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Original Article

Malaria Prevalence Among Pregnant Women Attending Kwadon Primary Health Care, Yamaltu-Deba Local Government Area, Gombe State, Nigeria

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ABSTRACT

Background: Malaria infection, particularly during pregnancy, is a major public health concern in Nigeria, and there is a scarcity of data on it prevalence and scope in many areas, especially in remote villages that lack basic infrastructure and adequate health facilities for treating and managing the disease. The study which was conducted from June to December, 2021 and investigated the prevalence of malaria among pregnant women in some selected villages of Yamaltu-Deba Local Government Area of Gombe State, Nigeria.

Methods: 384 consented pregnant women attending antenatal at Kwadon primary health clinic were enrolled. Vein puncture technique was used to collect venous blood and analysed microscopically using Gemsa staining technique. *Plasmodium falciparum*-malaria was detected using microscope with x100 objective lens.

Results: Malaria parasites were found in 81(21.09%) of the 384 samples collected, highest prevalence was documented from Wajari village. Malaria infection was not statistically linked with the respondents' village (x^2=5.847, df=4, P>0.05). Older pregnant women aged 40-45 years had the highest prevalence of 2(40.00%), while subjects aged 36-40 years had the lowest prevalence of 36.0%. Malaria infection was not statistically associated with the subject's age (x^2=4.816, df=6, P>0.05). Subjects in first trimester and multigravida had the highest prevalence of 02(28.57%) and 63(29.57%) respectively. Statistically malaria infection was not associated with the pregnant women's trimester (x^2=0.355, df=2, P>0.05) and gravidity (x^2=1.825, df=2, P>0.05).

Conclusion: In conclusion, moderate level of malaria infection was recorded from the selected villages and older pregnant women suffer most from the disease.

Keywords: Trimester, Gravidity, Age, Malaria, Yamaltu-Deba

1. Introduction

Malaria is a parasitic disease which causes serious health problems in the global population, particularly in Sub-

Saharan Africa, where more than 90% of malaria-related consequences such as morbidity and anemia, as well as 93% of malaria deaths occur [1] by which Nigeria alone accounts for 25% of the total malaria burden in Africa [2]. It is caused by one or more parasite species belonging to the genus *Plasmodium*, including *Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, and Plasmodium knowlesi* [3]. *Plasmodium falciparum*-malaria, is the most common form of malaria disease in the tropical and subtropical regions of the world [4] where it causes about 99% of the infection in the region [5]. Infected female Anopheles mosquito serves as vector for the parasite [6] where it undergoes sexual development before being transferred into human host during blood meal. In pregnancy, it contributes considerably to high rates of maternal morbidity, particularly in primigravida, resulting in roughly 10,000 maternal fatalities per year and 75,000 to 200,000 child deaths per year [7].

In malaria-endemic regions of the world, more than 125 million women become pregnant each year, with more than 85 million at risk of the disease, while in Sub-Saharan Africa more than 25 million women become pregnant, with nearly 19–24 million women at risk of the disease and its adverse effects during pregnancy [8]. Pregnant women especially primigravida in the first and the second trimester and children under the ages of five years, are among the high risk group for malaria attack as they are yet to acquire and develop immunity against the disease [9]. Furthermore, a fraction of P. falciparum-infected erythrocytes' special propensity to sequester in the placenta complicates the situation in pregnant women [10]. Pregnant women who live in locations where malaria transmission is low or unstable have little or no immunity to the disease and are at a 2 to 3 times higher risk of acquiring severe disease as a result of malaria infection than non-pregnant people in the same area. Pregnant women in malaria-endemic areas are constantly exposed to mosquito bites, which is partly due to increased body surface and some unique scent secretions. These and the other variables make pregnant women more prone to mosquito bites and, as a result, malaria infection. This constant exposure causes them to develop semi-immunity, which allows them to keep the infection at an asymptomatic level in the majority of cases, but this subclinical infection still poses a significant risk to both the mother, the foetus, and the infants [11], by causing low birth weight, stillbirths, preterm, and failure to thrive in infants. Whilst in the mother, it causes anemia, abortions, and subsequently the other pregnancy-related complications [12].

As a result, malaria infection during pregnancy is a critical public health problem which poses significant risks and has negative repercussions for the mother, foetus, and new-borns [13]. The situation also becomes more complicated and worsen when malaria parasite infects placenta [14]. Despite the fact that malaria in pregnancy is a preventable infectious disease, it remains a major public health concern and a leading cause of maternal morbidity and mortality, particularly in rural areas with limited access to adequate shelter. Malaria is responsible for 11% of maternal mortality, 2-5% of maternal anaemia, 8-15% of low birth weight in infants, and 3-8% of the infant deaths in Nigeria [15]. For malaria prevention and case management in pregnant women, Insecticide-treated bed nets (ITNs), Intermittent Preventive Therapy using Sulphadoxine/Pyramethamine (IPT), and effective case management using recommended drugs like Artemisinin based Combination Therapy are highly recommended. These are also the cardinal elements of the Roll Back Malaria

Initiative of the Federal Government of Nigeria [16].

The susceptibility and severity of malaria infection in pregnant women vary widely and are influenced by several biological parameters such as immunological and humoral alterations, parity, maternal age, gestational age, and transmission intensity. Although malaria during pregnancy might be asymptomatic due to a high level of acquired immunity in mothers living in high transmission areas [17], hence there is a need for surveillance of pregnant women's malaria status in order to provide prompt and effective disease management, as recommended by the World Health Organization. As a result, the aim of this paper was to investigate the situation of malaria infection among pregnant women from Yamaltu-Deba Local Government Area of Gombe State, Nigeria.

2. Materials and Methods

2.1. Study area

The study was carried out at Kwadon district, Yamaltu Deba Local Government Area of Gombe state. It lies between latitude 10°27^1, 10°16^{1}N and longitude 11°28^{1}E, 11°17^{1}E with an altitude of 210.63feet (369.0m). It's located about 7 km away from the State Capital, along Gombe-Biu road. The major tribes in the area are Tera, Fulani, Hausa and Waja. Kwadon has a population of 81,937. The local government is known for its agricultural activities throughout the year.

2.2. Ethical consideration and consent of the subjects

Prior to the commencement of research permission was sought from Yamaltu Deba Local Government Primary Health Care for using their facility as the recruitment centre and its client as the study subjects. The permission was granted and after which permission of each subject was sought verbally after they were briefed on the benefit of the research and a need for them to actively participate by giving blood sample and other basic information.

2.3. Inclusion criteria

Only pregnant women who reported themselves to Kwadon Primary Health care and were voluntarily willing to participate actively in the study were recruited.

2.4. Exclusion criteria

All pregnant women who were enrolled for antenatal or not, but under malaria treatment, or declined to voluntarily participate in the study were automatically excluded from the study.

2.5. Study population

The study population were pregnant women attending anti-natal clinic at Primary Health Care Kwadon.

2.6. Study subjects and sample size determination

A total of 384 study subjects were randomLy selected using the following standard formula.

$$\text{Sample size (n)} = \frac{(Z)2p\,(1-p)}{d^2}$$

2.7. Blood sample collection

Blood samples were collected using a venepuncture technique. Safety procedures were adopted in the collection. The area of skin from which the blood was to be drawn (upper arm) was tied with tourniquet and sterilized with cotton wool moistened with 70% alcohol and puncture was made with sterile needle and plastic syringe. Venous blood sample (2.0 mL) was collected from the median cubital vein of each participant into Ethylene Diamine Tetra Acetic acid (EDTA) containers and gently mixed with the EDTA.

2.8. Blood sample analysis

2.8.1. Staining and examination of slides

Thin and thick films were prepared on a grease free slide, the thick film was fixed with methanol and later allowed to dry. The dry films were stained in 10% **Gemsa** for 10 minutes finally, the films were examined under an oil immersion, microscope objective (100x).

2.9. Statistical analysis

All data generated were analysed using statistical package for social Sciences (SPSS) version 20.0. Chi-square was used to tests for associations between the variables and Statistical significance was set at $P \leq 0.05$.

3. Results

3.1. Demographic information

A total of 384 consented pregnant women from five different villages comprised of Kwadon 191(49.74%), Liji 62(16.5%), Wajari 49(12.76%), Boltongo 47(12.34%), and Danaje 35(9.11%) of Yamaltu-Deba Local Government Area were enrolled in the study. The age of the study subjects ranged between 14 to 45 with the mean age of 25.3±6.4, 213 (55.47%), and 194 (50.52%) of the subjects were respectively multigravidae and in their third trimesters as shown in Table 1, as follow.

Table 1. Demographic Characteristic and vital statistics of the study subjects

Village	No. of subjects	Trimester	No. of subject	Gravidity	No. of subject	Vital statistics	Value
Boltongo	47 (12.24%)	First	07	Paragravidae	51 (13.28%)	Mean age	24.2
Danaje	35 (9.11%)	Second	183	Secundigravidae	57 (14.84%)	±SD	6.2
Kwadon	191 (49.74%)	Third	194	Multigravidae	213 (55.47%)	Mode	20 years
Liji	62 (16.15%)	Total	384 (100%)	Total	384 (100%)	Range	20-23 year
Wajari	49 (12.76%)						
Total	384 (100%)						

3.2. Prevalence of malaria

Out of the 384 pregnant women actively participated in the study, 81(21.09%) were *Plasmodium falciparum*-malaria positive, as displayed in Figure 1.

Malaria prevalence with regard to the villages of the subjects is listed in Table 2, where Wajari village had the highest prevalence of 13(26.53%) while Danaje recorded the least prevalence of 03(8.57%). A prevalence of 15(24.19%), 43(22.51%), and 07(14.89%) were reported from Liji, Kwadon and Boltongo, respectively. Statistically there was no association between malaria infection and location of the pregnant women (x^2=5.847, df= 4, $P > 0.05$).

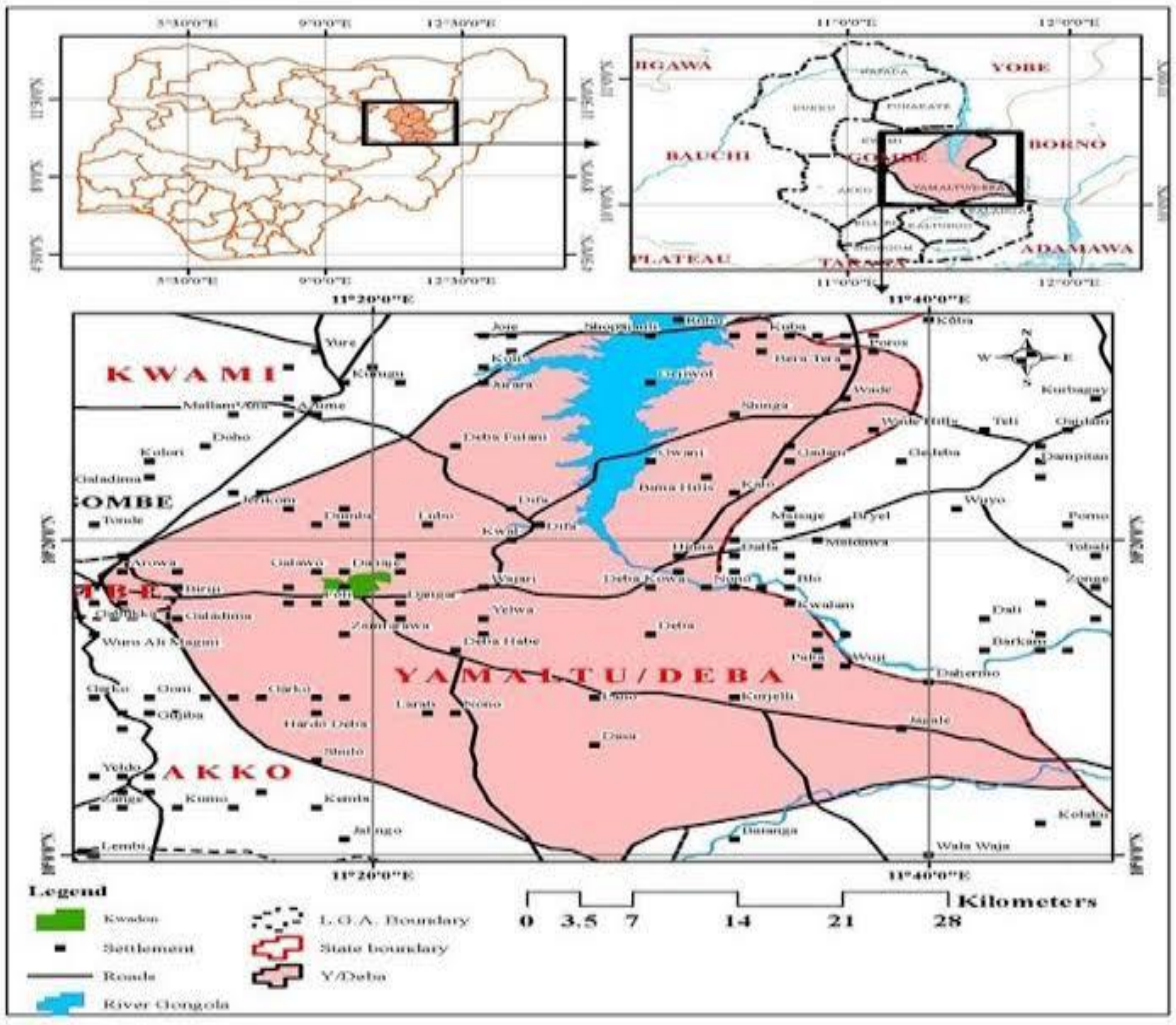

Figure 1. Map of Yamaltu- Deba LGA, Gombe state

The result of malaria prevalence with regard to the age group of the pregnant women is indicated in Table 3. The result revealed that the highest prevalence of 02(40%) was recorded from the age bracket 41-45 years, while least prevalence of 02(13.33%) was recorded from age bracket 36-40years. A prevalence of 01(14.29%) and 19(16.24%) were recorded from age group 10-15 and 16-20 years, respectively. A prevalence of 26(23.64%) was reported from the age bracket 21-25, while age group 26-30 and 31-35 had a prevalence of 20(22.47%) and 11(26.83%), respectively. Statistically, there was no association between malaria infection and age group of the pregnant women (x^2=4.816, df=6, P>0.05).

Table 4 depicts the prevalence of malaria in relation to trimester of the pregnant women, where the highest level of malaria infection of 02(28.57%) was recorded from subjects in first trimester, while subjects in second and third trimester had a prevalence of 37(20.23%) and 42(21.65%), respectively. Statistically, malaria infection was not associated with trimester of the pregnant women (x^2=0.355, df=2, P>0.05). Malaria infection in relation to gravidity revealed that highest prevalence of 63(29.57%) was recorded from multigravidae, while primigravidae and secundigravidae had a prevalence of 9(17.64%) and 9(15.79%), respectively as listed in Table 3. Statistically, malaria infection was not associated with gravidity of the subjects (x^2=1.825, df=2, P>0.05).

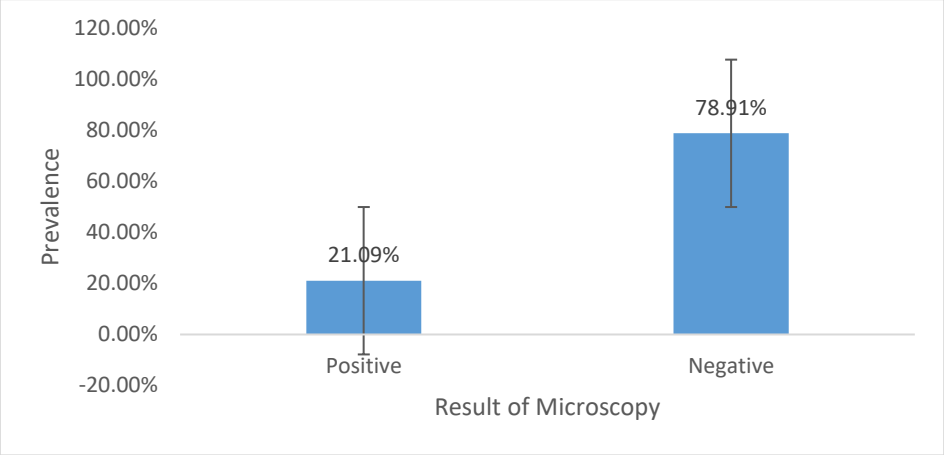

Figure 2. Malaria Prevalence among pregnant women

Table 2. Relationship between Malaria prevalence and the villages of the pregnant women

Village	No. of the examined sample	Positive (Prevalence %)
Boltongo	47	07(14.89%)
Danaje	35	03(8.57%)
Kwadon	191	43(22.51%)
Liji	62	15(24.19%)
Wajari	49	13(26.53%)
Total	384	81(21.09%)

(x^2=5.847, df= 4, P> 0.05).

Table 3. Relationship between malaria prevalence and age of the pregnant women

Age range(years)	No. of subjects	Positive (Prevalence)
10-15	07	01(14.29%)
16-20	117	19(16.24%)
21-25	110	26(23.64%)
26-30	89	20(22.47%)
31-35	41	11(26.83%)
36-40	15	02(13.33%)
41 and above	05	02(40.00%)
Total	384	81(21.09%)

x^2=4.816, df=6, P>0.05

Table 4. Relationship between malaria prevalence, trimester and gravidity

Trimester	No.of subjects	Positive (Prevalence%)	Gravidity	No.of subjects	Positive (prevalence%)
First	07	02(28.57%)	Primigravidae	51	09(17.64%)
Second	183	37(20.22%)	Secundigravidae	57	09(15.79%)
Third	194	42(21.65%)	Multigravidae	213	63(29.57%)

x^2=0.355, df=2, P>0.05
x^2=1.825, df=2, P>0.05

4. Discussion

This study found a relatively low prevalence of 21.09% , which is significantly lower than the 99.0% reported by Gunn *et al.* [18] among Pregnant Women from Enugu State, Nigeria and 55.9% reported by Udoh and Peter [19] among the pregnant women from Calabar, Cross River State, and Nigeria. The difference seen could be ascribed to the season in which the study was conducted, as the current study was conducted in two seasons, wet and dry, whereas the previous study was conducted entirely during the rainy season (May-September). This is the season when malaria vectors are at the height of their breeding activities due to the abundance of active breeding sites created by rainfall, thus facilitating malaria transmission. It could also be attributed to different locations, as Lagos is located in southern part of the country where malaria transmission is all year round as a result of it swampy nature and rainfall.

The presence of only *Plasmodium falciparum* specie in this study was not surprising as the species is the most predominant malaria parasite in the region where majority of all malaria infections are attributed to *Plasmodium falciparum*. This disagrees with the findings of Okpu *et al*. [20] who reported the *Plasmodium vivax* from Bayelsa among pregnant women. The finding of this study is very similar to the findings of Oboro *et al*. [21] who reported 99% *Plasmodium falciparum* among pregnant from Niger Delta region of Nigeria. On the other hand, the finding of this study is very similar to that of Kwizera [22] who reported a prevalence of *Plasmodium falciparum*-malaria of 29.4% among Pregnant Women in their second trimester from Rwanda.

The prevalence of malaria among pregnant women in the selected villages was in the rage 8.59-26.53% with Wajari village recorded the highest rate of malaria among the pregnant women. This might be attributed to the presence of numerous active breeding site of malaria vector around the vicinity of the village, as most inhabitant of the village engaged in irrigation farming which provide constant supply of water for the vector, thus making the breeding sites in the village active all year round, hence facilitate malaria transmission. In addition, the presence of a quite number of small ponds which are used by herdsmen for watering cattle and other small animals may also influence malaria transmission in the village.

In this study older pregnant women (35-40 years) had the highest malaria prevalence. This finding is contrary to the findings of Fana *et al.* [23] and James and Victoria [24] who respectively reported high malaria prevalence from age range 21 – 27 among pregnant women in a semi-urban community of north-western Nigeria, and low malaria prevalence among pregnant women Pregnant Women WHO Attended General Hospital Shendam, Plateau State State, Nigeria. In this high prevalence of malaria was recorded from subjects in first trimester study, this is similar to the findings of Maduka *et al.* [25] who also reported high prevalence among pregnant women in first trimester from Niger Delta area, Nigeria. High prevalence of the disease among pregnant women in first trimester may be attributed to the weak immunity possessed by the pregnant women in first trimester. Highest prevalence was recorded from multigravidae, this is contrary to the findings of Oladeinde *et al.* [26] who also reported high prevalence among Primigravidae among pregnant women Benin City, Nigeria.

5. Conclusion

Malaria infection among pregnant women is prevalent in Yamaltu-Deba

L.G.A, however it is at moderate level, where an overall prevalence of 21.09% was recorded and the highest prevalence of less than 27% was recorded from Wajari village of the Local government. *Plasmodium falciparum* was the only malaria parasite specie reported from the selected villages.

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Ethics Approval and Consent to Participate

Permission was sought through Health, Research and Ethical committee of ministry of health, Gombe state. The ethical approval was communicated via a letter with the following code **MOH/ADM/621/Vol.1/416**. **Conflict of interest**.

The authors declare that there is no conflict of interest.

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