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SERUM ELECTROLYTE AND MACRONUTRIENT PROFILES IN PREGNANT WOMEN WITH MALARIA IN ABA SOUTH, NIGERIA

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Abstract: Malaria during pregnancy remains a critical public health issue in sub-Saharan Africa, particularly in Nigeria. This study aimed to assess the serum electrolyte and macronutrient profiles in pregnant women diagnosed with malaria in Aba South LGA, Abia State. A total of 80 participants were recruited, comprising 50 malaria-positive pregnant women and 30 malarianegative controls. Blood samples were analyzed for sodium (Na^+), potassium (K^+), calcium (Ca^{2+}), bicarbonate (HCO_3^-), chloride (Cl^-), total protein, albumin, and glucose. The results revealed statistically significant reductions in serum sodium, potassium, and calcium levels in malariainfected pregnant women compared to controls ($p<0.05$). Additionally, total protein and albumin were significantly lower in the malaria group, suggesting compromised nutritional status. These findings highlight the need for integrated malaria management and nutritional monitoring in antenatal care settings.

Keywords: Malaria, Pregnancy, Serum Electrolytes, Macronutrients, Aba South, Nutritional Assessment

1. Introduction

Malaria is a parasitic disease caused by Plasmodium species and transmitted by the female Anopheles mosquito. In Nigeria, malaria remains a leading cause of maternal and perinatal morbidity and mortality, with pregnant women representing a highly vulnerable group due to immunological and physiological changes (WHO, 2022).

Electrolyte and macronutrient imbalances are common complications in malaria-infected individuals and can be exacerbated by the metabolic demands of pregnancy. Electrolytes like sodium, potassium, calcium, bicarbonate, and chloride play critical roles in maintaining cellular homeostasis, muscle contraction, and nerve conduction. Meanwhile, macronutrients such as proteins and glucose are essential for fetal growth and maternal energy balance (Ogbodo et al., 2021).

Despite extensive studies on malaria and pregnancy, few have investigated the combined impact on biochemical parameters in southern Nigeria, especially in Aba South LGA. This study seeks to bridge this gap by evaluating serum electrolytes and macronutrient levels in pregnant women diagnosed with malaria.

2. Objectives

- To determine serum electrolyte levels (Na^+, K^+, Ca^{2+}, HCO_3^-, Cl^-) in pregnant women with malaria.
- To assess macronutrient levels (glucose, total protein, and albumin) in the study group.
- To compare findings with those of malaria-negative pregnant women.

Original Article

3. Materials and Methods

3.1 Study Area

The study was conducted in Aba South LGA, Abia State, Nigeria, a malaria-endemic region characterized by tropical climate and poor drainage.

3.2 Study Design and Participants

A cross-sectional analytical study involving 80 pregnant women aged 18–45 years was carried out between March and June 2025. Fifty participants were confirmed positive for malaria using rapid diagnostic tests and microscopy, while 30 age-matched participants served as malaria-negative controls.

3.3 Sample Collection

5 mL of venous blood was collected aseptically into plain and lithium-heparinized tubes. Samples were centrifuged and sera stored at −20°C before analysis.

3.4 Biochemical Analysis

- Electrolytes (Na^+, K^+, Cl^-, HCO_3^-, Ca^{2+}) were measured using flame photometry and ion-selective electrodes.
- Glucose, total protein, and albumin were analyzed using standard colorimetric enzymatic methods (Randox kits).

3.5 Statistical Analysis

Data were expressed as mean ± standard deviation (SD). Differences between groups were analyzed using Student's t-test at $p<0.05$ significance level.

4. Results

Table 1: Serum Electrolyte Levels in Pregnant Women with and without Malaria

Parameter	Malaria-positive (n=50)	Control (n=30)	p-value
Sodium (Na^+)	130.4 ± 4.8 mmol/L	137.8 ± 3.9	<0.001
Potassium (K^+)	3.2 ± 0.6 mmol/L	3.8 ± 0.5	0.002
Calcium (Ca^{2+})	7.1 ± 0.9 mg/dL	8.6 ± 0.7	<0.001
Bicarbonate	20.3 ± 3.2 mmol/L	22.1 ± 2.8	0.045
Chloride (Cl^-)	98.1 ± 4.5 mmol/L	102.3 ± 3.6	0.003

Table 2: Serum Macronutrient Levels

Parameter	Malaria-positive (n=50)	Control (n=30)	p-value
Glucose	68.4 ± 6.1 mg/dL	74.2 ± 5.8	0.012
Total Protein	5.4 ± 0.7 g/dL	6.7 ± 0.5	<0.001
Albumin	2.8 ± 0.4 g/dL	3.5 ± 0.3	<0.001

5. Discussion

The study demonstrates that malaria infection in pregnancy is associated with significant reductions in serum sodium, potassium, and calcium. Hyponatremia and hypokalemia are welldocumented complications of

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Plasmodium falciparum malaria and may result from renal losses, hemolysis, and acid-base disturbances (Afolabi et al., 2019).

Hypocalcemia observed in infected participants may affect uterine contractility and fetal development. The decreased levels of total protein and albumin further suggest protein-energy malnutrition or hepatic dysfunction, consistent with findings by Onyeneke et al. (2020).

Lower glucose levels could be due to increased parasitic consumption or impaired gluconeogenesis, posing a risk for hypoglycemia—a critical concern during pregnancy.

These findings underscore the need for proactive nutritional and electrolyte management among malaria-infected pregnant women in endemic regions.

6. Conclusion

Pregnancy complicated by malaria is associated with significant biochemical derangements, particularly in electrolyte and macronutrient balance. Routine monitoring and early nutritional intervention should be incorporated into antenatal care protocols in malaria-endemic areas such as Aba South.

7. Recommendations

- Routine biochemical screening for electrolytes and macronutrients in pregnant women during ANC visits.
- Provision of electrolyte supplements and nutritional support in malaria-endemic communities.
- Further research into micronutrient status and fetal outcomes among this population.

8. References

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