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Prevalence of asymptomatic malaria parasitaemia

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ABSTRACT

Objective: To evaluate factors associated with prevalence of malaria parasitaemia at first antenatal care visit. **Methods:** The study was conducted at the University of Calabar Teaching Hospital from 1st June, 2007 to 31st July, 2007. A structured questionnaire was administered to a total of 545 pregnant women that were recruited in this study after obtaining informed consent and two slides of thin and thick films were prepared for each participant. **Results:** Five hundred and twenty (95.4%) out of the 545 participants suffered from malaria parasitaemia, the rest 4.6% of those who had no parasitaemia had experienced symptomatic malaria before and were treated in private hospitals prior to their recruitment into the study. All participants (100%) who did not have antimalarials had parasitaemia compared with 91.1% among those that had antimalarials. The proportion of moderate to severe parasitaemia was also significantly higher among the former. Besides, the difference in parasitaemia between primigravidae and multigravidae was statistically significant (P=0.000) too. Among the methods used for vector control, only insecticide treated nets (ITNS) was associated with significant reduction in the level of parasitaemia (RR=0.83). **Conclusion:** Malaria parasitaemia at first booking is significantly higher in primigravidae and women who have no anti-malaria treatment. The use of safe and effective antimalarial treatment along with ITNs will significantly reduce the level of parasitaemia in pregnant women.

1. Introduction

Malaria has been shown to be the most frequent reason for hospital attendance in all age groups in Nigeria [1]. As a result of migration from endemic to non-endemic regions, malaria is also becoming a burden in the western world where it had earlier been eliminated. It is therefore an important public health parasitic infection not only in the tropics but also in the developed world [2].

Malaria was responsible for about 48.2% of the ailments experienced by pregnant women presented to doctors in Nigeria in 2000 [3]. Currently, it is the most frequent cause of anaemia in pregnant women in sub-Saharan Africa. The role of malaria infection in causing miscarriages, preterm labour, increased uterine activity, intrauterine fetal deaths and severe maternal morbidities cannot be overemphasized[2-6]. Impacts of this problem are worse on primigravidae and secundegravidae because of their reduced cell mediated and humoral immunity[4,5] Recent reports also show that malaria was responsible for about 10% of maternal deaths in Calabar, 8% in Enugu, 7.8% in Lagos and 8.2% in Kano, Nigeria[3]; the problem therefore cuts across the entire country. The prevention of malaria in pregnancy is therefore a major public health challenge and a priority for the Roll Back Malaria (RBM) programme.

The prevalence of malaria infection at first antenatal booking has not been studied yet in Calabar. This study can be as a guide to the treatment and prophylaxis of malaria parasitaemia among pregnant women.

2. Materials and methods

The setting of the study is Calabar, the capital city of Cross River State in Nigeria with a population of over a million people. The state is acclaimed as a tourism destination and Calabar the headquarter, the cleanest city in Nigeria. Thousands of international tourists visit the state annually. The vegetation is mangrove with a mean rainfall of 250 cm and malaria transmission is throughout the year.

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A structured questionnaire was administered to consenting pregnant women who booked for antenatal care at the University of Calabar Teaching Hospital, Calabar. Information obtained included age, parity, social status and malaria treatment prior to the antenatal care booking in the hospital.

Two glass slides were labeled for each patient to prepare thin and thick blood films. Blood was obtained using a sterile lancet to prick the palmar surface of the thumb after adequate asepsis. Thin and thick blood films were prepared and stained with Giemsa stain. The slides were read under oil immersion with a 100 × objective magnification. Parasite enumeration was done using the WHO approved method [7]. The minimum sample size of 464 women for the study was calculated from an earlier pilot study by the authors using 40 pregnant women at first antenatal visit. The prevalence of malaria parasitaemia in the pilot study was 54.0%. The data were analyzed using EPI-Info 2002 Statistical software of the Centre for Disease Control and Prevention, Atlanta, USA. A *P*-value of < 0.05 was considered as significant.

Parasite density in this study was quantified as mild (<1 000), moderate (1 000 – 2 999) and severe (⩾3 000) parasites per millilitre.

3. Results

3.1. General data

A total of 545 women participated in this study ranging from 16–45 years old. The mean age of primigravidae and multigravidae were (21.400 ± 3.051) and (24.270 ± 4.026) years old respectively (t= 9.44, df= 543, P= 0.000). All the participants were literate (Table 1).

Table 1
Age distribution of participants

Age(years)	Number	Primigravidae	Multigravidae
16–20	143	135(46.6%)	8(3.1%)
21–25	340	140(48.3%)	200(78.4%)
26–30	40	12(4.1%)	28(11.0%)
31–35	10	2(0.7%)	8(3.4%)
36–40	9	1(0.3%)	8(3.1%)
41–45	3	0(0.0%)	3(1.2%)
Total	545	290(100.0%)	255(100.0%)

Gestational age at first booking ranged from 8 to 37 weeks for all parities. Mean gestational age at first booking for primigravidae was (16.600 ± 4.730) weeks while that of the multigravidae was (22.580 ± 5.525) (t = 13.6, df=543, P= 0.000) (Table 2).

3.2. Previous treatments

Five hundred and forty out of 545 (95.4%) of the participants had parasitaemia and the rest 25(4.6%) pregnant women that had no parasitaemia were multiparous, with higher socioeconomic status and are more likely to adopt multiple preventive measures against malaria infection. These 25 women may have experienced symptomatic malaria before and were treated in private hospitals prior to their recruitment into the study. Four of them were treated with quinine, 10 with Artemisinin combination medications (These range from Coartem, Lonart, *P*-Alaxin to Artecom), 8 with sulphadoxine-pyrimethamine which was followed by Artemisinin combination therapy (ACTs), and 3 had quinine first, discontinued as a result of side effects and concluded with ACTs. There was significant difference between the mean parasite density of primigravidae (1 296.550 ± 1 233.753) and that of the multigravidae (660.77± 496.54) (t=7.70, df= 543, P = 0.000).

Table 2
Gestational age at booking.

Gestational age (weeks)	Primigravidae	Multigravidae
8–12	51(17.6%)	10(3.9%)
13–17	137(47.2%)	40(15.7%)
18–22	55(19.0%)	66(25.9%)
23–27	40(13.8%)	98(38.4%)
28–32	5(1.7%)	24(9.4%)
33–37	2(0.7%)	17(6.7%)
Total	290(100.0%)	255 (100.0%)

3.3. Severity comparisons

All participants who were not treated with antimalarials (265/265, 100%) suffered from parasitaemia and the corresponding proportion was 91.1% (255/280) among those that were treated with antimalarials before booking. There was a significant difference between them in the density of parasitaemia (x^2=24.8, P=0.0000006).

Mild and moderate – severe parasitaemia was present in 68.6% (175/255) and 31.4% (80/255) participants that had antimalarial drugs, while for those who didn't have, the corresponding proportion was 42.3% (112/265) and 55.5% (147/265) showing significant difference between them. (x^2 = 36.52, P = 0.0000000). The parasite density was also lower in those who had antimalarial drugs than those who did not.

3.4. Vector control methods

There was a statistically significant reduction of parasitaemia proportion (RR = 0.83, CI = 0.76 – 0.89) among participants that used insecticide treated nets (ITNs) as vector control method. However, no reduction was observed among those that used door/window nets or insecticide sprays, and those who said their living environments were surrounded by bushes, streams and water pots (RR=1.01, 1.01 and 1.00 respectively) (Table 3).

Table 3
Association between exposure variables and parasitaemia (%).

		Yes, exposed	No, not exposed	Relative risk 95% *RR* (CI)
Exposure	Door/Window nets	95.8(340/355)	94.7(180/190)	1.01(0.97–1.05)
n =545	ITNs	82.4(112/136)	99.8(408/409)	0.83(0.76–0.89)
	Insecticide spray	95.1(220/229)	94.9(300/316)	1.01(0.98–1.05)
	Environment surround by bush, etc	95.6(302/316)	95.2(218/229)	1.00(0.97–1.04)
Drugs	Pyrimethamine	97.3(110/113)	86.8(145/167)	1.12(1.05–1.20)
n = 280	Proguanil	28.1(9/32)	99.2(26/248)	0.28(0.16–0.49)
	Chloroquine	88.4(61/69)	92.0(194/211)	0.96(0.87–1.06)
	Sulphadoxine – pyrimethamine	95.5(193/202)	79.5(62/78)	1.20(1.07–1.35)
	Artesunate	98.3(118/120)	85.6(137/160)	1.14(1.07–1.22)
	ACT	60.0(12/20)	93.5(243/260)	0.64(0.45–0.92)
	Quinine	0(0/4)	–	Not estimable

4. Discussion

Adults living in malaria endemic areas like Nigeria acquire protective immunity; however, they become susceptible when they become pregnant, especially for the first time [4–10]. This reduction in immunity results in more frequent episodes of plasmodium parasitaemia [5, 6]. This is reflected in the 95.4% prevalence of parasitaemia in this study. In areas with stable malaria like Cross River State, majority of cases of malaria in pregnancy remain asymptomatic, undetected and untreated. All participants in this study were asymptomatic. The devastating effects of malaria parasitaemia on the erythrocytes and placental bed are a continual process in the asymptomatic pregnant woman and it is worse in primigravidae in endemic areas [5].

The prevalence of parasitaemia in pregnant women at booking visit was 95.4%. More than half (55.19%) of women who had antimalarial treatment before booking had mild parasitaemia, and these women may have had symptomatic malaria that caused them to take antimalarials. The interval between the use of antimalarials and booking was not ascertained. The parasitaemia in them could be a resistant strain or a reinfection.

The proportion of moderate to severe parasitaemia was significantly higher in those who had no antimalarial treatment before booking.

It was observed that all the primigravidae in this study were parasitaemic with a mean parasitaemia significantly higher than multigravidae. This observed difference is in consonance with previous reports [2,3,6,8,14]. They are therefore at increased risk of severe malaria and its complications, and deserve special attention to reduce the burden of malaria during pregnancy. It has been shown that the severity of malaria in pregnancy is related to the parasite density rather than the clinical presentation [6,12,13]. The primigravidae tend to book early in the second trimester. This improves their chances of receiving intermittent preventive treatments of malaria during pregnancy [9].

It was observed that all those who were not parasitaemic belonged to higher socioeconomic group and were more prone to adopting positive health interventions.

Among measures of vector control adopted by participants, only the use of insecticide treated nets (ITNs) showed significant decrease (17%) in the risk of parasitaemia. These finding has also been reported in previous studies [13, 16–18]. We did not however explore the possibility of utilizing more than one method of vector control in this study. It is probable that women who use insecticide treated nets are those who are more likely to utilize chemoprophylaxis and other methods to prevent malaria infection during pregnancy.

There was a significant association between parasitaemia and the use of proguanil, Artemisinin combination therapy and quinine with a 62%, 36% and 100% reduction in parasitaemia respectively. These drugs have been shown to be effective in the treatment of uncomplicated malaria1. Proguanil is generally used as prophylaxis while Artemisinin combination therapy (ACT) is recommended as first line drug for the treatment of malaria during pregnancy from the second trimester in Nigeria[1]. Quinine is safe in all stages of pregnancy if properly used [1]. The observed reduction may be multifactoral because some participants may have taken multiple drugs but become better with the index medications. The effectiveness of pyrimethamine and chloroquine for malaria prevention has been shown to fail in previous studies [1,8,15,16]. It has also been shown that there is increasing resistance in the use of Sulphadoxine – pyrimethamine and Artemisinin monotherapies [1,16]. The increasing level of resistance of malaria parasites to the above antimalarial drugs led the federal government of Nigeria to withdraw them as first line drugs in the treatment of malaria diseases[1].

The existing health facilities make it not feasible to screen all pregnant women before treatment and a negative blood film alone can not rule out parasitaemia completely. We used parasite density in assessing the intensity of malaria parasitaemia among the study population rather than blood films which were either positive or negative. Rapid diagnostic tests are available but may not be affordable in our setting [18,19]. This underscores the need for presumptive treatment of malaria in pregnancy.

Significant level of parasitaemia was present in asymptomatic participants. This poses a major problem of diagnosis and treatment of malaria during pregnancy. The screening of all pregnant women for malaria using parasite density in hyper–endemic areas is expensive, cumbersome and not feasible with the present state of health care delivery in the third world like ours. Efforts must therefore be made in providing cheap, available and accessible rapid diagnostic test kits for routine screening.

Hereby, it can be concluded that: (1)The observation that over 95% of the participants were parasitaemic in this study

poses a serious public health challenge.(2)Interventions to improve the rate of early booking should be put in place with awareness programmes especially directed to multigravidae. (3)The use of antimalarial drugs such as proguanil, Artemisinin combination drugs, quinine as well as Insecticide Treated Nets (ITNs) showed significant parasite reduction.

This study therefore shows that parasite clearance with effective and safe antimalarial drugs at booking is a logical practice in reducing the burden of malaria in pregnancy in endemic areas. The use of ITNs as vector control in combination with environmental sanitation in the community should also be encouraged. This study therefore justifies presumptive treatment of malaria with safe and effective antimalarial drugs at first antenatal visit in endemic areas.

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