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Malaria in Pregnancy and Associated Factors Among Antenatal Clients in A Rural Tertiary Hospital in Southern Nigeria

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Abstract **Original Research**

Introduction: Malaria in Pregnancy has detrimental effects on both the mother and the unborn child. Despite concerted efforts to prevent it, prevalence of malaria in pregnancy and its attendant complications are still very high in endemic region. This study was done to assess the prevalence of malaria and its associated factors in pregnant women.

Method: This is a hospital-based cross-sectional study conducted among pregnant women attending a tertiary hospital Antenatal clinic. Questionnaire was administered to consented participants. Thick and thin films stained with giemsa stain viewed under microscope were used for detecting malaria parasites.

Result: The prevalence of malaria was 32.9%, Age, Religion, and the use of Insecticide-treated mosquito nets were significantly associated with Malaria in pregnancy; p-value <0.001.

Conclusion: The Prevalence of Malaria infection is high among the pregnant women. Targeted programmes are needed for control of malaria among primigravida and women in their 3rd trimester of pregnancy. More women should be encouraged to use mosquito net.

Keywords: Malaria, pregnancy, Antenatal, Rural, Nigeria.

INTRODUCTION

Malaria is endemic in over 100 countries and placed a high number of their population at risk.[1] Global burden of malaria in 2024 included approximately 282 million cases and 610,000 deaths.[2] The disease disproportionately affects the WHO African Region, which bears 95% of all cases and deaths.[2] Malaria poses a significant public health challenge in Sub-Saharan Africa where poverty, limited healthcare access, insecticide/drug resistance, environmental, housing, climate-driven migration and

socioeconomic factors drive its spread.[3,4,5] It is transmitted through the bite of infected female anopheles mosquitoes, a vector for the transmission of *plasmodium* species.[6] *Plasmodium falciparum* is the most virulent of the *plasmodium* species resulting in severe morbidity and mortality.[6] Nigeria has the highest Malaria burden in Sub-Saharan Africa, accounting for 24.3% of the global malaria cases and over 30.3% Deaths.[6] Malaria is a preventable and curable life threatening disease. Pregnant women, infants, children less than 5years, and immunosuppressed are more susceptible and at higher risk of severe infection. Pregnancy reduces immunity to malaria, making women more susceptible to infection, higher parasite densities, and severe disease. *Plasmodium* species, especially, *P. falciparium* can sequester in the placenta (placenta malaria), causing inflammation that restricts fetal growth.[7]

Malaria in pregnancy is a serious medical condition causing approximately 11% of maternal deaths and complicating 8.4% to 58.1% of pregnancies.[8] Malaria in pregnancy is major condition that increases the risk of severe maternal anaemia, miscarriage, stillbirth, preterm delivery, low birth weight, congenital malaria, and infant mortality, particularly in the first pregnancy.[9] Despite the efforts made in reducing malaria morbidity and mortality by distribution of insecticide-treated net (ITN), Rapid Diagnostic Tests (RDT), Intermittent Prophylactic Antimalarial Treatment in Pregnancy, Artemisinin-based Combination Therapy (ACTs), environmental management, production of malaria vaccines, larva and vector controls, the disease still remains a major public health challenge amongst pregnant women in Nigeria. In Nigeria, about 300,000 lives of children and pregnant women are lost annually to malaria[3,5,10] Studies on malaria pregnancy in Nigeria revealed high prevalence rates ranging from 11% to 67%, with placental malaria rates estimated around 38.4%.[11] In a study done in Katsina, the prevalence of malaria in pregnancy was high (72%).[12] People within the age range of 25-29years were mostly affected. Least prevalence was in first trimester; while multiparous women had the highest infection rate.[7] This contrasted a study done in Okada community of Edo state, which had a prevalence of 50.7%[13] and highest malaria in pregnancy occur among women within the age range of 15-25years, and primigravida. It was noticed in the study that there was inadequate insecticide treated net and poor intake of Intermittent Prophylactic Antimalarial (IPT).[13] Prevalence of malaria in pregnancy is notably higher in rural compared to urban region. Documented challenges on prevention include slow policy implementation or uptake, preventive measure gaps and economic burden. Factors contributing to high risk include, low socioeconomic status, poor accessibility and poor utilization of ANC services in rural areas, age, and literacy level.[14]

The last time Malaria in pregnancy study was carried out in this study area was over a decade ago.[15] The changes in the sociodemographic characteristics, preventive and therapeutic measures, and new diagnostic measures thereby made the available information in the study obsolete, creating a huge knowledge gap. Consequently, this study is very important and timely in order to reveal current situation and data in this area. The aim of this study is to determine the prevalence and pattern of malaria in pregnancy and its associated factors among Antenatal clients of a rural hospital in Southern Nigeria as model of occurrence in the region. Research Questions are: What is the prevalence of malaria infection among the Antenatal patients in ISTH and what are the factors associated with malaria in pregnancy among Antenatal patients in ISTH.

MATERIALS AND METHODS

Study Design and Setting

The study was descriptive cross-sectional design carried out at the Antenatal Clinic in Irrua Specialist Teaching Hospital, Irrua, in Edo state, a rural community in south-south geopolitical zone of Nigeria. The state is bounded by Delta state to the South, Kogi state to the north, Ondo state to the west and the river Niger to the Eastern border. The hospital is a 550 bed hospital located along Benin Abuja expressway in Irrua, a semi urban area and headquarters of Esan Central Local Government

Area of Edo State. It serves all the three senatorial districts as well as Delta, Kogi, and Ondo State, and the people of the region are predominantly farmers and traders from low and medium income settings. There are also civil servants as well as artisans. The hospital offers residency training programs in many specialties. It is the centre of excellence for viral haemorrhagic fevers and emerging pathogens in Nigeria.

Study population and participants:

The study population was pregnant women attending the Antenatal care clinic (ANC) of ISTH Irrua. Two hundred and twenty five participants who granted informed consent were recruited from the study population by systematic random sampling method. The criteria for exclusion were those treated for malaria within four weeks prior to the study and presence of co-morbidities such as diabetes mellitus, depression and HIV

Sample size and sampling technique:

The minimum sample size for the study was determined using the formula for proportion; $n=z^2pq/d^2$, where 'n' is the desired sample size, 'z' is the normal standard deviation for the required level of confidence (1.96), 'p' is the estimated prevalence of 17.8% or 0.178 from a previous study[16], 'q' is 1-p and 'd' is the tolerable margin of error (set at 5% or 0.05). This gave a calculated sample size of 224.84, which was rounded up to 225 pregnant women as sample size for the study. Eligible participants were consecutively recruited by systematic random sampling till the sample size was obtained.

Ethical consideration:

Ethical approval was obtained from the Ethical Review Committee of ISTH, Irrua and informed consent was obtained from each participant. The study was conducted in line with the Helsinki guidelines of 1975 on the conduct of human experiments.

Data collection:

Data collection was done using a semi-structured questionnaire, administered on consenting participant who met the inclusion criteria for the study. The questionnaire contains information regarding sociodemographic and clinical characteristics such as age, sex (gender), marital status, occupation, education level, place of residence, gravidity, current trimester, estimated gestational age of booking, use of Insecticide-treated mosquito net (ITN) and use of Intermittent Prophylactic antimalarial (IPT).

Duration of the study

The duration of the study was a month after ethical approval

Testing for Malaria parasite

Under aseptic procedure, venepuncture was done and about 1 ml of blood was collected into an EDTA bottle, thin and thick blood smears were made on clean glass slide and stained with giemsa in accordance with the WHO standard and viewed under compound light microscope for malaria parasite.

Data analysis

Data were analysed by descriptive and inferential statistics using Statistical Package for Social sciences (SPSS), IBM SPSS Statistics for windows, Version 20.0, Armonk, NY: IBM Corp. Level of significance was set at *P* value of less than 0.05 or 95% confidence interval (CI).

RESULTS

Sociodemographic characteristics of Pregnant Women attending Antenatal Clinic (ANC) in ISTH

Table 1 shows the sociodemographic characteristics of women attending ANC in ISTH. The mean age was 31.53 (SD = 6.03) years, with the majority

(54.7%) aged 25–34 years. Most respondents were Christians (95.1%) and married (98.2%). In terms of reproductive characteristics, 38.2% were nulliparous, while 31.1% were primiparous. Similarly, 31.1% have either been pregnant once or twice, and the majority (59.6%) was in their third trimester. The predominant ethnic group was Esan (65.8%). Most respondents had tertiary education (67.6%), and over half (50.7%) were engaged in business or trading.

Table 1: Sociodemographic characteristics of ANC attendees in ISTH
N = 225

Variables	Frequency (n)	Percentage (%)
Age (in years)		
15 to 24	28	12.4
25 to 34	123	54.7
35 and above	74	32.9
Mean age 31.53 (± 6.03)		
Religion		
Christianity	214	95.1
Islam	11	4.9
Marital Status		
Single	4	1.8
Married	221	98.2
Parity		
Nulliparous (0 childbirth)	86	38.2
Primiparous (1 childbirth)	70	31.1
Multiparous (2 to 4 Childbirth)	63	28.0
Grand-parous (5 or more childbirth)	6	2.7
Gravidity		
1 to 2	70	31.1
3 to 4	63	28.0
5 or more	6	2.7
Trimester		
First Trimester	10	4.4
Second Trimester	81	36.0
Third Trimester	134	59.6
Ethnicity		
Esan	148	65.8
Bini	14	6.2
Etsako	18	8.0
Igbo	16	7.1
Yoruba	6	2.7
Hausa	1	.4
Others	22	9.8
Level of Education		
Primary	6	2.7
Secondary	67	29.8
Tertiary	152	67.6
Occupational Status		
Unemployed	4	1.8
Self Employed	46	20.4

Student	10	4.4
Business/Trader	114	50.7
Civil Servant	18	8.0
Professional	20	8.9
Teacher	13	5.8

PREVALENCE OF MALARIA INFECTION AMONG PREGNANT WOMEN ATTENDING ANC in ISTH

Table 2 shows the prevalence of malaria infection among pregnant women attending ANC in ISTH. Out of the total respondents (N = 225), 32.9% tested positive for malaria infection, while the majority (67.1%) tested negative.

Table 2: Prevalence of Malaria Infection among Pregnant Women Attending ANC in ISTH
N = 225

Variables	Frequency (n)	Percentage (%)
Malaria Test		
Negative	151	67.1
Positive	74	32.9

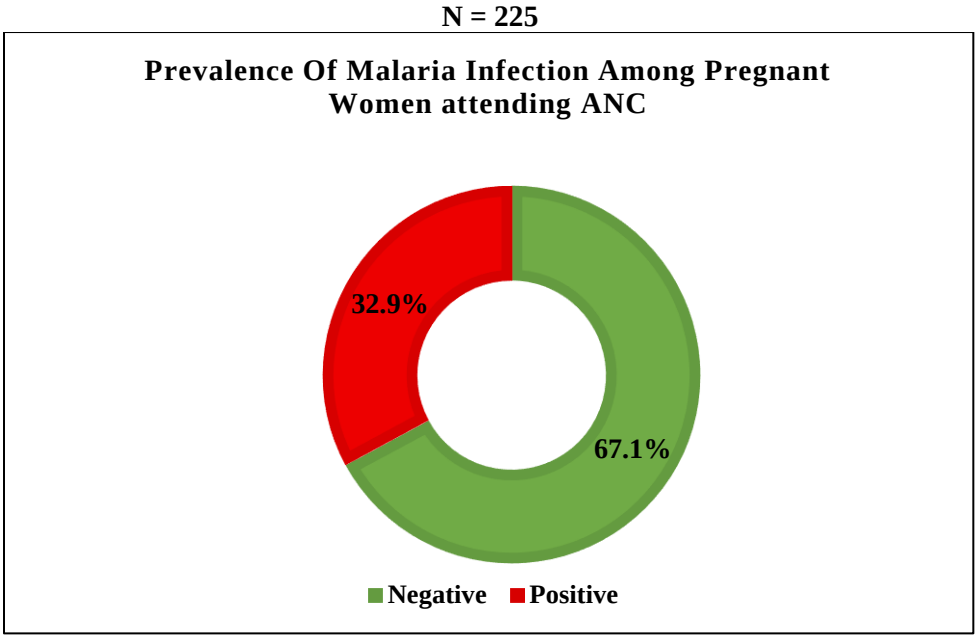

Figure 1: Prevalence of Malaria Infection among Pregnant women attending ANC.

Sociodemographic Factors Associated with Malaria in Pregnant Women attending ANC in ISTH

Table 3 shows the association between socio-demographic characteristics and malaria infection among pregnant women attending ANC. There was a statistically significant association between age group and malaria infection ($\chi^2 = 7.763$, $p = 0.021$). A higher proportion of malaria infection was observed among respondents aged 25–34 years (39.8%), followed by those aged 35 years and above (28.4%), while the lowest proportion was observed among respondents aged 15–24 years (14.3%).Similarly, there was a statistically significant association between religion and malaria infection ($\chi^2 = 8.316$, $p = 0.007$), with a higher proportion of infection observed among respondents practicing Islam (72.7%) compared to those practicing Christianity (30.8%).There was no statistically significant association between marital status and malaria infection ($\chi^2 = 0.540$, $p = 0.600$). Likewise, parity was not significantly associated with malaria infection (Fisher's exact = 7.142, $p = 0.060$), although higher proportions of infection were observed among primiparous (38.6%) and multiparous (39.7%) respondents. In addition, there was no statistically significant association between gravida and malaria infection ($\chi^2 = 1.694$, $p = 0.429$), nor between trimester and malaria infection ($\chi^2 = 4.758$, $p = 0.091$). However, there was a statistically significant association between ethnicity and malaria infection (Fisher's exact = 12.818, $p = 0.032$). Higher proportions of malaria infection were observed among respondents of Etsako (55.6%) and Yoruba (66.7%) ethnic groups compared to other ethnic groups. There was no statistically significant association between level of education and malaria infection (Fisher's exact = 0.486, $p = 0.880$). Similarly, occupational status was not significantly associated with malaria infection (Fisher's exact = 5.222, $p = 0.515$).

Table 3: Sociodemographic Factors Associated with Malaria in Pregnant Women attending ANC

Socio-Demographic Characteristics	Malaria Infection		Total n= 225 (%)	χ2 or Fisher's Exact	p value
	Absent n = 151 (%)	Present n = 74 (%)			
Age Group					
15 to 24	24 (85.7)	4 (14.3)	28 (100.0)	**7.763**	**0.021***
25 to 34	74 (60.2)	49 (39.8)	123 (100.0)		
35 and above	53 (71.6)	21 (28.4)	74 (100.0)		
Religion					
Christianity	148 (69.2)	66 (30.8)	214 (100.0)	**8.316**	**0.007***
Islam	3 (27.3)	8 (72.7)	11 (100.0)		
Marital Status					
Single	2 (50.0)	2 (50.0)	4 (100.0)	0.540	0.600
Married	149 (67.4)	72 (32.6)	221 (100.0)		
Parity					
Nulliparous	64 (74.4)	22 (25.6)	86 (100.0)	7.142	0.060
Primiparous	43 (61.4)	27 (38.6)	70 (100.0)		
2 to 4 Childbirth	38 (60.3)	25 (39.7)	63 (100.0)		
(Multiparous)	6 (100.0)	0 (0)	6 (100.0)		
5 or more childbirth(Grand-parous)					
Gravidity					
1 to 2	107 (68.6)	49 (31.4)	156 (100.0)	1.694	0.429
3 to 4	32 (60.4)	21 (39.6)	53 (100.0)		
5 or more	12 (75.0)	4 (25.0)	16 (100.0)		

Trimester					
First Trimester	7 (70.0)	3 (30.0)	10 (100.0)	4.758	0.091
Second Trimester	47 (58.0)	34 (42.0)	81 (100.0)		
Third Trimester	97 (72.4)	37 (27.6)	134 (100.0)		
Ethnicity					
Esan	105 (70.9)	43 (29.1)	148 (100.0)	**12.818**	**0.032***
Bini	8 (57.1)	6 (42.9)	14 (100.0)		
Etsako	8 (44.4)	10 (55.6)	18 (100.0)		
Igbo	14 (87.5)	2 (12.5)	16 (100.0)		
Yoruba	2 (33.3)	4 (66.7)	6 (100.0)		
Hausa	1 (100.0)	0 (0)	1 (100.0)		
Others	13 (59.1)	9 (40.0)	22 (100.0)		
Level of Education					
Primary	4 (66.7)	2 (33.3)	6 (100.0)	0.486	0.880
Secondary	47 (70.1)	20 (29.9)	67 (100.0)		
Tertiary	100 (65.8)	52 (34.2)	152 (100.0)		
Occupational Status					
Unemployed	2 (50.0)	2 (50.0)	4 (100.0)	5.222	0.515
Self Employed	35 (76.1)	11 (23.9)	46 (100.0)		
Student	6 (60.0)	4 (40.0)	10 (100.0)		
Business/Trader	73 (64.0)	41 (36.0)	114 (100.0)		
Civil Servant	14 (77.8)	4 (22.2)	18 (100.0)		
Professional	14 (70.0)	6 (30.0)	20 (100.0)		
Teacher	7 (53.8)	6 (46.2)	13 (100.0)		

RELATIONSHIP BETWEEN USE OF INSECTICIDE-TREATED MOSQUITO NET AND MALARIA IN PREGNANCY

Table 4 showed that about a third of the participants uses mosquito-net while rest did not. Only 2 out of 72 participants who used the net had malaria parasitaemia; as against those who did not use nets, where almost half had malaria. There is statistically significant difference between those who used and those who did not use mosquito nets.

TABLE 4: Relationship between Uses of Insecticide-Treated Mosquito Net and Malaria in Pregnancy

Mosquito net used / Malaria parasite	YES	NO	TOTAL
MP seen	**2(0.89%)**	**72(32.00%)**	**74(32.89%)**
MP not seen-	**70(31.11%)**	**81(36.00%)**	**151(67.11%)**
TOTAL	**72(32.00%)**	**153(68.00%)**	**225(100%)**

MP (Malaria parasite); Chi-square $\chi^2 = 2.243$; p-value = 0.0001* * significant

RELATIONSHIP BETWEEN USES OF INTERMITENT PROPHYLATIC ANTIMALARIA AND MALARIA IN PREGNANCY

Table 5 revealed that there is no statistically significant difference between those who used Sulphadoxine-Pyrimethamine (SP) and those who did not. (P-value = 0.091). Sixty four percent of the women used SP. Thirty eight out of the 144 women who used SP (26.39%) had malaria parasitaemia.

TABLE 5: Relationship between Uses of Intermittent Prophylactic Antimalarial and Malaria in Pregnancy

Use of IPT / MP Microscopy	IPT Used				IPT not Used	TOTAL
	1 dose	2 doses	3 doses	subtotal	Zero dose	
MP Seen	14	18	6	**38**	**36**	**74(32.89%)**
MP not seen	50	26	30	**106**	**45**	**151(67.11%)**
SUBTOTAL	64	44	36	**144**	**81**	**225(100%)**
TOTAL	**144(64.00%)**				**81(36.00%)**	**225(100%)**

Chi square $\chi^2 = 3.484$; p-value = 0.091 * significant

DISCUSSION

Two hundred and twenty five antenatal clinic attendees of a rural tertiary hospital in South-south geopolitical zone of Nigeria were recruited to determine the prevalence and factors associated with malaria in pregnancy in the area. Majority were within ages of 25 years and 34 years; their mean age being 31.53 years. This age range is comparable with other hospital-based studies in southern Nigeria.[14] However, young age group predominates in Northern Nigeria due to religious and cultural practices encouraging early marriage and motherhood.[12, 17] Just like the Ibadan study by Oyerogba et al, age is significantly associated with malaria in pregnancy.[20] The women within age range of 25 to 34 years are more predisposed to malaria than the other age groups. In most other studies, age was not a significant predisposing factor to malaria in pregnancy.[8,10-14,16,17]

In accord with the established general delayed antenatal care booking in Nigeria, the average gestational age at booking in the country being between 21st and 24th weeks of pregnancy; most women in this study are in their third trimester.[18,19] Attributable factors for late booking are financial constraints, ignorance, and the perception that the booking is "problem free"[19]

More than two-third of the women in this study had tertiary education. This was not surprising as the study site is a Teaching hospital affiliated to a nearby University and general level of education in the area is high. Furthermore, the religious and culture practices here did not discourage girl-child's formal education; hence the high level of education found in this study. However, educational level is not a determinant of malaria in pregnancy in this study, probably because of good level of enlightenment of some unlearned participants in the study compensates for the lack of formal education. This study contrast findings in Ibadan, Kastina and Kano, where level of education was a major predisposing factor to malaria in pregnancy.[12,17,20] Contrary to the findings Lawal et al[12] in Katsina and Oyerogba et al[20] in Ibadan, where occupation in addition to level of education was a significant associated risk factor to malaria in pregnancy; occupation is not significantly determinant of malaria in pregnancy in the study. Other factors that were not significantly associated to malaria in pregnancy are: gravidity, marital status, parity, gravidity and gestational age/trimester.

Similar to Ibadan study by Oyerogba et al, religion of the participants is a determinant of malaria in pregnancy in this study. Majority of the women (214) in this study were Christian, but only 30.8% Christians had malaria; whereas 72.7% of the Muslim participants had malaria in pregnancy. The reason for this disparity in prevalence of malaria in pregnancy across religious divide is not known and it's a subject of further investigation. Oyerogba et al also decovered religion as a determinant of malaria parasitaemia in pregnancy in Ibadan.

The prevalence of malaria in pregnancy in this study being 32.9% is high; but it's still within the National prevalence range of malaria in pregnancy in Nigeria. It is lower than the general prevalence value of 59-2% in Kano.[17] Prevalence of malaria in rural rainforest of Nigeria at Irrua was expected to be higher than the urban savannah region of the Kano, but it was not so. But the prevalence in this study, also in a tertiary facility is higher than the prevalence value of tertiary facilities in Kano.[17] The disparity between the studies may be because sociodemographic differences and timing of the studies.

Contrary to expectation, use of intermittent antimalarial chemoprophylaxis is not associated with malaria in pregnancy. Despite its usage and the number of doses, the 26.39% of those who used Sulfadoxine-Pyrimethamine (SP) had malaria parasitaemia. There is no statistically significant difference between those who used SP and those who did not. This may not be unconnected to evolving plasmodium resistance to SP and other antimalarial agents.[21]

Lastly, use of Insecticide-treated mosquito net is the singular most important determinant of malaria parasitaemia in pregnancy. Women sleeping under mosquito net are protected for malaria in pregnancy. This is a very important common finding by other researcher irrespective of the local and the sociodemographic differences. It is therefore important to advocate for strict adherence to the use of the net.[8,12,14,17,20]

AUTHORS' CONTRIBUTIONS

Adewuyi BT conceived the idea and conceptualized the study. The two authors were involved in literature search, development of research proposal, data collection and analysis, and writing of manuscript for publication.

DECLARATIONS

Conflict of interest: There is no conflict of interest.

Funding: Research costs were self-funded by the investigators.

Ethics: Ethics and Research Committee, Irrua Specialist Teaching

Data availability: Available from the corresponding author on reasonable request.

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