



Research Article

Prevalence of Malaria Infection among Pregnant Women Attending Some Antenatal Clinics in Gombe State, Nigeria

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ABSTRACT

Malaria continues to be a major health problem in endemic countries; it has been identified in many studies to worsen certain pregnancy outcomes, leading to an increase in morbidity and mortality. There are an estimated 100 million malaria cases with over 300,000 deaths per year in Nigeria. This study was aimed at assessing the prevalence of malaria among pregnant women living in Gombe State. A total of 725 Pregnant Women attending antenatal clinic from six selected general hospitals in Gombe State were examined, and blood samples collected from the subjects were analysed. Malaria diagnosis were carried out using standard parasitological techniques. The overall results showed that of the 725 samples examined, 31.9% were positive and 68.1% negative. The degree of parasitemia revealed mild in 78.4%, moderate in 17.3% and severe in 4.33%. Age group 21-25 (12.3%) had more infection, followed by age group 31-35 (7.31%), 26-30 (5.65%), 15-20 (4.00%), 36-40 (2.20%), 41-45(0.27%) and 46-50 (0.14%). More infections were recorded among pregnant women in their third trimester 19.7%(143) compared with those in second trimester 10.9%(79) and first trimester 1.24%(9) respectively. Malaria infection was also higher among multigravid 8.8%(136) pregnant women than among primigravid 8.41%(61) and secondigravid 4.68%(34) pregnant women. However, there was no significant difference ($P > 0.05$) between prevalence of infection with Age group, trimester and gravidity of the pregnant women. This research work has provided information at the local level on the spread of malaria parasites in pregnant women in Gombe State. There is therefore the need for increase sensitization and awareness on the effect of malaria infection in pregnancy which will in turn enhance prevention, management and control.

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INTRODUCTION

Malaria is a life threatening parasitic disease and is considered as a complex and overwhelming public health problem. Malaria has been a common disease and it continues to be one of the most widely spread health hazards in tropical and subtropical regions (Muhammad *et al.*, 2021). Five species of *Plasmodium* are known to cause malaria disease which include *Plasmodium falciparum*, *P. vivax*, *P. malariae*, *P. ovale*, and *P. knowlesi*, where *P. falciparum* and *P. vivax* being the predominant species in Africa (Esparanca *et al.*, 2010; Muhammad *et al.*, 2021). These parasites are transmitted to the human host by mosquitoes of the genus *Anopheles*. The transmission of malaria requires the interaction between the host, the vector and the parasite. Vector-borne diseases such as malaria are highly influenced by climatic factors, which enhance their transmission rate and extend their geographic presence (Rossati *et al.*, 2016). The burden of malaria infection during pregnancy is caused mainly by *Plasmodium falciparum*; the most common malaria species in Africa (Esparanca *et al.*, 2010). Malaria is the leading cause of pregnancy associated death in sub-Saharan Africa (Maitland, 2016). In sub-Saharan Africa, 25 million pregnant women are at risk for malaria, accounting for 10,000 maternal and 200,000 neonatal deaths per year (Matangila *et al.*, 2014; Mbah *et al.*, 2015). Nigeria is included among the 45 countries that are endemic for malaria, and about 97% of the population were at risk especially children and pregnant women (Hadiza *et al.*, 2018). More than 90% of the total population is at risk of malaria and at least 50% of the population suffers from at least one episode of malaria per year; beyond the impact on pregnant women and children it affects the population at large (Osaro *et al.*, 2019; WHO, 2012). Malaria has been shown in many

studies to worsen certain pregnancy outcomes. These include an increased incidence of anaemia and spontaneous abortions. Others include intrauterine growth restriction [IUGR], stillbirths, prematurity, low birth weight, fetal distress and congenital malaria (Rogerson *et al.*, 2007; Bawa *et al.*, 2014; Oyefabi *et al.*, 2015). Falciparum malaria during pregnancy has long been recognized as an important determinant of low birth weight of newborns. Low birth weight (LBW) which is defined as the birth weight of less than 2.5 kg is usually more marked in primigravidae but can extend to second and third gravidae in areas of low malaria transmission (Obianumba, 2012). A prevalence of placental parasitaemia of between 10 and 45% in malaria endemic areas has been reported with significant *Plasmodium falciparum* dominance (Enato *et al.*, 2007a; Desai *et al.*, 2007). Intraplacental parasitemia has also been shown to increase with gestational age, with the highest risk of infection being in the second trimester and often extending to the immediate postpartum period (Okpere *et al.*, 2010). The effect of malaria in pregnancy is worse in the first and second pregnancies compared to higher parities (Okpere, *et al.*, 2010). The primary tool for the control of malaria in many parts of Africa remains the early diagnosis and treatment of clinical cases of malaria (Wilfred *et al.*, 2010). Prompt, effective and well tolerated treatment, through the use of antimalarial drugs remains one of the cornerstones in the disease management, as there is no suitable vaccine for the disease (Wiriyaporn *et al.*, 2014; Eric *et al.*, 2015; Muhammad *et al.*, 2021). Management and control of malaria in pregnancy is enhanced by the availability of local prevalence statistics. Therefore, the study determines the prevalence of *P. falciparum* parasitaemia in relation to parity and trimester among pregnant women in Gombe State.

MATERIALS AND METHODS

Study Area

Gombe State located in the Northeastern part of Nigeria, is one of the country's 36 States; its capital is Gombe. The State has an area of 20,265 Km² and a population of around 2,365,000 people as of 2006. Gombe has two distinct climates, the dry season (November–March) and the rainy season (April–October). The mean annual rainfall ranges from 700 mm to 850 mm, while ambient temperature ranges from 24-34 °C and relative humidity ranges from 55-65%. Six Local Government Areas namely Akko, Billiri, Deba, Dukku, Gombe and Kaltungo, roundomly selected from the three geopolitical zones of Gombe State were used for this study.

Ethical Clearance

The research proposal was submitted to Gombe State Ministry of Health for approval. After consideration, an approval with the reference number MOH/ADM/621/VOL1/211 was obtained from the ethical committee.

Consent and Inclusion Criteria

During data collection, individuals were informed about the purpose of the study. Verbal and or written consent were obtained from relevant authorities and the study participants at the Primary Health Cares in the study area after briefing them about the purpose of the research. Confidentiality and the right not to participate or withdraw at any time in the study was assured. Laboratory investigations were free of charge for the purpose of this study. All women who self-identified as pregnant, give their consent and lived in the communities where the health facility is located were allowed for the study.

Sample Size Determination

The sample size was determined using the standard formula for calculation of minimum sample size (Osaro *et al.*, 2019).

$$n = Z^2pq/d^2$$

Where:

n = minimum sample size

z = standard normal deviation and probability.

p = prevalence or proportion of value to be estimated from previous studies.

q = Proportion of failure (= 1 - P)

d = precision, tolerance limit, the minimum is 0.05.

Study Subjects

A total of seven hundred and twenty five (725) consented volunteer pregnant women attending antenatal at Primary Health Cares in the study area were used as the study subjects for the research.

Sample Size

A total of 725 blood samples were collected from pregnant women of varying age ranging from 18 to 50 years, attending Clinics in study area.

Specimen collection/ Microscopy

Blood samples were obtained from selected pregnant women using venous blood collection process. The collection was carryout by experts in the medical field. The blood samples were collected in EDTA bottles. The subjects were swabbed with 70% alcohol and care was taken while using syringes to avoid excessive bleeding.

Determination of malaria parasites

Thick blood smear from each of the specimen was made on a clean grease-free glass slide and stained with 10% Giemsa stain to determine by microscopy, the species of malaria parasites and parasite density according to earlier published protocol (Cheesbrough, 2010). All stained slides were examined by microscopy using 100 power fields under oil immersion.

Determination of degree of parasitemia

Peripheral parasite density was calculated by using an assumed WBCs count of 8000/ μ L of blood (WHO, 2010a). Parasitemia with

absolute parasite density of less than 1000 per microliter of blood (<1000 parasites/ μ l) was graded as low parasitemia; however, parasitemia with absolute parasite density of greater than 1000 per microlitre of blood but less than 10,000 per microlitre of blood (>1000 to 9,999 parasites/ μ l) was graded as moderate parasitemia while parasitemia with absolute parasite density of greater than 10,000 per microlitre of blood (>10,000 parasites/ μ l) was graded as high parasitemia.

Data Analysis

The data obtained were subjected to statistical analysis using statistical package for Social Sciences (SPSS) version 23 to determine any significant relationship between: age, gravidity and Trimester stages of pregnancy. The results were expressed as mean and sum of error mean. Chi-squared test was performed to determine relationships. Differences of means were considered significant at a 95% confidence limit.

RESULTS

Out of the 725 blood samples that were examined for malaria, 31.9% had infection while 68.1% were not infected (Table 1). The results in Table 2 show that the degree of parasitemia was mild in 78.4%, moderate in

17.3% and severe in 4.33% respectively. In Table 3 the result shows that, age group 21-25 years recorded the highest prevalence rate of 12.3%, followed by age group 31-35, 26-30, 15-20 and 36-40 with the prevalence rate of 7.31%, 5.65%, 4.00% and 2.20% respectively; whereas age group 41-45, 46-50 had the least prevalence rate of 0.27% and 0.14% respectively. The differences observed among the various age groups were not statistically significant ($\chi^2=7.979$, $df=6$, $P>0.05$ (0.240)). The results in Table 4 revealed that, multigravid had the highest prevalence of 18.8% while primigravid and secondigravid had a prevalence rate of 8.41% and 4.68% respectively. Statistically there was no significant difference in the malaria prevalence with respect to the gravidity of the subject ($\chi^2=3.684$, $df=2$, $P>0.05$ (0.159)). The results in Table 5 show that, pregnant women in their third trimester recorded the highest prevalence 19.7%, followed by those in their Second trimester 10.9% and those in first trimester had the least prevalence 1.24%. Statistically there was no significant difference in the malaria prevalence with respect to the trimester of the subjects ($\chi^2=2.910$, $df=2$, $P>0.05$ (0.233)).

Table 1: Prevalence of malaria infection among pregnant women

Malaria Parasite (MP)	Number (Percentage)
Examined	725 (100%)
Infected	231 (31.9%)
Non-infected	494 (68.1%)

Table 2: Density of parasitemia in the blood samples examined

Density	Frequency	(%)
Mild (1-999 Parasites/ μ l)	181	78.4
Moderate (1000-9999 Parasites/ μ l)	40	17.3
Severe (>10,000 Parasites/ μ l)	10	4.33
Total	231	100

Table 3: Prevalence of malaria infection, according to the age group of the Pregnant women (N = 725).

Age Group	No. Examined	No. Infected	Percentage
15-20	81	29	4.00
21-25	322	89	12.3
26-30	127	41	5.65
31-35	148	53	7.31
36-40	39	16	2.20
41-45	7	2	0.27
46-50	1	1	0.14
Total	725	231	31.9
χ^2	7.979		
P-value	0.240		

Table 4: Prevalence of malaria infection according to parity of the Pregnant women (N = 725).

Parity	No. Examined	No. Infected	Percentage Infected
Primigravida	186	61	8.41
Secondigravida	136	34	4.68
Multigravida	403	136	18.8
Total	725	231	31.9
χ^2	3.684		
P-value	0.159		

Table 5: Prevalence of malaria infection according to their gestational age of the Pregnant women (N = 725).

Gestational age	No. Examined	No. Infected	Percentage
1 st Trimester	34	9	1.24
2 nd Trimester	275	79	10.9
3 rd Trimester	416	143	19.7
Total	725	231	31.9
χ^2	2.910		
P-value	0.233		

DISCUSSION

In this study, the results showed that 31.9% of the pregnant women were infected with malaria. The value observed among the pregnant women in this study is relatively lower than 40%, 56.7%, 62.4%, 78.4% and 92% reported in Abia, Gombe and Delta State Nigeria respectively (Ejike *et al.*, 2017; Foghi *et al.*, 2021; Ali, 2022; Muhammad *et al.*, 2021; Yoriyo and Hafsat, 2014) and the prevalence rate is higher than 18.5% and 19.5% reported in Sudan and Lagos Nigeria

respectively (Barkat *et al.*, 2019; Olukosi and Afolabi, 2018). The difference in the prevalence rate in this study compared to the previous studies could be attributed to different regions, time and season in which the studies were carried out and the environmental conditions inherent in the study area creating conducive atmosphere for the breeding of mosquito vectors. The degree of parasitemia among pregnant women in this research, shows 78.4% mild 17.3% moderate and 4.33% severe parasitemia. The result is in accordance

with that of Yoriyo and Hafsat (2014) who reported parasitemia density of 57% as low level, 26% moderate and 8% higher level. The authors suggested that, this could be attributed to the immune system which increases as trimester increases. Pregnant women within the age bracket 21-25 years recorded the highest rate of infection (12.3%), while those of the age group 46-50 years recorded the lowest prevalence rate of infection (0.14%). This might be associated with fact that, study subjects within this age bracket alone formed up to 44.4% of 725 pregnant women examined. However, the result supports the existing knowledge that high prevalence at lower ages and low prevalence at higher ages is due to the existence of natural immunity to infectious diseases including malaria, which the pregnant women acquires as the age increases (Yoriyo and Hafsat, 2014). Also the high prevalence rate was in accordance with the previous report of Yoriyo and Hafsat (2014), Muhammad *et al.* (2021) in Nigeria, and Foghi *et al.* (2021) in Gabon, who recorded high prevalence of infection among pregnant women under age range of 18-25 years. A prevalence of 19.7% and 18.8% recorded from subject in their multigravid and third trimester respectively were highest compared to those in first, second trimesters and primigravid, secondigravid. Higher prevalence of malaria infection recorded in multigravid is in accordance with the findings of K.S. and Muhammad, (2022), who also reported high prevalence among multigravid pregnant women in Gombe state, Nigeria. The finding differs to that of Hadiza *et al.* (2018), Foghi *et al.* (2021), Muhammad *et al.* (2021) and Ali, (2022). who reported higher prevalence of infection among Primigravid pregnant women. More also, the higher prevalence of malaria infection in third trimester agrees with the report of Falade *et al* (2010) but differs from that of Hadiza *et al*

(2018), Muhammad *et al* (2021), who reported higher infection among pregnant women in their first trimester. On the contrary Yoriyo and Hafsat (2014) and Ali (2022) reported higher prevalence among women in their second trimester. It has been reported that pregnant women in their second trimester were found to be the highest risk group of infection followed by third trimester while those in first trimester were the lowest risk group (Agomo and Oyibo, 2013). The variation in the prevalence rate with gravidity and trimesters in the different studies agrees with the previous report which suggest that, malarial infections vary at different trimesters of pregnancy, which might be as a result of some factors such as exposure to mosquito bite which might be due to the environment, use of preventive measures and immunogenetic constitution of the pregnant women (Amuta *et al.*, 2014).

CONCLUSION

The present study observed a prevalence of 31.9% of malaria infection among pregnant women in Gombe State, Nigeria. Prevalence were more in mild parasitaemia compared to moderate and severe parasitemia. This research work has provided information at the local level on the spread of malaria parasites in pregnant women in Gombe State. There is therefore, the need for increase sensitization and awareness on the effect of malaria infection in pregnancy which will in turn enhance the need for prevention, management and control.

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