



**PREVALENCE OF MALARIA INFECTION AMONG PREGNANT WOMEN  
ATTENDING ANTENATAL CLINIC IN NNAMDI AZIKIWE UNIVERSITY  
TEACHING HOSPITAL, NNEWI**

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**ABSTRACT:** *Malaria is a major health problem affecting people in the tropics and sub-tropical regions of the world. This cross-sectional hospital-based study was carried out to determine the prevalence of malaria infection among pregnant women attending a tertiary hospital in Nnewi, Anambra State, Nigeria. A total of 100 venous blood samples were collected from pregnant women into EDTA tubes and examined using field-stained thick and thin films for identification of malaria parasites. Demographic information such as age, trimester and insecticide-treated nets usage was obtained using a structured questionnaire. Data was analyzed using Statistical Package for the Social Sciences version 22. The chi-square test was used to determine the difference among the variables studied and  $P \leq 0.05$  were considered significant. Out of the 100 blood samples examined, 27 were infected and had an overall prevalence of 27%. Women within the age bracket of 31-35 years had the highest prevalence rate 11(36.7%) while no infection was recorded in the 41-45 years age group 0(0.0%). Pregnant women in their first trimester had the highest infection prevalence of 13(35.1%) while those in their third trimester had the least prevalence of 5(17.9%). In relation to ITN's usage, pregnant women who don't normally sleep under ITNs had the highest infection prevalence 23(31.5%) while those who usually sleep under ITNS had the least prevalence rate 4(14.8%). It is pertinent to periodically check the malaria infection status of pregnant women attending antenatal services. Prophylactic treatment should be routinely administered to avoid pregnancy complications due to malaria infection.*

**KEYWORDS:** Malaria infection, ante-natal, pregnant women, prevalence, blood film, Anambra.



## INTRODUCTION

Malaria is recognized globally as a serious public health problem that continues to cause morbidity and mortality globally. Malaria infection is caused by a single-celled protozoan parasite of the genus *Plasmodium*, through the bite of an infected female *Anopheles* mosquito (Nwoke, 2018). Malaria infection due to the female *Anopheles* mosquito is the leading cause of death in Nigeria and the second leading cause of death in Africa after HIV/AIDS (Murray *et al.*, 2014). The disease is mostly prevalent in sub-Saharan Africa, particularly among pregnant women, children and the immune suppressed (WHO, 2018; Ejike *et al.*, 2022). According to estimates from 85 malaria-endemic countries, the global malaria burden rose from 227 million cases in 2019 to 241 million cases in 2020 (Duguma *et al.*, 2022). In 2022, global malaria cases rose to 249 million cases and 608,000 deaths, as against the 244 million cases and 610,000 deaths in 2021. Sub-Saharan Africa bears the majority of the global load, with associated morbidity and mortality in the world being at an all-time high. The World Health Organization report reveals that the region is home to 94% of malaria cases (233 million) and 95% (580,000) of malaria deaths (WHO, 2023). It hurts people's health as well as economic development in many developing nations, especially in sub-Saharan Africa (Nwoke, 2018). Maternal mortality is the death of pregnant women due to complications arising from infections or during childbirth. One such infection is that caused by the malaria parasite; *P. falciparum*, and is reportedly one of the leading causes of maternal morbidity and mortality in Nigeria. Pregnancy increases the risk of severe disease for infected women due to immune system suppression, thus putting them at a three times higher risk of severe illness and a death rate close to 50% (Chua *et al.*, 2021). Reports indicate that the risk of infection is greatly influenced by the age and gravida status of the woman. Malaria during pregnancy can result in serious consequences for both mother and foetus, including maternal anaemia, fetal growth retardation, congenital malaria, low birth weight, abortion and stillbirth (Oyerogba *et al.*, 2023; Ali, 2022). Placenta parasitaemia limits the transfer of nutrients and oxygen to the foetus, leading to intrauterine growth restriction or intrauterine death (Bello and Ayede, 2019). Severe malaria can lead to maternal death from complications such as cerebral malaria, hypoglycemia, pulmonary oedema and other unwanted consequences such as prolonged hospital stays and psychological trauma for both patients and healthcare providers (Nkoka *et al.*, 2018). Malaria in pregnancy is still a major health issue in Nigeria and is implicated in 11% of maternal deaths in Nigeria where it is said to further complicate 8.4% to 58.1% of pregnancies (Bassey *et al.*, 2015). In Nigeria, the lack of access to adequate healthcare services, poverty, and ignorance have placed pregnant women as the most vulnerable group. The issue of poverty is particularly decisive as it makes it impossible for the majority of them to access proper antenatal care and afford malaria preventive measures such as insecticide-treated nets and antimalarial drugs. Consequently, many malaria episodes go undiagnosed and untreated, leading to severe medical complications for pregnant women and their unborn children. Epidemiological surveys to determine the current state of malaria infection in all geographical areas will help inform evidence-based planning, prevention, control and intervention programs. Therefore, this study was carried out to determine the prevalence of malaria infection among pregnant women attending antenatal in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria.



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## **MATERIALS AND METHODS**

### **Study Area**

The study was carried out in Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State. Nnewi is the second largest commercial city in Anambra state after Onitsha. Nnewi is located on latitude 6° 01'10.63" N and longitude 6°55'2.24" E. The city has an estimated population of 900,000 inhabitants as of the 2019 population estimates. Nnewi town has a land area of over 520km<sup>2</sup> and is home to over 900, 000 inhabitants of the 2019 population census estimates. The inhabitants are mostly involved in trading, production and farming. Nnewi town is home to Nnamdi Azikiwe University Teaching Hospital which is located at latitude 6° 1'32.7504" N and longitude 6° 54'49.932" E. The hospital is a large tertiary healthcare facility and provides medical services to residents of Nnewi town and its environment.

### **Inclusion and Exclusion Criteria**

All pregnant women who consented to participate in the study and who were not currently taking anti-malaria drugs were included in the study. However, pregnant women who declined consent as well as those who were on intermittent preventive chemotherapy for malaria were excluded from the study.

### **Ethical Clearance**

Ethical approval to conduct this study was sought and obtained from the management of the study hospital. Written approval was also obtained from the head of the nursing and medical laboratory services department of the hospital.

### **Informed Consent**

All pregnant women who visited the hospital for their routine ante-natal care were approached and details of the study were explained to them. However, only those who gave their consent were recruited in the study while those who refused to consent were not included. Data and other vital information obtained from the pregnant women were kept confidential and used only for the sake of this study.

### **Sample Collection**

A tourniquet was used to tie the upper part of the arm around the bicep and triceps and an alcohol swab was then used to clean the chosen vein. A syringe was then used to collect 2ml of venous blood sample which was dispensed into EDTA tubes and mixed gently to mix the anti-coagulants and prevent clotting. The blood sample tubes were then arranged in a Giostyle cooler box containing ice packs and immediately transported to the laboratory of the Zoology Department of Nnamdi Azikiwe University, Awka for examination.



## Determination of Malaria Parasites

Parasitological examination of the blood samples for malaria parasites was done by staining thick and thin blood films with field stains A and B as described by Chessbrough (2009). Blood samples were used to prepare thick and thin blood films on a clean grease-free microscope slide and were allowed to air dry. The slides were stained with field stains A and B, rinsed with water and allowed to air dry. The slides were viewed under the microscope using immersion oil and an x100 objective lens. Malaria parasites on each slide were recorded and classified as + (1-10 malaria parasites per 100 high power fields), ++ (11-100 per 100 high power fields) +++ (1-10 parasites in every high power field) and ++++ (more than 10 malaria parasite in every high power field) respectively (Cheesbrough, 2009).

## Statistical Analysis

Data generated from this study was subjected to statistical analysis using Statistical Package for Social Sciences version 25. Prevalence rates were calculated and expressed as percentages. The chi-square test was used to determine the association between malaria infection and risk factors studied and  $P \leq 0.05$  were considered significant.

## RESULTS

Out of the total 100 venous blood samples examined, 27 were infected with *Plasmodium falciparum* malaria parasite, and an overall infection prevalence of 27.0%. The findings of our study reveal that pregnant women within the age bracket of 31-35 years had the highest prevalence (36.7%) while no malaria infection was recorded among pregnant women in the 41-45 years age bracket (0.0%). However, the result was not statistically significant ( $P > 0.05$ ) as shown in Table 1

Table 1: Prevalence of malaria infection among pregnant women according to age

Age group (years)	Number examined (%)	Number infected (%)	P-value
16-20	14	2(14.3)	0.321
21-25	23	5(21.7)	
26-30	25	8(32.0)	
31-35	30	11(36.7)	
36-40	4	1(25.0)	
41-45	4	0(0.0)	
Total	100	27(27.0)	

The result in Table 2 showed that pregnant women in their first trimester had the highest malaria infection prevalence (35.1%), followed by those in their second trimester (25.7%) while the least



infection prevalence was observed among pregnant women in the third trimester (17.9%). The result of pregnancy duration was statistically significant ( $P = 0.041$ ).

Table 2: Malaria prevalence among pregnant women with respect to duration of pregnancy (Trimester)

Trimester	No Examined	No Infected (%)	No uninfected (%)	P-value
1 <sup>st</sup> (1-3 months)	37	13(35.1)	24(64.9)	0.041
2 <sup>nd</sup> (4-6 months)	35	9(25.7)	26(74.3)	
3 <sup>rd</sup> (7-9 months)	28	5(17.9)	23(82.1)	
Total	100	27(27.0)	73(73.0)	

In Table 3, our findings reveal the highest prevalence of malaria infection among pregnant women who were not in the habit of sleeping under Insecticide Treated Nets (ITNs) (31.5%) while those who usually sleep under ITNs had the lowest infection rate (14.8%). The result revealed a significant association between malaria infection and the use of mosquito nets ( $P = 0.003$ ).

Table 3: prevalence of malaria infection among pregnant women in relation to use of Insecticide Treated Nets (ITNs)

ITNs Usage	No Examined	No Infected (%)	No uninfected (%)	P-value
Yes	27	4(14.8)	23(85.2)	0.003
No	73	23(31.5)	50(68.5)	
Total	100	27(27.0)	73(73.0)	
Total	100	27(27.0)	73(73.0)	

## DISCUSSION

Malaria infection caused by *Plasmodium falciparum* remains a serious public health issue causing severe morbidity and mortality, particularly in tropical and sub-tropical regions of the world. In pregnant women and unborn children, the complications and associated consequences are far more devastating. The findings of our study reveal an overall malaria infection prevalence of 27% among the pregnant women studied in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State. This result is higher than the 8.7% reported by Oyerogba *et al.* (2023) in Ibadan, southwest Nigeria, but is similar to the work of Mukhtar *et al.* (2020) who reported 26% in Kano State, northern Nigeria. Elsewhere in Africa, Duguma *et al.* (2022) also reported a similar prevalence (21.1%) in southwest Ethiopia. On the contrary, our result is much lower than the 99%,



61% and 78% documented by Gunn *et al.* (2015), Diorgu *et al.* (2021) and Ali (2022) in Enugu, south-south and Gombe states in Nigeria. The differences observed in the overall prevalence could be due to the level of environmental sanitation and personal habits of inhabitants that might expose them to mosquito bites. In terms of age, pregnant women between 31-35 years of age bracket were the most infected (36.7%), although the result was statistically insignificant ( $P \leq 0.05$ ). This report contradicts the studies conducted by Abubakar *et al.* (2022) and Diouf *et al.* (2024) that reported highest prevalence within the 20-29 years (62.0%) and 21-25 years (54.6%) age brackets respectively. This finding further contradicts Ali (2022) who states that there is a lower prevalence among older pregnant women due to the existence of natural immunity to infectious diseases which the pregnant women acquired as their ages increased. The implication of our result is that malaria infection is not really age-dependent, but rather the level of exposure to mosquito bites by individuals. With respect to the duration of pregnancy, pregnant women who were in their first trimester had the highest rate of malaria infection. This result agrees with the work of Oyerogba *et al.* (2023) and Amadi and Nwankwo (2012) who also reported a higher malaria prevalence among pregnant women in their first trimester. This finding is in contrast to the studies by Frank *et al.* (2016) that reported the highest malaria prevalence among pregnant women in their third trimester. Other researchers such as Amali *et al.* (2011) and Ali (2022) reported the highest malaria infection among pregnant women in their second trimester. The highest prevalence among those in the first trimester can be attributed to the *Plasmodium falciparum* erythrocyte membrane protein-1 (PfEMP1), a major variant surface antigen displayed on the surface of *P. falciparum*-infected erythrocytes (IEs) that serves as an adhesin (Wang *et al.*, 2021; Lennartz *et al.*, 2019). According to Chua *et al.* (2021) and Tran *et al.* (2020), placenta malaria is common among first-time pregnant women due to their lack of immunity against placental binding IEs which is likely to negatively affect the placental, leading to poor outcomes in *P. falciparum* related malaria in pregnancy (MiP). However, more research needs to be conducted to fully understand the physical and physiological changes to the infected placentas during plasmodiasis in pregnancy. Pregnant women who regularly slept under treated mosquito nets were the least infected (14.8%) while the highest prevalence was seen among those who were not sleeping in mosquito nets. This finding agrees with the work of Okosa *et al.* (2022) who also found a higher prevalence (34.9%) of malaria infection in non-users of insecticide-treated nets (ITNs). Our result is also in line with Kuetche *et al.* (2023) and Diouf *et al.* (2024) who also reported lower infection rate among ITN users and higher prevalence among non-users. This finding further affirms the importance of ITNs in the prevention of malaria infection.

## CONCLUSION

Malaria in pregnancy remains a major health issue among pregnant women in Nigeria and globally. The overall prevalence of 27% in this study although not too high, still poses a health threat considering its associated medical consequences. Duration of pregnancy and usage of ITNs both revealed a significant association between malaria infection in the area. It is therefore necessary to intensify awareness campaigns on malaria prevention and control strategies among pregnant women as well as routine treatment of pregnant women with anti-malaria drugs to reduce maternal complications



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## CONFLICT OF INTEREST

The authors declare that they have no competing interest regarding the publication of this paper

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