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Malaria prevalence in pregnant women receiving antenatal care at the health centre of University of Uyo, Nigeria

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ABSTRACT

Objective: To assess the prevalence of malaria among pregnant women receiving antenatal care at the health centre of the town campus of University of Uyo, Nigeria.
Methods: A total of 1 171 pregnant women participated in the present study. Structured questionnaire was administered to obtain relevant demographic and clinical characteristics of the participants. Thin blood films were obtained and examined for malaria parasites. Data obtained were analyzed using the statistical software SPSS version 20.
Results: The results obtained showed that out of the 1 171 pregnant women, 61 (5.21%) were positive for malaria infection. The month of July recorded the highest prevalence [19.70% (12 cases)], while February, April and June had the lowest prevalence [11.50% (7 cases) each]. Results obtained from *Chi*-square test indicated that the difference in the prevalence of malaria in relation to age was statistically significant (χ^2_{cal} = 16.616, χ^2_{tab} = 7.815, $P < 0.05$). The difference in the prevalence of malaria based on occupation was not significant (χ^2_{cal} = 3.474, χ^2_{tab} = 9.488, $P > 0.05$).
Conclusions: The prevalence rate of malaria infection among pregnant women was low in the present study. However, malaria in pregnancy still remains a health-care concern in our communities.

1. Introduction

Malaria is a mosquito-borne infectious disease affecting humans and other animals, and it is caused by the parasitic protozoans of the genus *Plasmodium*. Malaria parasites (*Plasmodium* spp.) are transmitted from one person to another by female anopheline mosquitoes. An estimated 216 million cases of malaria occurred between 2000 and 2015 and the African sub-region accounted for 90%. There were 655 000 deaths due to malaria between 2000 and 2015 with 91% in the African region, and 86% were pregnant women and children under 5 years of age. Nigeria accounts for nearly 50% of the global malaria deaths[1]. Malaria has become one of the most challenging infectious diseases to eradicate in Africa. It imposes substantial costs to both individuals and governments. The disease has social consequences and exerts a heavy burden on economic development[2,3].

Malaria is responsible for significant morbidity in pregnant women and is a major cause of perinatal mortality, maternal anaemia and intrauterine foetal growth retardation[4-6]. Pregnant women have increased incidence of major complications of malaria[7]. A pregnant woman infected with the malaria parasite on established infection often suffers from febrile attacks and physical examination may reveal jaundice, tachycardia (abnormal rapidity of the heartbeat), tachypnoea (abnormal rapidity in breathing) and hepatosplenomegaly (enlargement of the liver and the spleen), and urine test may reveal proteinuria and slight haematuria[8,9]. Malaria in pregnancy contributes significantly to higher rates of miscarriages, intrauterine demise, premature delivery, low birth weight and neonatal death[10-12]. Despite massive anti-malaria campaigns and preventive measures across the African sub-continent, such as access to intermittent preventive treatment (IPT) and insecticide-treated nets (ITNs) from governments, non-government organizations and corporate bodies, malaria especially in pregnant women still persists.

The aim of this research was to assess the prevalence of malaria in pregnant women receiving antenatal care at the health centre of the town campus of University of Uyo, Nigeria.

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The study protocol was approved by the Ethics Committee of University of Uyo. All doctors and laboratory staff of the clinic involved in the study were briefly informed the objectives of the study. Consent was sought from the patients to participate in the study and only those who consented were enrolled for the study.

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2. Materials and methods

2.1. The study area

This study was conducted at the health centre of the town campus of University of Uyo, Nigeria. Uyo is the capital city of Akwa Ibom State, Nigeria (Figure 1). It lies in the coastal zone of the tropical rainforest of Nigeria, within latitude 4°32' N and 5°33' N and longitude 7°25' E and 8°25' E. The area has two rainfall peaks in June and September. The relative humidity is about 77.20%. Based on reports of the last population census, Uyo has an estimated population of 222 841[13].

2.2. Ethical clearance

The study protocol was approved by the Ethics Committee of University of Uyo.

All doctors and laboratory staff of the clinic involved in the study were briefly informed the objectives of the study. Consent was sought from the patients to participate in the study and only those who consented were enrolled for the study.

2.3. Study population and period of study

The population which served as models for this study comprised 1 171 pregnant women (all above 18 years of age) who were receiving antenatal care from the health facility used for this research.

A structured questionnaire was designed and administered to the participants to obtain relevant demographic information and clinical characteristics. This study commenced in January, 2016 and was concluded in July, 2016.

2.4. Collection and preparation of blood samples and laboratory screening

Blood samples used in this study were obtained from the pregnant women with the assistance of laboratory personnel of the health

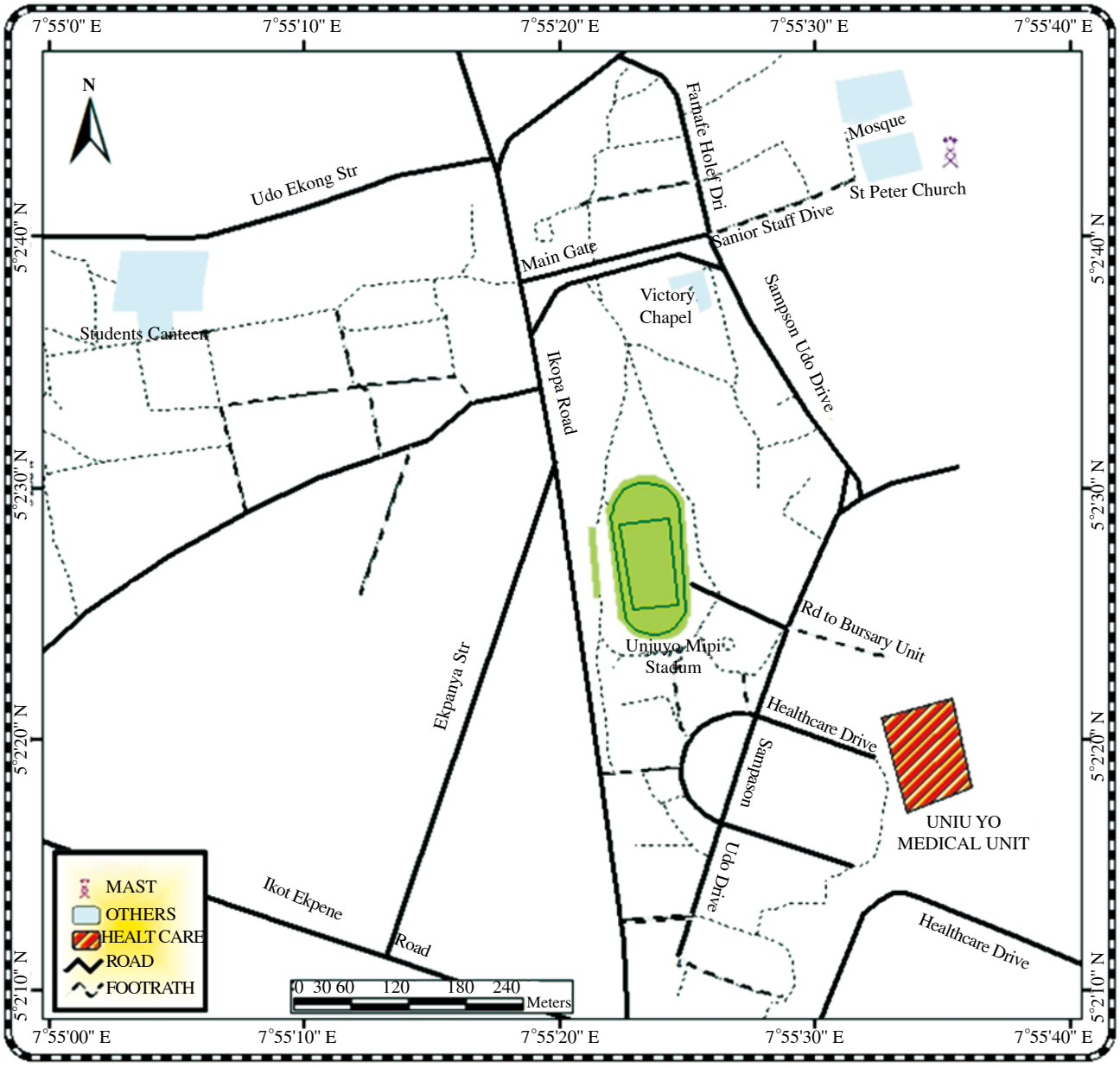

Figure 1. Map of University of Uyo (town campus) showing the study area.
Uniuyo Medical Unit: University of Uyo Health Centre.

facility. A tourniquet was tied to the upper arm to exert pressure and hence expose the vein. The blood collection site of the left lower arm was first sterilized by swabbing with absorbent cotton wool which had been soaked in 70% alcohol. The site was allowed to dry and then sterile needle and syringe were used to collect 1 mL of venous blood. A drop of the blood was placed on labeled clean and grease-free slide for preparation of thin blood smear.

The thin blood films were prepared and examined for malaria parasite as described by Cheesbrough[14]. Malaria diagnosis was based on identification of asexual stages of *Plasmodium* species. Slides were considered negative after observing at least 100 high power fields without detecting any malaria parasite.

2.5. Analysis of data

Data obtained from this research were subjected to descriptive analysis. *Chi*-square test was also employed to ascertain the pattern of distribution of infection among the pregnant women examined, taking age and occupation into consideration. The statistical software used was SPSS version 20. A probability value (*P*-value) of $P < 0.05$ was considered significant.

3. Results

A total of 1 171 pregnant women were examined for malaria parasite. The results indicated that 149, 186, 150, 104, 255, 133 and 194 pregnant women were examined in January, February, March, April, May, June and July, respectively (Table 1). However, of the 1 171 women examined, only 61 cases were found to be infected with the parasite. The month of July had the highest prevalence of 19.70% (12 cases), while the lowest prevalence of 11.50% (7 cases) occurred in February, April and June (Table 1).

Table 1
Prevalence of malaria in pregnant women receiving antenatal care in health centre of University of Uyo (January–July, 2016).

Month	Examined (*n*)	Infected (*n*)	Infected (%)
January	149	8	13.10
February	186	7	11.50
March	150	9	14.80
April	104	7	11.50
May	255	11	18.00
June	133	7	11.50
July	194	12	19.60
Total	1 171	61	100.00

The age distribution of pregnant women examined for malaria parasite is presented in Table 2.

Table 2
Age distribution of pregnant women examined for malaria parasite in the study area [*n* (%)].

Month	25 years and below	26–30 years	31–35 years	36–40 years	41 years and above	Total
January	12 (1.00)	75 (6.40)	43 (3.70)	12 (1.00)	7 (0.60)	149 (12.70)
February	27 (2.30)	74 (6.30)	46 (3.90)	28 (2.40)	11 (0.90)	186 (15.90)
March	31 (2.60)	41 (2.50)	40 (3.40)	34 (2.90)	4 (0.30)	150 (12.80)
April	27 (2.30)	28 (2.40)	24 (2.00)	17 (1.40)	8 (0.70)	104 (8.90)
May	55 (4.70)	98 (8.40)	60 (5.10)	26 (2.20)	16 (1.40)	255 (21.80)
June	34 (2.90)	31 (2.60)	35 (3.00)	21 (1.80)	12 (1.00)	133 (11.40)
July	28 (2.80)	67 (5.70)	58 (5.00)	31 (2.60)	10 (0.90)	194 (16.60)
Total	214 (18.30)	414 (35.40)	306 (26.10)	169 (14.40)	68 (5.80)	1171 (100.00)

The age group of 26–30 years had the highest prevalence of 42.60% (26 cases), while the age group of 41 years and above recorded the lowest prevalence of 1.60% (1 case) (Table 3). A comparison of the number of infected cases with that of the non-infected cases based on age group is presented in Table 4. Using *Chi*-square test, the difference in the prevalence of malaria in relation to age was statistically significant ($\chi^2_{cal} = 16.616$, $\chi^2_{tab} = 7.815$, $P < 0.05$).

Table 3
Prevalence of malaria in relation to age group among participants examined.

Month	25 years and below	26–30 years	31–35 years	36–40 years	41 years and above	Total
January	1 (1.60)	3 (4.90)	2 (3.30)	2 (3.30)	0 (0.00)	8 (13.10)
February	1 (1.60)	3 (4.90)	3 (4.90)	0 (0.00)	0 (0.00)	7 (11.50)
March	2 (3.30)	4 (6.60)	2 (3.30)	1 (1.60)	0 (0.00)	9 (14.60)
April	1 (1.60)	3 (4.90)	2 (3.30)	1 (1.60)	0 (0.00)	7 (11.50)
May	1 (1.60)	6 (9.80)	3 (4.90)	1 (1.60)	0 (0.00)	11 (18.00)
June	1 (1.60)	3 (4.90)	2 (3.30)	1 (1.60)	0 (0.00)	7 (11.50)
July	2 (3.30)	4 (6.60)	3 (4.90)	2 (3.30)	1 (1.60)	12 (19.60)
Total	9 (14.80)	26 (42.60)	17 (27.90)	8 (13.10)	1 (1.60)	61 (100.00)

Table 4
Comparison of the number of infected cases with that of the non-infected cases based on age group.

Age group (years)	Screened (*n*)	Infected [*n* (%)]	Non infected [*n* (%)]
25 and below	214 (18.30)	9 (0.80)	205 (17.50)
26–30	414 (35.40)	26 (2.20)	388 (33.10)
31–35	306 (26.10)	17 (1.50)	289 (24.70)
36–40	169 (14.40)	8 (0.70)	161 (13.70)
41 and above	68 (5.80)	1 (0.10)	67 (5.70)
Total	1 171 (100.00)	61 (5.20)	1 110 (94.80)

$\chi^2_{cal} = 16.616$, $\chi^2_{tab} = 7.815$, $P < 0.05$.

Of the 1 171 participants examined in this study, 290 (24.80%) were housewives, 539 (46.00%) were civil servants, 248 (21.20%) were traders and 94 (8.00%) were artisans/professionals (Figure 2). Of the 61 infected cases, 14 (23.00%) were housewives, 17 (27.90%) were civil servants, 25 (41.00%) were traders, and only 5 (8.20%) artisans/professionals were infected with the malaria parasite (Figure 2). The difference in the prevalence of malaria in the study population in relation to occupation was not statistically significant ($\chi^2_{cal} = 3.474$, $\chi^2_{tab} = 9.488$, $P > 0.05$).

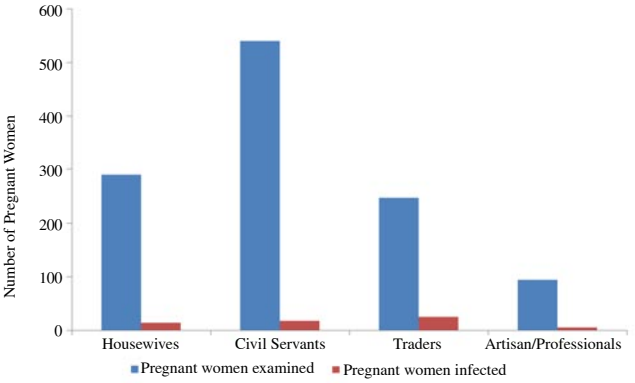

Figure 2. Pregnant women enlisted based on their occupation.
$\chi^2_{cal} = 3.474$, $\chi^2_{tab} = 9.488$, $P > 0.05$.

4. Discussion

The rainfall in the study area as earlier mentioned results in an increase in the number of stagnant pools which provide hospitable breeding grounds for vectors (*Anopheles* spp.) of the malaria parasite (*Plasmodium* spp.). This may have accounted for the prevalence of malaria infection in the study population. However, the prevalence of

malaria infection recorded in this study was low (5.20%). This low prevalence rate suggests an improvement in the malaria prevention strategies employed. One of the strategies is intermittent preventive treatment (IPT) of malaria using sulphadoxine and pyrimethamine, which are often administered to pregnant women in the health facility that was chosen for this study. This is in line with the intervention strategies of Roll Back Malaria (RBM) recommended by the World Health Organization for the management of malaria in pregnancy[15]. The IPT with sulphadoxine-pyrimethamine, thus, contributed to a reduction in the prevalence of the disease in the study population. This clearly shows the need to start protection against malaria as early as possible in pregnancy[16]. The significant difference in the prevalence of malaria in relation to age reported in this study is a reflection of the age-related state of anti-malarial immunity that is developed as a result of repeated malaria infections under established malaria endemicity. This is substantiated by the results in this study in which the lowest prevalence of infection was reported for age group of 41 years and above. This older population may have developed some immunity to malaria because of repeated exposure to the infection. This corroborates the reports of Adiamah *et al*.[17] and Onah and Omudu[18].

The highest number of infected cases in age group of 26–30 years, which was higher than that for the age group of 25 years and below, may be attributed to the fact that the age group of 26–30 years constitutes the productive work force in any organisation. Often, they are exposed to adverse environmental and climatic conditions which make them vulnerable to attacks.

The difference in the prevalence of malaria in this study based on occupation was not significant. This again agrees with the findings of Onah and Omudu[18] who reported that there was no relationship between occupation and malaria prevalence. However, when prevalence rates obtained from this research were ranked on the basis of occupation, traders had the highest prevalence of infection (Figure 2). They often move from place to place in order to buy and sell their wares. The frequent movement exposes them to adverse conditions and makes them more vulnerable to attacks by mosquito vectors and other disease-causing agents. Pregnancy makes the individual more vulnerable to attacks of malaria especially when compared to the non-pregnant women. Women exposed to *Plasmodium* infection develop antibodies and become semi-immune. During pregnancy, this immunity becomes suppressed. This makes both the pregnant woman and the foetus vulnerable to the adverse effects of malaria, particularly by *Plasmodium falciparum*[19,20].

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

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