



Research Article

Prevalence of Human Malaria Parasite among Pregnant Women Attending Antenatal Care at Eldin Specialist Hospital Jos, Plateau State, Nigeria

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ABSTRACT

Malaria infection is a severe parasitic infectious disease transmitted by the bite of an infected female *Anopheles* mosquito. The disease presents with severe consequences in pregnant women and children <5 years, particularly in sub-Saharan Africa where the burden of the disease is highest. Malaria in pregnancy may present with severe symptoms such as miscarriages, premature delivery, low-birth-weight neonates, and neonatal death. This study therefore determined the prevalence of malaria infection among pregnant women in Jos Metropolis. Capillary blood samples were collected from 200 symptomatic pregnant women attending Eldin Specialist Hospital, in Jos, and thin and thick blood Giemsa-stained films were prepared and examined for the presence of malaria parasites. Our findings revealed that 70(35%) of the 200 pregnant women sampled were infected. Based on gravidity, incidence of malaria infection was highest in the primigravidae 45 (41.9%) as compared to multigravidae 25 (27.8%) although decreasing with gestational age, as subjects in their first trimester were more infected 44 (44.0%) with the least being those in their third trimester 14 (21.5%). Two peaks of infection were encountered in respect to age; 46.2% in subjects aged 20-24 years and 42.9% in subjects aged 30-39 years with the least infection recorded in subjects aged > 39 years, 17.9%. Malaria incidence is decreasing in the country due to scale up intervention and prevention measures, however, malaria still remains a major public health problem among pregnant women and deliberate efforts need to be put in place to forestall the negative impact of this disease.

Keywords: *Plasmodium*, Gravid, Pregnant Women, Plateau State, Nigeria

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INTRODUCTION

Malaria remains a global health concern. It is a disease caused by the protozoan parasite, *Plasmodium* which infects the red blood cell (RBC) after an infectious bite from an infected female *Anopheles* mosquito. Though a global health issue, most of the burden of malaria infection is felt in sub-Saharan Africa. Malaria has a global prevalence of ~515 million people in Latin America, Asia and Sub-

Saharan Africa with about 3 trillion deaths yearly (WHO, 2022). More recently, an estimated 228 million people have been reported to be infected worldwide with sub-Saharan Africa alone accounting for about 213 million of the infection which is about 93% of the world's population (WHO, 2023).

Similar to other countries around the globe which are endemic for malaria infection, the adverse effect of

malaria in Nigeria is more in infants and pregnant women (Warrell, 1997) with severe manifestations as increased morbidity and mortality and the birth of premature infants with low birth weights due to intrauterine growth retardation (IUGR) caused as a result of placental parasitisation (Chua *et al.*, 2021). According to the WHO (2022), an estimated 3.4 million pregnant women are infected with malaria in central Africa with severe complications which include anemia, low birth weight children, abortion, intrauterine fetal retardation, short gestational period for age as well as premature births.

One of the reasons for the significant impact of malaria infection in Africa could be due to the presence of the more virulent *Plasmodium falciparum* with significant morbidity that far outweighs those of other parts of the world (Molineaux, 1997). According to reports, *P. falciparum* infection poses a significant risk to pregnant women as they suffer high morbidity from the infection. This goes further to harm the fetus when the infected erythrocytes accumulate in the placenta expressing the parasite protein VAR2CSA on their surface. This then binds to the chondroitin sulfate A (CSA) on the cells of the placenta thus resulting in outcomes such as severe maternal anemia, miscarriage, stillbirth and perinatal mortality (Mahamar *et al.*, 2021).

In West Africa, studies have revealed that the continuous failure of some interventions in health care delivery is attributed to complete reliance on only clinical and laboratory diagnosis (WHO, 1997) for the detection of malaria infection. Although a good practice, the WHO recommends prompt diagnosis of patients suspected of malaria infection before treatment (WHO, 2021). Most pregnant women, especially those in the early stage of their pregnancy, do not report to the hospital for antenatal services and because they may not fully be aware of the symptoms of the infection especially during pregnancy, this serves to contribute to the persistence of this menace.

Therefore, we embarked on this study to ascertain the incidence of malaria infection in pregnant women attending in Eldin hospital in Jos, Plateau State Nigeria.

MATERIALS AND METHODS

Study Site and Population

The study population in this study were 200 symptomatic pregnant women, attending Eldin Specialist Hospital Jos, Plateau State, Nigeria. Pregnant women who came for booking at the antenatal clinic of the hospital between January to March 2019 were randomly selected and enrolled for this study.

Data Collection and Diagnosis

Informed consent of the study participant as well as that of the hospital authority was first obtained before sample collection. Blood sample collection was done from the 200 symptomatic pregnant women via finger prick. Thick and thin films were made as described by Cheesbrough (2006) and stained with Geimsa stain and examined for the presence of *Plasmodium* parasites under the microscope (WHO, 2010).

Data Analysis

Collected data were cleaned and coded in excel and thereafter imported into Stata version 14.0 for statistical analysis. Chi-square test of association was used to ascertain if there was a significant association between malaria infection and gravidity as well as the trimester stage and age group of the studied subjects at a 5% level of significance.

RESULTS

The result of this study revealed that 70(35.0%) out of the examined 200 pregnant women were infected with malaria. Malaria infection was highest in the primigravidae, 45(40.91%) as compared to the multigravidae, 25(27.78%) although, this was not significant ($p>0.05$) (Table 1).

However, the incidence of malaria infection was related to gestational age as infection was observed to decrease with trimester stage: infection was more in women who were in their first trimester, 44(44.0%) and least in those who were in their third trimester stage 14(21.54%) of pregnancy ($p<0.05$) as contained in Table 2.

Malaria incidence peaked in subjects aged 20-24 years old, 12(46.15%) and in those aged 35-39 years old, 18(42.86%). However, generally, the incidence of malaria infection decreased with an increase in age although, based on chi square analysis, age was not a determinant of infection in the pregnant subjects sampled ($p>0.05$) (Table 3).

Table 1: Infection status in relation to gravidity

Parity level	No examined	No infected	% infected
Multigravidae	90	25	27.78
Primigravidae	110	45	40.91
Total	200	70	35.00

$\chi^2=3.7518$, df=1, p=0.053

Table 2: Infection Status in relation to gestational age

Trimester stage	No examined	No infected	% infected
First	100	44	44.00
Second	35	12	34.29
Third	65	14	21.54
Total	200	70	35.00

$\chi^2=8.7458$, df=2, p=0.013

Table 3: Status of infection across age groups

Age group	No examined	No infected	% infected
20-24 years	26	12	46.15
25-29 years	54	20	37.04
30-34 years	50	15	30.00
35-39 years	42	18	42.86
>39 years	28	5	17.86
Total	200	70	35.00

$\chi^2=6.8264$, df=4, p=0.145

DISCUSSION

The current study examined the prevalence of malaria parasites among pregnant women attending Eldin Specialist Hospital Jos, Plateau State, Nigeria. A high prevalence of malaria infection was recorded in the subjects that presented to the hospital. In previous study, other authors reported a lower prevalence than what was found in this study. For instance, in Ibadan, Bello and Ayede (2019) reported a prevalence of only 3%. In another study, Balogun *et al.* (2010) reported a fairly high prevalence of 21.3%. However, other studies had higher prevalence than what we found in the current study: 42% (Fana *et al.*, 2015), 45% (Yakubu *et al.*, 2018), 53.9% (Samaila *et al.*, 2015) and 58% (Bassey *et al.*, 2015). The variation in the prevalence recorded could be as a result of the period in which the study was conducted. This study was done in the peak of the late dry season where most breeding habitats of the vector mosquitoes must have dried out as a result, there might be fewer mosquitoes that could transmit the infection. Previously it has been shown that weather variables such as rainfall has a significant effect on malaria transmission (Segun *et al.*, 2020). Also, variation in the geographical and climatic conditions of the settings of the various studies conducted could have

influenced the prevalence that was recorded in the respective studies.

Findings from this study revealed that infection was higher in primigravidae compared to the multigravidae. Since the primigravidae are experiencing such a shift in their body chemistry for the first time, adjustment in hormonal activities as well as the lack of specific immunity to the malaria parasite could have influenced the prevalence of malaria recorded in this group as reported by Staalsoe *et al.* (2004) and Elliott *et al.* (2005). However, immunity to malaria infection accumulates with successive pregnancies, when there is exposure to the malaria parasite (Beeson & Duffy, 2005) and this might as well be the reason for the lesser incidence recorded in the multigravidae. Although, it is important to note that this study found that gravidity was not a significant determinant of malaria infection during pregnancy as was also reported by Berry *et al.* (2018). However, Ajayi *et al.* (2014) in their study reported a significantly higher infection in primigravidae. Similarly, Agomo *et al.* (2009) observed that gravidity is a factor that increase the risk of malaria infection in pregnant women.

Generally, women experiencing pregnancies for the first time and those experiencing it the second time are more vulnerable to malaria infection. According to Mcgregor (1984), inhibition of type 1 cytokine

responses (interferon, interleukins 2 and 12 and TNF) is a factor that predisposes the primigravidae to malaria infection. Since maternal and fetal material exchange occurs majorly at the placenta, parasitized erythrocytes may accumulate at the placenta and influence the risk of death, induce low birth weight resulting from IUGR, premature delivery, or both. It was confirmed also by Steketee *et al.* (1996), that IUGR is the predominant mechanism of this action.

Our study revealed that infection tend to decrease with the gestational age as subjects in their first trimester harboured more of the infection. Similar to this, Okela *et al.* (2019) observed that malaria incidence was more in women in their first trimester (75.4%) than in those who were in their in second (23.3%) and third trimester (51.9%). Shaibu *et al.* (2019) also reported similar trend with most of the women in their first trimester harbouring the infection (70%). The high incidence of malaria infection in the first trimester of pregnancy could be due to the women generally not attending antenatal clinics during their early pregnancy stages as most of the infection may be unrecognized and therefore untreated since the infection may not present any symptom in the earlier stage (Coulibaly *et al.*, 2007). Noteworthy however is the fact that gestational age was found to be a significant predictor of malaria infection in the current study as has been found also in other studies (Maduakor *et al.*, 2019; Diouf *et al.*, 2024).

In this study, two peaks of malaria incidence were observed in relation to age group (20-24 years and 36-36 years) with the much younger pregnant women harbouring most of the infection. This agrees with earlier reports that subjects below the age of 24 years were at high risk of malaria infection (Bouyou-Akotet *et al.*, 2003; Tako *et al.*, 2005). Our results have equally shown that with increase in age, there was a decrease in malaria infection, although, infection tend to increase in subjects aged between 35-39 years. This observation is consistent with the earlier findings of Marielle *et al.* (2003) in Gabon where high incidence of malaria infection was also recorded in pregnant women within similar age group (36-39 year). This result also agrees with the earlier report by Okwa (2003) that older women (aged between 30–39 years) appeared to be more susceptible to malaria parasitemia than younger women. Although, several variations were observed in malaria parasitaemia with respect to age group, the difference was not significant suggesting that, all the subjects have an

equal chance of being infected provided that suitable conditions are in place. This mean therefore that adequate protective measures should be put in place to protect pregnant women irrespective of their age so as to reduce malaria prevalence in this section of the population.

CONCLUSION

This study has recorded high prevalence of malaria infection in pregnant women attending Eldin Specialist Hospital Jos, Plateau State, Nigeria. Although the incidence of malaria infection was higher in primigravidae and appeared to decrease with age, those two factors were not significant determinant of malaria infection in the study population. Gestational age was however the significant determinant of malaria infection in pregnant women in the current study as subjects in their first trimester of pregnancy harboured more infection than those in their second and third trimester.

It is therefore encouraged that proper care should be taken such as the use of insecticide treated bed nets by pregnant women to avoid mosquito bites. Furthermore, awareness should be created on the need to incorporate malaria enlightenment programs for pregnant women, particularly those in their first trimester as this will help curtail the spread of the disease. Furthermore, Government should embark on free malaria treatment programs particularly for pregnant women and regular taking of antimalarial drugs should be encouraged.

DECLARATIONS

Ethics Approval and Informed Consent

This study received ethical clearance (JUTH/DCS/IREC/127/XXX1/2680) from the Jos University Teaching Hospital Institutional Research Ethical Committee. Consent for this study was sought from the head of the hospital. Verbal and written informed consent to participate in the study were also sought from the participants. All participants were duly informed of the objectives of the study.

Author's Contribution

NN and JND conceptualized and designed the study. JND, LI and MTT participated in fieldwork and data collection. OEO and SM performed the data analysis and interpreted the data. NN and OEO prepared the first draft of the manuscript, reviewed by ONG and

GSM. All authors contributed to the development of the final manuscript and approved its submission.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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