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Prevalence and Associated Factors of Malaria among Pregnant Women Attending Antenatal Clinic at a Specialist Referral Hospital in Onitsha, South-East Nigeria

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Abstract

Background: Malaria in pregnancy (MiP) remains a major public health problem in sub-Saharan Africa, contributing to maternal anemia, placental insufficiency, low birth weight, and neonatal mortality. Nigeria bears a substantial proportion of the global malaria burden despite ongoing preventive interventions.
Objective: To determine the prevalence of malaria and associated factors among pregnant women attending antenatal care in Onitsha, Anambra State, Nigeria.
Methods: A cross-sectional hospital-based study was conducted among 125 pregnant women attending antenatal clinic at St. Charles Borromeo Specialist Hospital, Onitsha. Sociodemographic and clinical data were collected using structured questionnaires. Venous blood samples were examined for malaria parasites using Giemsa-stained thick blood smear microscopy. Data were analyzed using SPSS version 24. Chi-square test was used to assess associations, with statistical significance set at $p < 0.05$.
Results: The overall prevalence of malaria parasitemia was 37.6% (47/125). No statistically significant association was observed between malaria prevalence and age, marital status, occupation, educational level, trimester, exposure to mosquito-infested areas, use of insecticide-treated nets, or mosquito repellents ($p > 0.05$). Parity demonstrated a statistically significant association with malaria prevalence ($p = 0.0265$), with multigravidae showing higher susceptibility.
Conclusion: Malaria prevalence among pregnant women in Onitsha remains high. Parity is a significant determinant of infection, suggesting that parity may play a role and warrants further investigation in larger studies.

Keywords: Pregnant women, antenatal care, *Plasmodium falciparium*, Nigeria

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1. Introduction

Malaria remains one of the most significant infectious diseases globally, with the World Health Organization (WHO) reporting 263 million cases and 597,000 deaths in 2023, of which 94% occurred in the African region (WHO, 2023). Expectant/pregnant women are at high risk of developing malaria, mostly caused by *P. falciparum*. In 2021, there were estimated to be 40 million pregnancies across the WHO African Region's 38 nations with moderate to high malaria transmission, with 13.3 million (32%) being infected with malaria (Zegeye *et al*., 2025). More so, pregnant women are particularly vulnerable due to pregnancy-associated immunological changes and placental sequestration of infected erythrocytes (Dennis *et al*., 2024; Pereira *et al*., 2016). Malaria exposure during pregnancy varies by WHO sub-region, with West Africa having the highest prevalence (40.7%), closely followed by Central Africa (39.8%) and Eastern and Southern Africa (20%) (WHO, 2023). In the West African sub-region, Nigeria accounts for about 56% of all malaria cases. According to malaria prevalence reports detected by microscopy, the country's malaria prevalence decreased from 42% in 2010 to 27.4% in 2015 (Maduka, 2018).

Plasmodium falciparum, the dominant malaria species in sub-Saharan Africa, expresses VAR2CSA proteins that mediate adhesion to chondroitin sulfate A in the placenta, leading to placental malaria (Pereira *et al*., 2016; Renn *et al*., 2021). The consequences include maternal anemia, low birth weight, intrauterine growth restriction, preterm delivery, and neonatal mortality (Moore *et al*., 2017; Chua *et al*., 2021). Primigravidae are disproportionately affected due to lack of pregnancy-specific immunity against placental-binding parasite variants (Cutts *et al*., 2020; Jaffer *et al*., 2019).

Although preventive measures such as intermittent preventive treatment in pregnancy (IPTp) and long-lasting insecticidal nets (LLINs) are implemented in Nigeria, malaria prevalence among pregnant women remains significant (Asiwome *et al.*,2022; Ojo *et al*., 2020; WHO, 2022). Updated epidemiological data are limited in Onitsha, Anambra State. This study therefore aimed to determine the prevalence and associated factors of malaria among pregnant women attending antenatal care at a specialist referral hospital in Onitsha, South-East Nigeria

2. Materials and Methods

2.1 Study Design and Setting

This study employed a cross-sectional hospital-based design. It was conducted between May and September 2025 at St. Charles Borromeo Specialist Hospital, located in Onitsha, Anambra State, Nigeria. The hospital provides comprehensive antenatal services to women from diverse socioeconomic backgrounds residing in both urban and peri-urban communities within the state.

2.2 Ethical Considerations

Ethical approval was granted by the St. Charles Borromeo Specialist Hospital Research Ethics Committee. All participants provided written informed consent prior to enrollment. Throughout the study, participants' autonomy and privacy were protected, and all personal data were treated with strict confidentiality.

2.3 Study Population

The study population comprised 125 pregnant women aged between 19 and 50 years who attended the antenatal clinic during the study period and met the eligibility criteria. Women who declined participation or were unable to provide consent were excluded.

2.4 Sampling Technique

A combination of convenience and purposive sampling techniques was employed. Eligible participants who presented at the antenatal clinic during the study period and met the inclusion criteria were consecutively recruited until the required sample size was achieved.

2.5 Data Collection

Participants data were collected using a structured questionnaire. All respondents consenting to complete the questionnaire provided their blood samples for analysis. The questionnaire included demographic information as well as questions to gain insights into the respondents' risk factors awareness of malaria.

2.6 Laboratory Procedures

Approximately 5 mL of venous blood was aseptically collected from each participant into ethylenediaminetetraacetic acid (EDTA) anticoagulant tubes. Thick blood smears were prepared on clean glass slides, air-dried, and stained using Giemsa stain according to standard parasitological procedures. The stained smears were examined microscopically under ×100 oil immersion objective for the presence of malaria parasites.

2.7 Data Analysis

Data obtained were entered and properly organized using Microsoft Excel, then analyzed using Software Package for Social Sciences (SPSS) version 24 as explained by Anteneh *et al.* (2024). Results of the analysis were expressed in percentage and the chi square test was used to ascertain the significance levels across the parameters. The level of significance was fixed at <0.05.

3. Results

A total of 125 pregnant women attending antenatal care at St. Charles Borromeo Specialist Hospital, Onitsha, Anambra State, were enrolled and analyzed for malaria infection. Out of the 125 participants, 47 tested positive for malaria parasites, giving an overall prevalence of 37.6% as shown in the Figure 1

3.1 Sociodemographic and Obstetric Characteristics

The sociodemographic characteristics of the participants are summarized in Table 1. The age of participants ranged from 15 years to ≥40 years, with the highest proportion within the 25–29-year age group (38.4%). The least represented group was 15–19 years (0.8%). Most participants were married (98.4%), while only 1.6% were single. In terms of occupation, over half were self-employed (58.4%), followed by employed women (29.6%). A majority had attained tertiary education (63.2%), whereas 36.8% had secondary education; none reported primary education as their highest level.

Regarding obstetric characteristics, most women were in the second (48.0%) and third trimesters (46.4%), while only 5.6% were in the first trimester at the time of recruitment. Parity distribution showed that primigravidae constituted the largest group (39.2%), followed by women in their second (21.6%) and third (16.8%) pregnancies. Only one participant (0.8%) reported a sixth pregnancy.

3.2 Association between Sociodemographic Variables and Malaria Prevalence

Chi-square analysis revealed no statistically significant association between malaria prevalence and age group ($p = 0.8211$), marital status ($p = 1.0000$), occupation ($p = 0.3893$), educational level ($p = 0.3793$), or trimester of pregnancy ($p = 0.2589$) as shown in Table 2. However, parity demonstrated a statistically significant association with malaria prevalence ($p = 0.0265$). Higher prevalence rates were observed among women in their third (52.4%) and fourth (56.3%) pregnancies. The single participant in her sixth pregnancy tested positive (100%), although this finding should be interpreted cautiously due to the very small sample size in that category. Overall, parity was the only sociodemographic or obstetric variable significantly associated with malaria infection in this study population.

3.3 Risk Factors and Malaria

Exposure to mosquito-infested areas was associated with a higher prevalence of malaria (43.9%) compared to those not exposed (32.4%), although this difference was not statistically significant (p = 0.2) (Table 3). Participants who did not use insecticide-treated nets had a slightly higher prevalence (40.5%) compared to those who reported using them (36.1%), but this association was not statistically significant (p = 0.6).

Regarding mosquito repellent use, participants who always used repellents had the lowest prevalence (28.6%). In contrast, prevalence was higher among those who used repellents rarely (42.0%) or sometimes (43.1%), and among those who did not use repellents at all (20.0%). However, no statistically significant association was found between repellent use and malaria prevalence (p = 0.4).

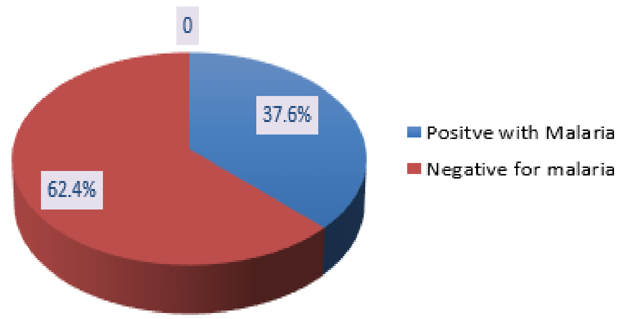

Figure 1: Overall Prevalence Rate of malaria among the study participants

Table 1: Socio-demographical Features of the Study Participants

Variables (N=125)	Categories	No. Tested	%
Age Group (Years)	15-19	1	0.8
	20-24	14	11.2
	25-29	48	38.4
	30-34	39	31.2
	35-39	18	14.4
	40 and above	5	4
Marital Status	Single	2	1.6
	Married	123	98.4
	Divorced	0	0
	Widowed	0	0
Occupation	Self-employed	73	58.4
	Employed	37	29.6
	Unemployed	6	4.8
	Student	9	7.2
Educational Level	Primary	0	0
	Secondary	46	36.8
	University/Tertiary	79	63.2
	Antenatal Features		
Trimester	1st(1-3month)	7	5.6
	2nd (4-6 month)	60	48
	3rd(7-9month)	58	46.4
Parity	1st	49	39.2
	2nd	27	21.6
	3rd	21	16.8
	4th	16	12.8
	5th	9	7.2
	6th	1	0.8
Total		125	100.0

Table 2: Prevalence of Malaria in relation to sociodemographic features

Variables	Categories	No. Tested	No. Positive	Prevalence (%)	P-value
Age group	15-19	1	0	0	0.8211
	20-24	14	5	35.71	
	25-29	48	17	35.42	
	30-34	39	14	35.9	
	35-39	18	8	44.44	
	40 and above	5	3	60	
Marital status	Single	2	1	50	1.0000
	Married	123	46	37.4	
Occupation	Employed	37	15	40.54	0.3893
	Self-employed	73	29	39.73	
	Unemployed	6	2	33.33	
	Student	9	1	11.11	
Educational Level	Secondary	46	15	32.61	0.3793
	Tertiary	79	32	40.51	
Trimester	1st	7	1	14.29	0.2589
	2nd	60	26	43.33	
	3rd	58	20	34.48	
Parity	1st	49	19	38.78	0.0265
	2nd	27	6	22.22	
	3rd	21	11	52.38	
	4th	16	9	56.25	
	5th	9	0	0	
	6th	1	1	100	
	Not specified	2	1	50	
Total		**125**	**47**		

Table 3: Risk factors associated with the prevalence of malaria among the study participant

	Categories	No. Tested	Positives	Prevalence (%)	P_value
Exposure to mosquito infested area	No	68	22	32.4	0.2
	Yes	57	25	43.9	
Use of insecticide treated net	Yes	83	30	36.1	0.6
	No	42	17	40.5	
Often use of mosquito repellant	Rarely	50	21	42.0	
	Sometimes	37	16	43.1	0.4
	Always	28	8	28.6	
	Not at all	10	2	20.0	
Total		**125**	**47**		

4. Discussion

This study evaluated the prevalence and associated factors of malaria parasitemia among pregnant women attending antenatal care at St. Charles Borromeo Specialist Hospital, Onitsha, Anambra State, Nigeria. The overall malaria prevalence of 37.6% as shown in figure 1 indicates that more than one-third of the study population had laboratory-confirmed parasitemia at the time of assessment, underscoring the persistent burden of malaria in pregnancy in this region. This aligns with the 2023 WHO malaria report which showed that the highest rates of malaria exposure during pregnancy were observed in West Africa (39.3%) and Central Africa (40.1%), while the sub-region of East and Southern Africa had a relatively low prevalence of 27.0% (WHO, 2023; Minwuyelet *et al*., 2025).

4.1 Malaria Prevalence in Context

The prevalence of 37.6% (figure 1) observed in this study is consistent with several Nigerian studies reporting moderate to high malaria prevalence among pregnant women, though regional variation remains substantial. For example, prevalence as low as 7.7% has been reported in Lagos and as high as 53.9% in Katsina (Gontie *et al*., 2020; Shulman *et al*., 2003; Oyerogba, *et al*., 2023). In contrast, studies conducted in other sub-Saharan African countries reported lower prevalence rates, including 13.2% in the Democratic Republic of Congo, 4.1% in Tanzania, and 3.8% in Mozambique (Sisay, *et al*., 2024). These differences highlight the heterogeneous epidemiology of malaria across sub-Saharan Africa and emphasize the influence of local transmission intensity, vector ecology, climatic conditions, and the effectiveness of national malaria control programs (Laydon *et al*., 2025). Given the well-established association between malaria in pregnancy and adverse outcomes such as maternal anemia, placental malaria, low birth weight, and preterm delivery, the persistence of this burden represents an ongoing threat to maternal and neonatal health (Minwuyelet *et al*., 2025).

4.2 Sociodemographic and Obstetric Characteristics

The majority of participants were within the 25–29-year age group (38.4%), followed by those aged 30–34 years (31.2%), reflecting the peak reproductive age commonly observed in antenatal clinic populations in Nigeria. Most participants were married (98.4%), self-employed (58.4%), and had attained tertiary education (63.2%). The relatively high level of education may reflect the urban setting of the study hospital and could influence health literacy and preventive practices (Wang *et al*., 2020). Some of these findings particularly as it regards to age and marital status align with reports from different studies indicating that most pregnant fall within similar age range and are married (Salako *et al*.,2025; Nwabueze *et al*.,2023).

A significant number of participants were observed in the second (48.0%) and third (46.4%) trimesters, with only 5.6% in the first trimester. This pattern aligns with reports of delayed antenatal booking in many Nigerian settings (Ebeigbe & Igberase 2010; Aliyu & Dahiru 2017; Olufemi *et al*., 2022). Late initiation of antenatal care may reduce timely access to preventive interventions such as intermittent preventive treatment in pregnancy (IPTp), potentially influencing malaria outcomes.

Primigravidae constituted the largest proportion of participants (39.2%). This aligns with findings reported by Peter-Kio & Ofonime (2026) studies where 35.0% of primigravidae mothers had malaria, indicating that primigravidae mothers had a higher prevalence of malaria. This obstetric distribution is particularly relevant given the established relationship between parity and malaria susceptibility in endemic regions.

4.3 Sociodemographic Factors and Malaria Infection

No statistically significant associations were observed between malaria parasitemia and age, marital status, occupation, educational level, or trimester of pregnancy. This suggests that, in this setting, malaria transmission may be influenced more strongly by ecological and environmental exposure factors than by individual-level socioeconomic characteristics. This finding diverges from earlier studies. For instance, Gontie *et al*. (2020) reported that women with secondary or higher education were less likely to have malaria compared to those without formal education. Similarly, Dosoo *et al*. (2020) observed a significant association between occupation and malaria prevalence, with professionals demonstrating lower infection rates. These discrepancies may reflect differences in endemicity, study design, sample composition, or levels of heterogeneity in socioeconomic variables across study populations.

However, parity was significantly associated with malaria prevalence ($p = 0.0265$), with multigravidae exhibiting higher infection rates compared to primigravidae. This contrasts numerous studies that typically demonstrate higher susceptibility in primigravidae (first pregnancy) due to lack of immunity. For instance, Fried & Duffy (2017) stated clearly that successive pregnancies confer partial immunity against placental-binding *Plasmodium falciparum* variants, thereby reducing susceptibility in multigravid women. Again, our findings contradict those of Jaffer *et al*. (2019) and Asiwome *et al*. (2022), who demonstrated that primigravidae are at significantly higher risk of malaria parasitemia and placental infection compared to multigravidae. Similarly, Walker *et al*. (2015) reported increased vulnerability among primigravidae and secundigravidae due to limited pregnancy-specific acquired immunity. Their finding is biologically plausible and consistent with established immunological mechanisms in malaria-endemic settings (Uba *et al*., 2021; Abdullahi *et al*., 2025).

However, our findings align with records by Emmanuel *et al*., (2024) who reported that the highest occurrence of malaria infection was observed in women with multiple pregnancies (multigravida). The results of this study also, were in line with those of Suliman *et al*. (2021) and Kiemde *et al*. (2024), which showed that women who have had multiple pregnancies are the most susceptible group and that the number of prior pregnancies has no bearing on protective immunity during pregnancy.

Several explanations may account for the discrepancy observed in this study. First, subgroup sample sizes for higher parity categories were small, including a single participant in the sixth pregnancy category. Small cell counts may inflate prevalence estimates and compromise the reliability of chi-square analysis. Second, parity may be acting as a proxy for other unmeasured factors, such as cumulative environmental exposure, household size, or differences in preventive practice adherence. Third, the cross-sectional design precludes assessment of temporal relationships or causality.

Given these considerations, the observed association between parity and malaria infection should be interpreted cautiously. It may represent a context-specific pattern or a statistical artefact rather than a true biological reversal of established immunity trends. Further studies using larger samples and multivariable analysis are needed to clarify this relationship.

4.4 Risk Factors and Preventive Practices

Although higher malaria prevalence was observed among women exposed to mosquito-infested areas (43.9%) and among those who did not use insecticide-treated nets (40.5%), these associations were not statistically significant. A lower prevalence was noted among consistent users of mosquito repellents (28.6%), though this relationship also lacked statistical significance. These observations align with reports by Das *et al*., (2024) and Abdullahi *et al*., (2025) which state that insecticide-treated nets (ITNs) are a very efficient way to prevent malaria, and research investigations have consistently shown that pregnant women who disregard using ITNs are at higher risk of contracting the disease.

There were no statistically significant associations identified between malaria prevalence and risk factors such as exposure to mosquito-infested areas, use of insecticide-treated nets (ITNs), and use of mosquito repellents. The observed prevalence rate aligns with previous studies conducted by Oladosu & Adeniyi (2023) which recorded no significant association between malaria prevalence and the use of some preventive measures including ITNs use and use of mosquito repellants in this case. In this study it is noted that there is a lower rate of prevalence of malaria among pregnant women who make use of insecticide-treated nets (ITN). This is consistent with previous studies which reported that pregnant women who did not use ITNs as frequently as those who did were more susceptible to malaria (Oladosu & Adeniyi 2023; Yakubu *et al*., 2018; Fana *et al*., 2015).

5. Conclusion

This study demonstrated that malaria prevalence among pregnant women in Onitsha remains substantial at 37.6%. Parity was significantly associated with malaria infection ($p = 0.0265$), with multigravidae at higher risk than primigravidae. These findings reinforce existing evidence that malaria continues to pose a significant threat to maternal and fetal health in Nigeria and across sub-Saharan Africa. Parity could contribute to the observed effects, and future larger studies are needed to validate this.

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Disclosure of conflict of interest

The authors have declared that no competing interests exist.

Statement of ethical approval

All authors declare that all experiments have been examined and approved by the Saint Charles Borromeo Specialist Hospital Research Ethics committees. Therefore, the study is performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

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