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The Incidence of Maternal Malaria among Antenatal Attendees in Primary Health Center, Masaka, Nasarawa State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors AZK and SCS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors LYA, AZK and SCS managed the analyses of the study. Authors LYA, AZK and SCS managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: In Nigeria, more than 90% of the total population of the country is at risk of malaria infection and about 50% of the population suffers from at least one episode of the disease annually. Malaria in pregnant women is associated with adverse maternal and fetal complications which can result to death if left untreated.
Aim: The aim of this study is to ascertain the incidence of maternal malaria among antenatal attendees in a Primary Health Center, Masaka, Nasarawa State.
Methods: One hundred and fifty (150) pregnant women were recruited for this study. Structured questionnaire was administered; 2 mls of peripheral blood was collected. Thick and thin blood smears were prepared to check for the Plasmodium parasites.
Results: An incidence rate of 44.67% was obtained from this study. One hundred and fifty (150) pregnant women were examined for malaria parasites, out of which 67 (44.67%) were positive for malaria infection while 83 (55.33%) were negative for malaria infection. A 75% incidence rate of

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malaria was recorded in the Primigravidae women while 35% incidence rate was recorded in the multigravidae. The highest prevalence of 56.86% was recorded, and the least prevalence was in the second trimester 37.5%. Pregnant women within the age group of 17-22 years recorded the highest prevalence rate of 69.44%. The Chi-square analysis used in this study, reveals that there was no significant relationship (*P*>0.05) between malaria in relation to gestation, gravid status, age and occupation.

Conclusion: The incidence of Malaria infection is high among the antenatal attendees in Primary Health Centers Masaka. Routine screening is highly recommended and there should be more enlightenment on best practices to prevent malaria during pregnancy.

Keywords: Malaria; pregnancy; incidence; Nigeria.

1. INTRODUCTION

Malaria has a global distribution affecting people of all ages. In 2016, an estimated 216 million cases of malaria occurred worldwide [1]. Of the 91 countries reporting indigenous malaria cases in 2016, 15 countries all in sub-Saharan Africa, except India carried 80% of the global malaria burden [1]. In Nigeria, 97% of the population is at risk of malaria with 11% maternal deaths attributable to this disease [2].

Malaria in pregnancy remains a major global challenge. It was estimated that 125 million women each year are at risk of malaria with about 50 million pregnant women at risk of *Plasmodium falciparum* infection in Africa, where the risks and morbidity burden of malaria in pregnancy are highest [3]. Pregnant women with young children are the people most at risk of the adverse consequences of malaria infection. The consequences for mothers and their unborn children vary with setting, the infecting *Plasmodium* species, and the intensity of malaria transmission [4].

In high transmission settings where repeated exposure to infectious mosquito bites is common, pregnant women in these settings remain comparatively more susceptible to malaria than their non pregnant counterparts as both cellular and humoral immune responses to *Plasmodium* antigens are depressed [5]. In such settings, Malaria in pregnancy (MIP) is mainly characterized by asymptomatic parasitemia often with sequestration of parasites in the placenta with maternal anaemia and low birth weight (LBW) as the principal adverse outcomes [6,7]. In areas of low transmission, most women attain reproductive age with relatively little acquired immunity to malaria. Here, MIP is associated with severe clinical illness often with increased risks of miscarriages, still births, LBW, preterm labour, increased uterine activity, and intra uterine fetal death [6,8,9,10]. It also causes maternal hypoglycaemia, acute pulmonary oedema, cerebral oedema, maternal morbidity and mortality [11].

In spite of these implications, little attention is given to asymptomatic pregnant women. Hence, this study was carried out to examine the incidence and probable risk factors associated with malaria amongst pregnant women in Masaka town.

2. METHODOLOGY

2.1 Study Area

This study was conducted in Primary Health Care Centre, Masaka, Karu Nasarawa State. The Primary Health Care Centre, Masaka provides rapid and affordable medical care services to Masaka community. The centre receives about 50-60 antenatal attendees on a monthly basis. Nasarawa State lies between latitude 9°0’ North and longitude 7°40’East, with an elevation of 448m (1,470 ft).Masaka is a town and a suburb of Abuja in central Nigeria. It is a district of Karu Local Government Area. According to the 2006 census, the population of Karu town was 205,477 [12].

2.2 Study Design

A cross-sectional study was conducted. Apparently healthy pregnant women (with no fever and no symptoms suggestive of malaria) reporting for antenatal care were recruited for the study. A pre-tested semi-structured interviewer administered questionnaire was used to collect Socio-demographic data such as age, occupation, gravidity and gestational age.

All the women were confirmed pregnant through an abdominal ultrasound scan result for early pregnancy or a positive pregnancy test. Pregnant

women who were currently treating malaria were excluded from the study. Pregnant women with a body temperature > 37.5°C were also excluded from the study.

Gestational calendar that defines the first trimester as <14 weeks, second trimester as 14-<28 weeks and third trimester 28 weeks or above was used. Gravidity was dichotomized as >3 previous pregnancies and <3 pregnancies.

The Random sampling technique was used to collect One hundred and fifty (150) blood samples from pregnant women between the age range of 17-40 who reported for antenatal care (ANC) in the Primary Health Care (PHC) Center, Masaka. Cochran's formula for the calculation of sample size was used in this study, the formula is as follow: $n= (Z^2PQ)/e^2$ Where n is the sample size, Z is the standard normal deviation setting at 1.96 corresponding to 95% confident interval, P is the estimated proportion of the attribute under study, Q is derived from 1 – P and finally e is the precision level (0.05) [13]. Blood samples were collected between the months of May to July.

2.3 Ethical Approval and Informed Consent

Informed consent was obtained from the study group, and the participants were enrolled consecutively. Ethical consent was sought for and obtained from the Research and Ethics Committee of the Primary Health Care Center.

2.4 Sample Collection and Processing

Two (2 ml) of peripheral venous blood was aseptically collected from each woman into EDTA tubes by a trained laboratory technician. Thick and thin blood films were prepared on glass slides for parasite identification and speciation using Giemsa technique [14]. The blood smears were stained and examined using a light microscope under oil immersion with x100 objective lens [15]. To ensure quality control, each slide was independently examined by two laboratory technicians. A third laboratory technician was employed to read slides with discrepancies. Positive findings were graded on the thick smear using the 'plus' system scale: + (1 to 9 trophozoites in 100 fields); ++ (1 to 10 trophozoites in 10 fields); +++ (1 to 10 trophozoites per field); ++++ (>10 trophozoites per field).

Malaria parasitaemia was classified as high and low based on the malaria plus system. Those in the 0 and + group were classified as low parasitaemia; while those in the ++, +++, and ++++ groups were classified as high parasitaemia.

2.5 Statistical Analysis

The result was analyzed using Chi-square test to determine statistical association between categorical demographic variables on the prevalence and effect of malaria in pregnancy at 5% level of significance.

3. RESULTS

An incidence rate of 44.67% was obtained from this study. One hundred and fifty (150) pregnant women were examined for malaria parasites, out of which 67 (44.67%) were positive for malaria infection while 83 (55.33%) were negative for malaria infection.

The incidence of the malaria parasite in pregnant women in relation to gravid status is shown in Table 1. Of the 150 samples examined, (44.67%) had malaria parasite in their blood. A 75% incidence rate of malaria was recorded in the Primigravidae women while 35% incidence rate was recorded in the Multigravidae women.

The occurrence of malaria in association with gestation period in Table 2 reveals that pregnant women in their first trimester have the highest prevalence of 56.86% and the least prevalence was in the second trimester 37.5%.

The incidence of the malaria parasite in relation to age group of the pregnant women is shown in Table 3. The age group 17-22 years recorded the highest prevalence rate of 69.44%, women within age groups 23-28, 29-34 and 35-40 years had incidence rates of 40.74%, 25.64% and 47.61% respectively.

Prevalence of malaria parasite in pregnant women in relation to occupation shows that the health care workers (37.5%) were least affected while students (63.15%) were mostly affected with malaria infection, as shown in Table 4.

The Chi-square analysis used in this study, reveals that there was no significant relationship (P>0.05) between malaria in relation to gestation, gravid status, age and occupation.

Table 1. Incidence of malaria parasite among pregnant women in relation to gravid status

Gravid status	No. examined	No. positive	Prevalence (%)
Primigravidae	36	27	75%
Multigravidae	114	40	35%
Total	**150**	**67**	**44.67%**

Table 2. Incidence of malaria parasite in association with gestation

Gestation	No. examined	No. positive	Prevalence (%)
1st trimester	51	29	56.86%
2nd trimester	80	30	37.5%
3rd trimester	19	8	42.10%
Total	**150**	**67**	**44.67%**

Table 3. Incidence of malaria parasite among pregnant women in association with age

Age – group	No. examined	No. positive	Prevalence
17-22	36	25	69.44%
23-28	54	22	40.74%
29-34	39	10	25.64%
35-40	21	10	47.61%
Total	**150**	**67**	**44.67%**

Table 4. Incidence of malaria parasite in relation to occupation

Occupation	No. examined	No. positive	Prevalence (%)
Full time house wives	43	22	51.16%
Manual labourers	16	5	31.25%
Students	19	12	63.15%
Health workers	8	3	37.5%
Entrepreneurs	51	19	37.25%
Civil servants	13	6	46.15%
Total	**150**	**67**	**44.67%**

4. DISCUSSION

This study reveals a high incidence rate of malaria infection (44.67%) among pregnant women in Primary Health Centre Masaka. This incidence rate is higher than the prevalence reported in similar studies by Gajida et al. [11], Ibeneme et al. [16] Emiasegen et al. [17] who reported a prevalence of 39.2%, 41% and 22% in Kano State, Ebony State and Nasarawa State Nigeria respectively. The incidence rate of malaria in this study is however lower than the separate reports of Nwagha et al. [18], Oladeinde et al. [19], Udoma et al. [20] and Alaku et al. [21] who reported a prevalence of 60%,78.9%, 52.2% and 88% among pregnant Nigerian women in Enugu, Edo, Sokoto and Nasarawa States. This variation may be due to different geographical locations, sample size, mosquito vectors and various preventive measures used by the pregnant women.

The incidence of malaria was higher among primigravidae compared to multigravidae in our study and this agrees with the findings of George et al. [22] and Ogbu et al. [23]. These findings can be attributed to immune response in pregnancy to the malaria parasites. A suppressed immunity in first pregnancy may be responsible for high prevalence of malaria infection among the primigravidae women. The multigravidae pregnant women may have acquired immunity from previous infections and may have also experienced physiological changes caused by pregnancy, hence a lower incidence rate of malaria infection.

The results from this study shows that the highest incidence rate of malaria in association with gestation period was among pregnant women in their first trimester (56.86%), and the least incidence rate was reported among pregnant women in the second trimester

(37.5%).This concurs with the reports of Cisse et al. [24];Enoch and Gloria [25].

The highest incidence rate of malaria among pregnant women in their first trimester may probably be due to a lowered immunity that results from sudden onset of pregnancy, despite the baseline immunity the pregnant women may acquire in malaria-endemic areas. On the other hand, the least incidence rate among pregnant women in the second trimester can be attributed to the effective administration of antimalarial drug in the second trimester of pregnancy as recommended by the World Health Organization; coupled with providing and encouraging the correct use of long lasting insecticide treated Nets [26].

The age group 17-22 years recorded the highest prevalence rate of 69.44%, women within age groups 23-28, 29-34 and 35-40 years had incidence rates of 40.74%, 25.64% and 47.61% respectively. This result supports the existing knowledge that high prevalence in adolescents and young adult pregnant women and low prevalence at higher ages is due to the existence of natural immunity to infectious disease including malaria which the pregnant women acquire as the age increases Lander et al. [27] Falade et al. [10],Dicko et al. [28], Haruna and Daskum [29].

The report of this study however contradicts the findings of Adefioye et al. [30] who reported that women within 36 – 39 years are more susceptible to malaria. Similarly, Anyanwu et al. [31] reported that middle aged women have the highest prevalence rate (59.2%) of the infection in a study conducted in some parts of Nasarawa State and Federal Capital Territory, Nigeria.

The prevalence of malaria parasite in pregnant women in relation to occupation shows that students were mostly affected with malaria infection. This may be due to exposure to mosquitoes while reading in open or closed spaces without protective measures for the students.

5. CONCLUSION

The prevalence of malaria in this study indicates that malaria in pregnancy is still a major health problem in Nigeria. From this study, the malaria infection among pregnant women affected more primigravidae women, pregnant women in the younger age group and those in their first trimester. Screening and treatment of malaria after conception will go a long way to reduce malaria infection in the first trimester. Although several far-reaching measures have been deployed to fight malaria in endemic countries, more strategic measures need to be put in place to prevent malaria in pregnancy in view of the devastating effect it has on pregnant women.

CONSENT

Informed consent was obtained from the study group, and the participants were enrolled consecutively.

ETHICAL APPROVAL

Ethical consent was sought for and obtained from the Research and Ethics Committee of the Primary Health Care Center.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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