PREVALENCE OF MALARIA PARASITES AND ANAEMIA IN PREGNANT AND NON PREGNANT WOMEN IN ABA AND OKIGWE TOWNS OF SOUTHEAST NIGERIA

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ABSTRACT

A study of the prevalence of Malaria parasites in pregnant women attending pre - natal care in Government hospitals in two major towns (Aba and Okigwe) in Southeast Nigeria was carried out. Blood was collected by vein puncture from 500 pregnant women in different trimesters (300 from Aba and 200 from Okigwe) and 200 non - pregnant women, 100 from each town. Presence of Malaria parasite was observed microscopically on thin and thick blood smears prepared from each sample. Personal data were collected both orally and from maternity records of the women. The results were analysed statistically using the Chi - square test. Only the ring trophozoite and gametocyte forms of Plasmodium falciparum were observed in the infected samples. A total of 270 (54 %) pregnant women out of the 500 examined were infected with P. falciparum while 66(33 %) of the non - pregnant women sampled were infected. This represents a significant difference. Aba had 158 (52.6 %) out of the 300 pregnant women examined infected while Okigwe had 112(56 %) of the 200 pregnant women examined infected. There was no significant difference between the results obtained in the two towns. (P > 0.05). Peak prevalence was observed in the first trimester 64.1 % (100 out of 156) while 3rd trimester showed the lowest 45 % (68 of 150). Prevalence was also highest in primgraviidae and women in second pregnancy (67.96 %). Multiparous women (3rd pregnancy and above) had 39.31 % . Age was significant. Anaemia (Hb. < 11g/dl) was observed in 385 (77 %) of the 500 pregnant women examined. Of the 270 infected women 254(94.07 %) were anaemic. Anaemia was significantly higher in women with higher parastemia (Z.cal. = 9.06). The implications of this result on the epidemiology of malaria are discussed.

Keywords: Prevalence, Malaria, Pregnancy, Women, Anaemia, *Plasmodium*

INTRODUCTION

Malaria is a major public health problem in developing countries causing considerable morbidity and mortality especially in sub Saharan Africa. It is endemic in 103 countries with about 2000 million people exposed to infection (Menendez, 1995). An estimated 1 - 2 million deaths result each year from about 300 - 500 million clinical cases in highly endemic areas (Snow *et al.*, 1999, 2001). Mostly affected are children less than 5 years and followed closely by pregnant women. An increased risk of Malaria during pregnancy was observed over 60 years ago by Wickramasariya (Steketee and Mutabingwa, 1999). In all endemic areas it has been observed that the frequency and severity of malaria increases with pregnancy (Gilles *et al.*, 1984).

Several reasons have been adduced for this increase such as relative impairment of the immune system (Ibeziako *et al.,* 1980; Mutabingwa 1994), cytoadherence to chondroitin Sulphate A in the placenta (Fried and Duffy 1996) and an increased attractiveness of pregnant women to Malaria vectors (Lindsay *et al.*, 2000). Also in areas of high transmission, primigraviidae are more susceptible to infection than multiparous women (Okoko *et al.*, 2003). Furthermore it has been observed that increased risk of malaria varies during the course of pregnancy with the first trimester showing highest prevalence and parasite density than the 2nd and 3rd trimesters (Menendez, 1995).

Malaria in pregnancy holds severe consequences which range from anaemia to severe complications such as cerebral malaria, pulmonary oedema and renal failure in the mother (Steketee *et al.*, 2001; Saute *et al.*, 2002; Bouyou - Akotet *et al.*, 2003), increased stillbirth, intra - uterine growth retardation and low birth weights in the foetus (Kasumba *et al.*, 2000; Verhoeff *et al.*, 2001; Steketee *et al.*, 2001).

With the Government of Nigeria interested in the Roll Back Malaria Programme, this study was undertaken to provide part of the much needed baseline data for effective planning and control of Malaria especially among the population at risk, the pregnant women.

MATERIALS AND METHODS

The study area consists of two towns, Aba and Okigwe in South East Nigeria. Aba is one of the commercial nerve centers of the country and therefore more cosmopolitan in nature than Okigwe. They have tropical climate with mean daily maximum air temperature range from 28 °C – 35 °C and mean daily minimum air temperature range from 19 °C – 24 °C (Nwoke and Uwazie, 1991).

The highest temperature occurs between March and April and the lowest in January. Wet and dry seasons are distinct in the area. Wet season spans from March to October giving an annual rainfall of between 1,700 mm and 20,000 mm.

Okigwe has varied vegetation being equatorial around the banks of natural water bodies and Guinea Savannah further inland. It is rocky and hilly with springs scattered all over. Aba's vegetation is typically rain forest. It is an urban town spotting a lot of open drains, bushes puddles and inefficient waste disposal system with huge refuse litters found in strategic areas of the town.

The two hospitals from where samples were collected (Abia State University Teaching Hospital, Aba and General Hospital Okigwe) serve as the most accessible and more focal for pregnant women in these areas during pre - natal care.

Sampling: 500 pregnant women were randomly selected and their blood sampled for Malaria parasitaemia from the two hospitals. 300 pregnant women were sampled in Aba while 200 were sampled in Okigwe. Also 200 non - pregnant women, 100 from each town were sampled. Peripheral venous blood from each woman was used in preparing thick and thin blood films, which were stained with Giemsa and examined for Malaria parasites using standard quality and controlled procedures (Alonso *et al.*, 1994). The presence and level of parasitemia was observed and recorded. A sample was recorded as positive, on the microscopic detection of any *Plasmodium* stage on the slide. The sampled females were grouped into age groups 11 - 20, 21 - 30, 31 - 40 and 41 - 50 years old. All other information needed on the pregnant women was gotten from their maternity records and also orally from the women as presented in (Table 1.)

Table 1: Information obtained from women on the prevalence of malaria parasites in pregnant and non-pregnant women in Aba and Okigwe towns of Southeastern Nigeria

Information obtained orally	Information obtained from maternity records
Age	Age
Marital status	Trimester
Parity	Parity
Chemoprophylaxis	Prescribed Chemoprophylaxis

Haemoglobin Estimation: Haemoglobin was estimated using Haemiglobincyanide (HICN) technique. Haemoglobin level of >11g/dl was considered normal while low anaemia was 11 - 9g/dl, moderate anaemia 8.9 – 7 g/dl and severe anaemia <7g/dl. (Bouyou - Akotet *et al.*, 2003).

Data Analysis: The data were analysed statistically using Chi - square and Normal distribution (Z test).

RESULTS

Plasmodium falciparum was the only malaria parasite observed in the blood samples of the pregnant women sampled in the study. Trophozoites and gametocytes were the erythrocytic stages observed during the study. Out of the 500 pregnant women examined for malaria parasites in both towns, 270 (54 %) had positive infections while 66(33 %) out of the 200 non - pregnant women were equally infected. There was significant difference in malaria prevalence among the women ($P > 0.05$). In Aba 158 (52.6 %) out of the 300 pregnant women examined were positive for malaria parasitemia while 112 (56 %) out of the 200 examined in Okigwe were positive. There was no significant difference in malaria prevalence among the towns. ($P < 0.05$) (Table 2).

Table 2: Prevalence of malaria parasites in pregnant and non pregnant women in Aba and Okigwe towns

Town	Pregnant		Non-Pregnant	
	NE	NI	NE	NI
Aba	300	158 (52.7%)	100	30 (30%)
Okigwe	200	112 (56%)	100	36 (36%)
Total	500	270 (54%)	200	66 (33%)

NE means No. Examined: NI means No. infected

Highest prevalence of 64.1 % (100 out of 156) was observed in women in the first trimester of pregnancy followed by 52.5 % (102 of 194) in the 2nd trimester, with the least seen in the 3rd trimester 45 % (68 out of 150). Statistically significant differences in malaria prevalence among women in different trimesters was observed ($P > 0.05$) (Table 3).

Table 3: Effect of gestation and parity on the prevalence of malaria parasites in pregnant women in the two towns

Gestation Period	NE	NI (%)
1st Trimester	156	100 (64.1%)
2nd Trimester	194	102 (52.5%)
3rd Trimester	150	68 (45%)
Parity	NE	NI (%)
1st Pregnancy	124	86 (69.35%)
2nd Pregnancy	132	88 (66.67%)
3rd and above (Multiparous)	244	96 (39.31%)

NE means No. examined; NI means No. infected

Parity was statistically significant ($P > 0.05$) as primgravidae (69.35 %) and secungravidae (66.67 %) were more infected than multi - parous women (3rd pregnancies and above) that had 39.31 % infection. Age was significant ($P > 0.05$). The age prevalence (Table 4), followed a concave pattern, being more prevalent in younger females 11 - 20 years, 68 %) and older (41 - 50 years, 67 %) age groups than in mid age groups of (21 - 30, 50 %) and (31 - 40, 53 %). In the non - pregnant women, those of age group 11 - 20 were more infected (62.5 %).

Anaemia was observed in 385 of the 500 pregnant women examined giving an overall prevalence of 77 %. Out of the 270 infected pregnant women 254 (94.07 %) were anaemic, while 160 out of the 230 (69.56 %) uninfected pregnant women were anaemic (Table 5). There was a significant difference between results of the two groups.

Table 4: Effect of age on prevalence of malaria parasites in pregnant and non-pregnant women in the two towns

Age	Pregnant		Non-pregnant	
	NE	NI	NE	NI
11-20	44	30 (68%)	40	25 (62.5%)
21-30	288	146 (50%)	98	27 (27.55%)
31-40	138	74 (53%)	37	10 (27.03%)
41-50	30	20 (67%)	25	4 (16.00%)

Table 5: Prevalence of anaemia in the pregnant and non-pregnant women examined in Aba and Okigwe towns of Southeastern Nigeria

	Pregnant		Non-pregnant	
	NE	NA	NE	NA
Infected	270	254 (94.07%)	66	30 (45.45%)
Un-infected	230	160 (69.5%)	134	28 (20.90%)
Total	500	385 (77%)	200	58 (29%)

NE means No. Examined: NA means No. Anaemic

Anaemia was also found to be higher in pregnant women with higher parasitaemia (mean = 7.712 ± 0.8750 g/dl) as against those with lower parasitaemia (Mean = 9.8230g/dl ± 2.0725). The difference was statistically significant (Z Cal = 9.06). Also (45.45 %) of the infected non - pregnant women were anaemic.

Chloroquine was observed to be the chemoprophylaxis of choice with 198 (39.6 %), followed by Daraprim (33.6 %) and Fansidar 12 %. However only 14.8 % of the women were on no chemoprophylaxis. Those on Chloroquine also had a low infection of 46.6 % as against 66.7 % by those on Fansidar and 72 % infection by those on no drugs at all. (Table 6).

Table 6: Drugs used by the pregnant and non pregnant women examined in Aba and Okigwe towns of Southeastern Nigeria

Drug	Pregnant		Non-pregnant	
	ND	NI	ND	NI
Chloroquine	198(39.6%)	92(46.6%)	96	28 (29.17%)
Daraprim	168(33.6%)	92(55%)	12	3 (25.00%)
Fansidar	60(12%)	40(66.7%)	62	22 (33.33%)
No Drugs	74(14.8%)	53(72%)	30	23 (76.67%)

ND means No. on Drugs: NI means No. Infected

DISCUSSION

The prevalence *of Plasmodium falciparum* infection in pregnant women in Aba and Okigwe, South Eastern towns of Nigeria, were 52.6 % and 56.0 % respectively. These rates were comparable to the 47.5 % reported in Onitsha (Nwokedi, 1992), 42 % reported in Ghana (Mockenhaupt et al.,(2000), 57.5 % reported in Gabon (Bouyou - Akotet *et al*., 2003) and 41 % observed in Uyo Nigeria (Opara *et al*., 2004). However they are higher than 7.3 % reported in Port Harcourt (Ibeziako *et al*., 1980), 18.5 % reported in Keneba Gambia (Watkinson and Rushton 1983), 23 % reported in Mozambique (Saute *et al*., 2002) and 26.75 % reported in Malawi (Rogerson *et al*., 2003),. These rates were however much lower than 97.2 % observed in India (Meintra *et al*., (1993)

The high rate of prevalence observed could be due to the environmental conditions inherent in Aba and Okigwe, which favours *P. falciparum* transmission. It has been recognized that a temperature range of 16^0 C – 38^o C and relative humidity of 60 % were suitable for malaria parasite transmission (WHO, 2000).

The attitude of the women of not starting pre - natal care early in pregnancy may also have contributed to the prevalence. Some of the women began pre - natal care either towards the end of 1st trimester or mid second trimester. Also some avoided antimalaria chemoprophylaxis for fear that the foetus may be affected. Some did not take the standard dosage of the drugs as reported in Dakar, Senegal, where 11.9 % of pregnant women took Chloroquine in inappropriate dosages (Faye *et al*., 1998).

The prevalence obtained within the first and second trimesters agreed with those of Bernard (1991), Nair and Nair (1993,) Rayanal (1998), Zhou *et al*. (2002) and Anosike *et al*. (2004) who observed peak prevalence in weeks 10 - 20 of pregnancy. This may be attributed to the expression of adherent proteins on the surface of infected red blood cells (IRBCs), enabling the IRBCs to adhere to micro vascular capillaries of vital organs causing severe pathological conditions (Menendez, 1995; Miller *et al*. 2002). Achur *et al*. (2000) have shown that Chondroitin Sulfate Proteoglycans (CSPGs) present in the intervillous spaces mediate the adherence of IRBCs in the placenta. Agbor- Enoh *et al*. (2003) had suggested that the high prevalence was due to the rapid expansion of the placenta corresponding to the concomitant expression of significant levels of extra cellular CSPGs providing binding sites for IRBCs. This coupled with the absence of Chondroitin - 4 - sulfate ((C4s) - IRBC) adhesion - inhibitory antibodies prior to 12 - 20 weeks of gestation enhanced the prevalence.

Also parity played a role in the prevalence rates. Primgravidae and Secungravidae accounted for 67.96 % of the infection as against 39.31 % in multiparous women. These results were similar to the 65 % reported in Malawi (Mattelli *et al*., (1994), 65 % reported in Senegal (Diagne *et al*., 1997), 62 % in Tanzania (Wakibara *et al*., 1997) and 64 % in Gabon (Bouyou - Akotet *et al*., 2003). The results were definitely higher than 26.2 % observed among the Primigravidae in Malawi (Rogerson *et al*., 2003) but disagrees with Saute *et al*. (2002) in Mozambique that observed no significance in prevalence levels with parity. Duffy and Fried (1999), Ricke *et al*. (2000), O'Neil-Dunne *et al*. (2001), and Okoko *et al*. 2003 had suggested that the early onset of efficient antibody response in Multigravidae and the delayed production of antibodies in Primigravidae appeared to account for the gravity dependent and differential prevalence of Plasmodium Malaria in pregnant women. Duffy and Fried (1999) showed that plasma from Kenyan multigravid women inhibited adhesion of placental parasites to Chondrotin sulfate A (CSA).

Furthermore Okoko *et al*. (2003) reported that malaria infection of the placenta causes a shift from Th2 to Th1 cytokine profile that may be detrimental to pregnancy. The prevalence of anaemia in this study was in agreement with mean percentage for Africa put at 61 %. It also agreed with those of Nair and Nair (1993) in Tanzania, Van Den Broek *et al*. (2000) in Southern Malawi and Bouyou - Akotet *et al*. (2003) in Gabon.

Different drugs including Daraprim, Chloroquine and Fansidar were used by sampled pregnant women. Chloroquine was found to be the most widely used and most effective with a low prevalence of 46.6 % amongst its users. This agreed with the findings of Bouyou - Akotet *et al*. (2003) in Gabon. Our finding may not be unconnected with its recommended safety during pregnancy and its cheap cost. In conclusion, the study agrees that pregnancy was among other factors affecting the prevalence of malaria. Efforts should be geared towards control among the population at risk especially the Primgravidae.

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