feto-maternal morbidity has been associated with pregnancy-induced hypertension, and blood electrolytes have been connected to the pathogenesis of hypertension [7,8].

2. Experimental

2.1. Study design

This was a case-control study carried out at the Al-Batool Hospital teaching hospital's Obstetrics and Gynecology clinic. during February 2021in Diyala/ Iraq .

*Corresponding author e-mail: alaa.shawqi@esraa.edu.iq.; (Alaa Shawqi Abdulbari).
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2.2. Subject Selection

The study population included normal Iraqi pregnant women in 3rd trimester pregnant women and as a control group, thirty non-pregnant women were used. Aged between two groups (27.04 ± 2.130 years) attending the obstetrics and gynecology clinic at Al-Batool Hospital teaching hospital who gave their informed consent. All pregnant women subjects were confirmed with 3rd trimester period.

2.3. Exclusion Criteria

Subjects with abnormal electrolyte imbalance and chronic disease(diabetes nephritis, and any other systemic disease) were excluded from the control group of the study.

2.4. Methodology

Plasma electrolytes were measured using spectrophotometric method. Venous blood about 5 ml was drawn from the women and allowed to coagulate at room temperature at the very least 10-15 minutes, and centrifuged at 4000xg for 10 min. Serum sodium, potassium, chloride, calcium, phosphorous was evaluated by spectrophotometry measurements by their specialized kit.

2.5. Statistical analysis

All of the research's statistical studies were done with version 20.0 of the Social Sciences Statistical Package (SPSS) for statistical software (SPSS Inc., Chicago, IL, USA) and GraphPad Prism 9.1.0.221. Correlation analysis used to test the linear relationship between parameters. The ANOVA test was also used to illustrate the variations in the variables in the different groups. A p-value ≤ 0.05 was considered statistically significant.

3. Results and discussion

The current study involved 30 3rd trimester pregnant women and 30 non-pregnant women as control group. There was a significant decrease ($p < 0.03$) of serum sodium levels in pregnant group compared to non-pregnant control group, Table 1. A significant decrease ($p < 0.04$) was observed in serum potassium levels in the pregnant group compared to control non-pregnant group. In addition, there was a significant decrease in serum calcium concentration in the 3rd trimester comparing with controls. A non-significant increase in chloride and phosphor levels in the 3rd trimester of pregnant women comparing with control.

Pregnancy is a special state characterized by alterations in the body's operating system [9]. It's a phase of fluid overload induced by active sodium and water retention caused mostly by potassium, sodium, calcium, and chloride insufficiency, which has been associated to a number of health issues in pregnancy, including an increased rate of maternal morbidity and mortality. In pre-eclamptic individuals, hypernatremia and hypokalemia induce an electrolyte imbalance in the blood, and hence may be causative factors in pre-eclampsia pathophysiology [10].

This study discovered that pregnant women's chloride levels increased when compared to non-pregnant women in their third trimester, but the increase was non-significant and still within the normal range, indicating that serum chloride levels remained stable during pregnancy [11], and this finding is agree with Mohammed et. al.,[12] who collected 120 samples from pregnant women for his study, found that the level of chloride in the majority of them was within the normal range.

The mean of serum sodium is obviously significantly lower in the pregnant group compared to controls P(0.03*) as shown in the table (1), and also it stills in the normal range. This result agrees with the finding of Faith Diorgu et. al., [7] which demonstrated a sodium level of 94 percent normal in the second and third trimesters. According to the researchers, normal pregnancy induces a decrease in the osmotic threshold; this causes the antidiuretic hormone arginine vasopressin (AVP) to be released, as well as the response to thirsty. Normal pregnancy is associated with a 3-6 mmol/L reduction in serum sodium and a reduction in serum osmolality as a result of this physiological adaption. If serum sodium is less than 135 mmol/L in non-pregnant people, but less than 130 mmol/L in pregnant women, hyponatremia is suspected [13].

The study individuals' serum phosphorus levels were nearly identical, and there was no significant difference between them and the controls. (P 0.42), and this result agrees with the finding of Sultana MS et.al.,[14], other researchers, on the other hand, found decreased phosphorus levels during pregnancy.[15].

As shown in the table (1), there is a significant decrease in serum calcium concentration in the third trimester comparing with controls, which agrees with Faith Diorgu et.al., [7] and with Atem Bethel et.al., [16] that fined a prevalence of hypocalcaemia in the third trimester of pregnant women. Calcium metabolism is strained throughout pregnancy, according to experts. About 25 grams of fetal calcium is removed from mother circulation, and about 80% of total calcium of the fetal is deposited during the 3rd trimester, resulting decrease in calcium circulation in maternal blood, according to Indumatic et.al., [17]. Calcium is required at its highest quantities in the third trimester for foetal bone growth and consolidation, which explains why transplacental calcium transport is much higher in the third trimester

[18]. The result in this study showed that significant decrease in serum potassium in 3rd trimester pregnant women as compared with control group that's may be due to an imbalanced diet, constant diarrhea or vomiting leading to mineral imbalances in the body, or may due to fluid retention, also, potassium loss can also occur when pregnant women consume and excrete normal amounts of sodium yet have high levels of aldosterone and mineralocorticoids [7], this contradicts J Tomala's findings [19] that find the pregnant group's potassium levels decreased in the third trimester as compared to controls, which that revealed an increasing in potassium levels in the third trimester of pregnancy.

Table 1: The biochemical parameters of different studied groups (Mean+ P value)

Groups	Mean	P value	
Chloride(mmol/L)	Pregnant	96.797	0.33
	Controls	88.567	
Sodium (mEq/L)	Pregnant	139.963	0.03*
	Controls	143.640	
Phosphate (mg/dl)	Pregnant	4.097	0.42
	controls	4.235	
Calcium(mg/dl)	Pregnant	8.211	0.02*
	controls	9.550	
Potassium(mmol/)	Pregnant	3.474	0.04*

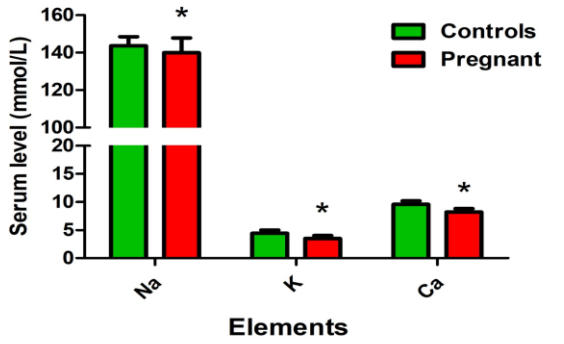

Fig 1. Error bar showing the mean and standard deviation of serum sodium, potassium, and calcium levels of 3rd trimester pregnant and control non-pregnant women.

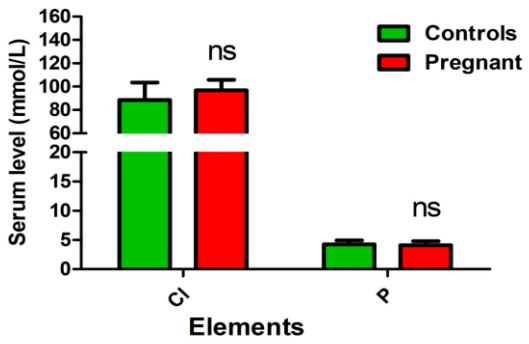

Fig 2: Error bar showing the mean and standard deviation of serum levels of chloride and phosphor of 3rd trimester pregnant and control non-pregnant women.

4. Conclusion

Mineral ions known as electrolytes govern the osmolality of interior biological systems and can be dangerous if they are lost.

This research found a significant difference in serum electrolytes concentrations in last stages of pregnancy women, particularly for potassium and calcium, Electrolytes testing may be included as one of the standard and universal tests conducted during pregnancy to prevent fetal-maternal morbidity and mortality due to electrolytes.

5. Conflicts of interest

There are no conflicts to declare.

6. Formatting of funding sources

None.

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8. References

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