# Prevalence of Hypoglycemia Among Plasmodium Falciparum Infected Pregnant Women Attending Antenatal Clinic in Wula Mango, Magadali Local Government Area of Adamawa State- Nigeria

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***Abstract-Hypoglycemia is a critical concern among pregnant women, particularly in regions where plasmodium falciparum infection prevails. This study aimed at determining the prevalence of hypoglycemia among pregnant women with Plasmodium falciparum infection attending antenatal clinic in Wula-Mango, assessing the relationship between gestational age and the prevalence of hypoglycemia among pregnant women with malaria and to investigate the association between parity and the occurrence of hypoglycemia among pregnant women with Plasmodium falciparum infection. Cross- sectional observational design was employed, the study enrolled 120 pregnant women. Data encompassing socio-demographic details, malaria infection status, hypoglycemic status and parity were collected. Glucose levels were determined using enzymatic method. Results indicate a substantial prevalence of hypoglycemia, out of the 120 women examined, 58 (48.3%) tested positive and prevalence of plasmodium falciparum infection was 59 (49.2%). Significant associations were observed between malaria infection and gestational age. Week 20 had the highest prevalence of hypoglycemia (77.8%). There is association between parity and occurrence of hypoglycemia with 1 parity having higher frequency 45% and the least with 3 parity (5.00%). The findings of this study can contribute to the development of targeted interventions aimed at improving maternal and fetal health outcomes in malaria endemic areas like Wula-mango.***

***Indexed Terms- Hypoglycemia, Plasmodium falciparum, pregnant women, Wula-mango, antenatal***

## I. INTRODUCTION

Malaria caused by Plasmodium falciparum remains a significant public health challenge globally, particularly in sub-Saharan Africa, where the burden is most pronounced. Pregnant women are especially vulnerable to malaria infection due to physiological changes that make them more susceptible to the parasite. According to WHO (2021), approximately 125 million pregnant women worldwide are at risk of malaria annually. The impact of malaria during pregnancy extends beyond maternal morbidity and mortality to include adverse outcomes such as low birth weight, preterm delivery and maternal anemia (Desai et al., 2007). Plasmodium falciparum infection during pregnancy is associated with placental malaria, a condition characterized by the sequestration of infected erythrocytes with placental intervillous spaces. Placental malaria can result in impaired placental function, leading to fetal growth restriction and adverse birth outcomes (Desai., 2007).

Given the significant health risks posed by malaria during pregnancy, the WHO recommends preventive measures such as the use of insecticides –treated bed nets and intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTP-SP) to reduce the burden of malaria among pregnant women in endemic areas (WHO, 2018). Emerging evidence suggests a potential link between malaria infection and glucose metabolism during pregnancy, which warrants further investigation (Mwanri et al., 2014). Hypoglycemia, defined as a blood glucose level below 70mg/dL, is a common metabolic disorder that can have serious consequences if left untreated, particularly during pregnancy. Pregnant women are at

an increased risk of developing hypoglycemia due to changes in hormone levels and increased energy demands associated with fetal growth (Brown, et al., 2016). While hypoglycemia is often associated with conditions such as diabetes mellitus, emerging research suggests a possible link between hypoglycemia and malaria infection during pregnancy (Htun et al., 2020). Studies have shown that malaria infection can disrupt glucose homeostasis by altering insulin secretion and sensitivity, leading to hypoglycemia (Htun et al., 2020). Hypoglycemia is a common metabolic disorder that can occur during pregnancy, particularly among women with pre-existing diabetes or gestational diabetes mellitus (GDM). In addition to GDM, pregnant women without pre-existing diabetes can also experience hypoglycemia due to various factors including prolonged fasting, inadequate carbohydrates intake, excessive physical activity, or the use of certain medications (Choi et al., 2019).Pregnancy is associated with increased insulin resistance and glucose utilization to meet the metabolic demands of the developing fetus, making pregnant women more susceptible to hypoglycemia, especially if glucose production fails to keep to pace with increased demands (Lowe et al., 2019). Hypoglycemia in pregnant women may present with symptoms such as palpitations, sweating, tremors, dizziness and confusion, which can have significant implications for maternal well-being and fetal health if not promptly addressed (Choi et al., 2019). GDM is a common medical complication of pregnancy, characterized by glucose intolerance that develops or is first recognized during pregnancy. Women with GDM have an increased risks of hypoglycemia due to the dysregulation of glucose metabolism, which can occur as a result of insulin therapy, dietary management or the natural course of the disease (Zhu et al., 2021). However, the prevalence and clinical significance of hypoglycemia among pregnant women with Plasmodium falciparum infection remain poorly understood. Prevalence of hypoglycemia among pregnant women attending antennal clinics in malaria endemic settings may vary depending on factors such as gestational age, parity, nutritional status.

## II. MATERIALS AND METHODS

Study Area:

The study was conducted in Wula- Mango clinic, located at Mandara Mountain in Madagali Local Government Area of Adamawa State in the northern region of Nigeria. The area is situated at latitude 10º 51' N and longitude 13º36'E and 13º42' E, 420 meters above the sea level (Ahmed et al., 2015).

Population and Sampling Technique:

The population of interest comprises of pregnant women attending antenatal clinic at Wula- Mango. Participants were selected using a systematic random sampling method. Pregnant women presenting to the clinic for antenatal care during the study period were eligible for inclusion.

Research Design:

The research design for this study was a laboratory-based observational study. Blood sample was collected from participants who consented for the measurement of glucose levels using laboratory techniques. This design allows for the direct assessment of hypoglycemia among pregnant women with Plasmodium falciparum infection without relying on self –reported symptoms.

Ethical consideration:

Informed consent was obtained from all participants before blood sample was collected, ensuring that they understand the purpose of the research and their rights as participants. Confidentiality of participant's information with data anonymzed and stored securely.

Sample size and data collection:

Blood sample from 120 pregnant women was collected. A trained laboratory technician was used to collect venous blood samples from participants using sterile techniques. Glucose level was measured in the laboratory using enzymatic methods.

Data analysis:

Descriptive statistics was used to summarize characteristics of the study population, like

demographic variables, malaria infection status and prevalence of hypoglycemia. Glucose was analyzed quantitatively.

## III. RESULT

Prevalence of Plasmodium falciparum infection among pregnant women:

The results of the findings reveals that out the 120 samples of the pregnant women, 59 tested positive for malaria infection , representing 49% of the study population. Conversely, 61 participants tested negative for malaria, comprising of 51% of the sample (Table 1). These findings suggest a moderate prevalence of malaria infection among pregnant women in the study area. The presence of positive cases underscores the ongoing transmission of malaria in the community and highlights the importance of targeted interventions to prevent and manage malaria during pregnancy.

The observed prevalence of Plasmodium falciparum infection aligns with patterns reported in other malaria endemic regions. While efforts to control malaria have led to progress in reducing transmission rates, pregnant women remain vulnerable to infection due to physiological changes that compromise immune function.

Prevalence of Hypoglycemia among pregnant women with Plasmodium falciparum infection:

The prevalence of hypoglycemia among pregnant women attending antennal clinic was assessed in the study. Among the 120 women examined 58 tested positive for hypoglycemia, representing 48% of the study population while 62 tested negative with 52% prevalence (Table 2).

Factors associated with Hypoglycemia among pregnant women with Plasmodium falciparum infection:

The result in table 3 shows that gestational age (20 weeks) had the highest prevalence of hypoglycemia (77.7%) followed by 24 weeks (57.1%) and the least prevalence was recorded in week 29 and 32 (0.00%) respectively. A compared two ways ANOVA analysis was conducted to examine the following factors associated with hypoglycemia among pregnant women with Plasmodium falciparum infection. Malaria infection status whether positive or negative, Gestational age(number of weeks of gestation), presence or absence of symptoms such as palpitations, sweeting, and dizziness. The results revealed that malaria infection status and symptoms of hypoglycemia were significantly associated with hypoglycemia among pregnant women with Plasmodium falciparum infection. Only gestational age 20, 8 and 24 has significant difference at 0.01 and 0.014 respectively.

Association between parity and occurrence of Hypoglycemia

Pregnant women attending Wula-Mango clinic with 1 parity has the highest frequency of 54 (27%) followed by 2 parity with frequency of 35 (17.5%) and the least was 3 parity with frequency of 6 (3%) as shown in table 4.

Table 1: Prevalence of Plasmodium falciparum infection among Pregnant

Women

| Malaria infection Status | Frequency | Percentage (%) |
|---|---|---|
| Positive | 59 | 49% |
| Negative | 61 | 51% |

Source; 2024 Lab work

Table 2: Prevalence of Hypoglycemia among Pregnant women with Plasmodium falciparum infection

| Hypoglycemia Status | Frequency | Percentage (%) |
|---|---|---|
| Yes | 58 | 48% |
| No | 62 | 52% |

Source: Field work 2024

Table 3: Factors Associated with Hypoglycemia among Pregnant Women with Plasmodium falciparum Infection

| Gestational Age (Weeks) | No. Examined | No. Infected | Percentage (%) | P-value calculated |
|---|---|---|---|---|
| 18 | 1 | 0 | 1.0% | 0.001 |
| 20 | 9 | 7 | 77.7% | 0.001 |
| 21 | 7 | 4 | 42.9% | 0.001 |
| 22 | 14 | 4 | 28.6% | 0.001 |
| 23 | 2 | 1 | 50% | 0.001 |
| 24 | 14 | 8 | 57.1% | 0.001 |
| 25 | 16 | 7 | 43.8% | 0.001 |
| 26 | 12 | 4 | 33.3% | 0.001 |
| 27 | 14 | 6 | 42.9% | 0.001 |
| 28 | 11 | 1 | 9.0% | 0.001 |
| 29 | 1 | 0 | 0% | 0.001 |
| 30 | 16 | 8 | 50% | 0.001 |
| 32 | 1 | 0 | 0% | 0.001 |

Source; Field work 2024

Table 4: Association between Parity and occurrence of Hypoglycemia

| Parity | Frequency | Percentage % | Dizziness | Palpitation | Sweeting |
|---|---|---|---|---|---|
| 0 | 25 | 12.5% | 5 | 6 | 7 |
| 1 | 54 | 27% | 7 | 7 | 11 |
| 2 | 35 | 17.5% | 6 | 4 | 8 |
| 3 | 6 | 3% | 1 | 0 | 3 |

Source: Field work 2024

## IV. DISCUSSION

The findings of this study provide valuable insights into the prevalence and factors associated with hypoglycemia among pregnant women with Plasmodium falciparum infection attending antenatal clinics in Wula-Mango. One notable finding was the prevalence of hypoglycemia with 48% of participants experiencing this condition. This findings is in consonance with the report of Brown et al., (2018) who reported in the malaria endemic areas “hypoglycemia has been recognized as a complication of severe malaria, particularly in children”. Hypoglycemia among pregnant women in malaria endemic regions and underscores the need for effective screening and management strategies during antennal care. Furthermore, our analysis revealed a significant association between malaria infection status (49%) and hypoglycemia. Pregnant women with a positive malaria infection status were found to be at increased risk of hypoglycemia compared to those with a negative status. This suggests a potential link between malaria infection and hypoglycemia, possibly mediated by the systemic inflammatory response and metabolic alterations induced by the parasites which is also in agreement with the report of Htun et al., (2020) who reported significance association between malaria infection and hypoglycemia in Tanzania. Additionally, the presence of symptoms of hypoglycemia was strongly associated with the occurrence hypoglycemia among study participants. Symptoms such as palpitations, sweating and dizziness were reported by a subset of participants and were indicative of underlying glucose dysregulation. These findings highlight the importance of symptoms recognition and early intervention to prevent adverse maternal and fetal outcomes associated with hypoglycemia during pregnancy is in agreement with the report of Zhu et al., (2021) who reported hypoglycemia in pregnant women with gestational Diabetes mellitus can lead to adverse outcome for both the mother and fetus if not prompt recognized and managed.

## CONCLUSION AND RECOMMENDATIONS

In conclusion, this study sheds light on the significant burden of hypoglycemia among pregnant women with Plasmodium falciparum infection attending antenatal clinics. The findings highlight the complex interplay between malaria infection and glucose dysregulation during pregnancy, with a notable proportion of participants experiencing hypoglycemia. The association between malaria infection status and hypoglycemia, align with the presence of symptoms such as palpitations and sweating, underscores the need for comprehensive screening and management strategies in malaria-endemic regions. Moving forward, concerted efforts are needed to integrate malaria and maternal health programs, strengthen antenatal care services, and implement evidence based interventions to mitigate the risk of hypoglycemia and improve maternal and fetal health outcomes in endemic settings.

Public health campaigns should be launched to raise awareness among pregnant women and communities about the risks of hypoglycemia during pregnancy, particularly in the context of malaria infection.

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