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ABSTRACT

Introduction: Malaria in pregnancy is a major public health problem in tropical and subtropical regions of the world. We aimed to study the prevalence of *Plasmodium falciparum* among pregnant women attending antenatal clinics in Osogbo, Osun State.

Methods: It was a cross-sectional study with a total of 243 pregnant women involved. Ethical approval was sought and given. Blood samples were obtained for both thick and thin film, stained with Giemsa stain and examined for *Plasmodium* parasitaemia. Data were analyzed using Statistical Package for Social Sciences (SPSS 17.0 windows version). The statistical significance of variables was estimated using the Chi-square test. Pearson correlation analysis was used to establish a possible correlation of prevalence with parity, age, and trimester. P-value equal to or less than 0.05 was taken as significant.

Results: One hundred and thirty-one (53.9%) of the women had *Plasmodium falciparum* parasitaemia. Those within the age group 21-25 years had the highest prevalence of infection (68.8%), while the highest rate of infection (65.8%) was observed among primigravid. A majority (71.2%) of the women who had malaria were in their first trimester.

Conclusion: Malaria parasitemia in pregnancy is still prevalent in our community, and is more so in young primigravid and in early pregnancy.

Keywords: *Plasmodium falciparum*; Pregnant Women; Parity; Trimester; Osogbo

INTRODUCTION

Malaria has been described as a disease of poverty and underdevelopment. It is a life-threatening parasitic disease transmitted by female *Anopheles* mosquitoes. More than 40% of the world's population lives in malaria-prone areas.¹ It remains a complex and overwhelming health problem, with over 300 to 500 million cases and 2 to 3 million deaths per year. About 90% of all deaths attributed to malaria occur in sub-Saharan Africa.

Malaria infection during pregnancy is a major public health problem in tropical and subtropical regions of the world.¹ The burden of malaria infection during pregnancy is caused mainly by *Plasmodium falciparum*, the most common malaria species in West

Africa. The symptoms and complications of malaria during pregnancy differ with the intensity of malaria transmission and thus with the level of immunity the pregnant woman has acquired.² Pregnant women and unborn children are particularly vulnerable to malaria, which is a major cause of prenatal mortality, low birth weight, and maternal anaemia.³

Past studies showed that despite evidence of the cost-effectiveness of improving treatment access and compliance, most victims of malaria die because of inability to access health care, misdiagnoses and late presentation.⁴⁻⁷ Early diagnosis and prompt effective treatment of malaria illness has been a cornerstone of malaria control.⁸ Diagnosis based on symptoms alone has inherent difficulties, although volunteer health workers in rural areas have practised this with some success.^{8,9} There is a need to continuously monitor the prevalence of malaria in some special groups such as pregnant women, this will help in policy-making to prevent, manage and ultimately eradicate malaria. We aimed to study the prevalence of *Plasmodium falciparum* among pregnant women attending selected antenatal clinics in Osogbo, Osun State.

METHODS

Study Area

The study was conducted in Antenatal Clinics in Osogbo, Olorunda Local Government, Osun State, Nigeria. Osogbo is the state capital of Osun State and one of the most developed parts of Osun State. Osogbo is in the tropical rain forest belt of the southwestern part of Nigeria. It is about 500kilometres from Abuja the capital city of Nigeria. It lies approximately on latitude 400N of the equator and longitude 7.340E Greenwich meridian. Malaria is endemic in most areas of Osogbo and occurs throughout the year with peaks during the rainy season. The designated study areas were Ladoke Akintola University of Technology Teaching Hospital and Ayomide Women's Health Fertility Hospital, Power line 2nd gate, Osogbo.

Ethical Approval

Ethical approval was sought and obtained from the ethical committee of the College of Health Sciences, Ladoke Akintola University of Technology and informed consent was obtained from the subjects.

Sample Population

The sample populations were pregnant women that attended ante-natal clinics in these hospitals in Osogbo.

Sample Size

The figure obtained was calculated using the formula for determining sample size: $n = N / 1 + N(e^2)$; where n = minimum sample size, N = total population to be sampled, e = error term at 5% (95% confidence interval).¹⁰

Data Collection

The study was a hospital-based cross-sectional survey conducted between November 2017 and January 2018. Blood samples were collected from 243 pregnant women of reproductive age (20-45 years) and an equal number were collected from each hospital once in a week during the antenatal visits. This lasted for three months. The consent of the subjects was taken before commencing the study. Questionnaires concerning age, parity and pregnancy stages were distributed to the sampled pregnant women with the assistance of members of our research group and the nurses. All pregnant women who presented themselves for antenatal care on the day of sampling at the selected hospitals were eligible for inclusion while all women who did not give their consent were excluded from sampling. Sick cell trait, level of education and occupation were also excluded when selecting participants for this study.

Giemsa Staining Procedure

Blood samples collected were preserved in Ethylene diamine tetra acetic acid (EDTA) before being transported to the laboratory for analysis. Thick blood films were prepared and stained with Giemsa diluted in 1:10 for 25minutes and rinsed with water as described by Cheesbrough.¹¹ The thin film was fixed using methanol (methyl alcohol) by maintaining contact with methanol for 10

seconds. The slide was immersed in the staining trough containing Giemsa solution prepared with buffered water in a ratio of 1:10, and contact was maintained for 15 minutes, and then allowed to dry. Stained slides were examined under the light microscope using X100 objective lens (immersion oil). The thick films were used to identify the parasite densities while thin films were used to identify the parasite species.

Data Analysis

The data generated on the prevalence of *Plasmodium falciparum* was analyzed using statistical programme for service solution (SPSS 17.0 windows version). The statistical significance of variables was estimated using the Chi-square test. Pearson correlation analysis was used to establish a possible correlation of prevalence with parity, age, and trimester. P-value equal to or less than 0.05 is taken as measures of significance.

RESULTS

Of the 243 blood samples examined among the pregnant women, 131 were positive for *Plasmodium falciparum* giving an overall prevalence of 53.9%. The rate of infection among the age groups showed that 33(68.8%) pregnant women under the age of 21-25 years had the highest prevalence followed by 16-20 years (66.7%) while the ages 26-30years, 31-35 years, 30-40 years and 41-45 years had 42(63.6%), 18(40.9%), 11(32.4%) and 3(20.0%) respectively (Table 1).

The highest rate of infection was observed among primigravid (65.8%) followed by the low multigravida (second pregnancy and third pregnancy) with infection rates of (61.1%) and (51.2%) respectively while the multigravid had a low infection rate of (43.0%) (Table 2). The prevalence of *Plasmodium falciparum* was higher in the first trimester (71.2%) than in the second trimester (46.3%) and third trimester (44.2%) respectively (Table 3).

There was a significant decline in the rate of infection in the low multigravid generally and a significant increase in the multigravid group (Figure 1).

Table 1: Prevalence of *Plasmodium falciparum* among pregnant women in relation to age

Age Group	Number Examined	Number Infected (%)
Number of participants	243	131(53.9)
Mean age (years) ± SD	22±13.1	
16-20	36	24(66.7)
21-25	48	33(68.8)
26-30	66	42(63.6)
31-35	44	18(40.9)
36-40	34	11(32.4)
41-45	15	03(20.0)

Table 2: Prevalence of *Plasmodium falciparum* in relation to parity

Parity	Number Examined	Number Infected (%)
Primigravid (1st Pregnancy)	73	48(65.8)
Low multigravid (2nd Pregnancy)	36	22(61.1)
Low multigravid (3rd Pregnancy)	41	21(51.2)
Grand Multigravid (4th Pregnancy & above)	93	40(43.0)

Table 3: Prevalence of *Plasmodium falciparum* in relation to Trimester

Characteristics	Number Examined (%)	Number Positive (%)
Gestation Age		
1st Trimester	81	58(71.6)
2nd Trimester	67	31(46.3)
3rd Trimester	95	42(44.2)

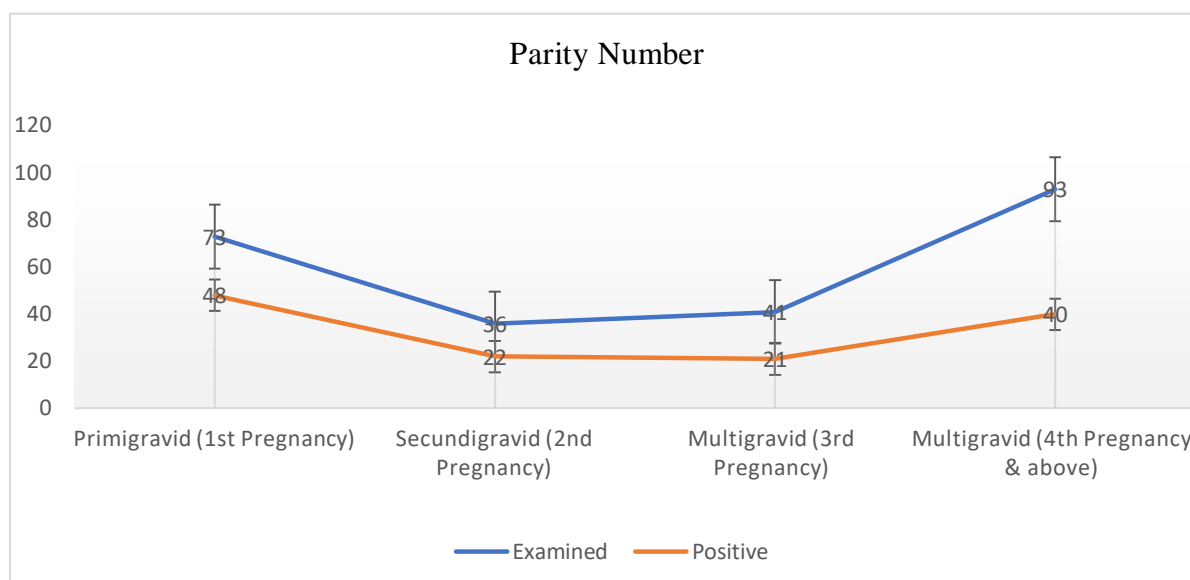


Figure 1: Prevalence of *Plasmodium falciparum* in relation to parity number

DISCUSSION

This study was undertaken to determine the prevalence of malaria parasitaemia among pregnant women attending selected antenatal clinics at Osogbo. Generally, parasitic infections abound in Nigeria, Osogbo inclusive. This is because most of the population lives in highly unsanitary surroundings characterized by dirty, waterlogged drainage and a bushy environment that aid the breeding of the insect vector of malaria. The high prevalence of 53.9% of malaria parasite recorded in this study was in accordance with Aribodor and Akinboro research studies who reported a prevalence of 64.4% and 63.6% respectively.^{12,13} The prevalence in this study was lower than those of the two studies mentioned above; this may be attributed to the improved understanding of the antenatal clinic women about malaria control strategies like the use of long-lasting insecticide-treated nets (LLIN) or alternative intermittent preventive treatment (IPT) with Sulfadoxine pyrimethamine (SP). The lower prevalence might also be attributed to the fact that this study was conducted during the dry season when the rate of breeding of insect vectors is reduced.

From our study, the higher prevalence of 71.2% in the first trimester of pregnancy than

46.3% and 44.2% in the second and third trimesters respectively further supports the susceptibility of pregnant women to malaria infestation in an early stage of pregnancy which could be associated with a high frequency and density of *Plasmodium falciparum* parasitaemia, with a high rate of maternal morbidity including fever and severe anaemia, abortion and stillbirth as well as high rates of placental malaria and consequently low birth weight in newborns caused by both prematurity and intrauterine growth retardation.

Pregnancies in women living in malaria-endemic regions, particularly in sub-Saharan Africa are associated with a high frequency and density of *Plasmodium falciparum* parasitaemia, with high rates of maternal morbidity¹⁴. *Plasmodium falciparum* being the only species found in this study is in line with studies from Malawi and Sokoto, Nigeria which showed that *Plasmodium falciparum* is the most dominant species in pregnancy.^{15,16} In highly malaria endemic areas where semi-immune adults usually have substantially acquired resistance to local strains of *Plasmodia*, the prevalence of clinical malaria is higher and its severity greater in pregnant women than in non-pregnant women¹⁷.

Younger women appeared to be susceptible to malaria in this study as prevalence (68.8%) was the highest among the age group 21-25 years. This finding contradicted the work of Okwa's study group that found the 36-39-year-old group to be more susceptible but agreed with the findings of Aribodor and his colleagues who opined that adolescents and young adult pregnant women were more susceptible to malaria than older pregnant women, because of continuous development of malaria immunity in older women.^{18,19}

We suggest that Malaria Rapid Diagnostic tests (RDTs) be recommended to improve diagnostic efficiency, which is important for preventing indiscriminate use of Artemisinin-Based Combination Therapy (ACT), thereby preventing or delaying the development of parasite resistance to this first-line drug.²⁰ RDTs can be used as a stop-gap when microscopy services are not operating (e.g. evenings/weekends/public holidays) or as a primary diagnostic tool for rural/ remote areas without microscopy services.

CONCLUSION

Malaria parasitemia in pregnancy is still prevalent in our community, and is more so in young primigravid and in early pregnancy.

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