ISSN: 2141 – 3290
www.wojast.com

CONGENITAL MALARIA IN UYO, AKWA IBOM STATE, NIGERIA.

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ABSTRACT: The study was designed to determine the true prevalence of congenital malaria in Uyo, Akwa Ibom State, Nigeria. Peripheral blood smears of near-term pregnant women as well as the placental, cord and peripheral blood smears of their new born babies were examined for malaria parasite using the thick and thin film stain with Giemsa technique. All so medical record of mothers attending pre and post natal clinic and those of their babies between one days to 14 days old were examined for clinical symptoms of 432 pregnant women screened 188 (43.5%) were infected with malaria parasites of this numbers, 140 (7.45%), 28 (14.9%) and 20(10.6%) were infected with *Plasmodium falciparum, P. malariae* and a mixture of both respectively. Similarly, out of their 468 babies screened, 78 (16.7%) babies were infected, out of which 55 (70.5%), 12(15.4%) and 11(14.1%) were infected with *P. falciparum, P. malariae* and a mixture of both respectively. There what a significant correlation between the clinical symptoms of malaria between the mothers and their babies ($r = 0.687$ $P < 0.01$). The birth weight of the new born babies from mothers, positive for *Plasmodium* parasite ranges from 1.8 – 4.5kg with a mean weight of 3.0kg. There was a significant difference between low birth weight of babies with malaria infection and those without infection ($P < 0.05$). There is therefore an urgent need to supply and improve on intermittent preventive treatment of malaria in pregnant women to limit the adverse outcomes associated with placental malaria.

INTRODUCTION

Malaria is a life-threatening parasitic disease caused by a protozoan parasite called *Plasmodium* transmitted by female Anopheles mosquitoes. Malarial kills an African child every 30 seconds (Rowe *et al*., 2006). Many children who survive an episode of severe malaria may suffer from learning impairments or brain damage. Pregnant women and their unborn children are also particularly vulnerable to malaria, which is the major causes of perinatal mortality, low birth weight, maternal anaemia etc.

Malaria symptoms appear about 9 to 14 days after the infectious mosquito bite, although this varies with different Plasmodium species. Typically, malaria produces fever, headache, vomiting and other flu-like symptoms (Romington and Klein 1995).

Reports from studies and reviews within the last few years are of the consensus that malaria causes at least 20% of all deaths in children under 5 years of age in sub-Saharan African (Rowe *et al*., 2006; Sharp *et al.*, 2007, WHO, 1991).

Placental malaria is known to be a major determinant of congenital malaria. Although previously thought to be a rarity in Sub-Saharan Africa, a recent review has indicated congenital malaria is more common than previously thought (Brabin, 1983, Brabin *et al* 1994 and Uneke, 2007a). It has been demonstrated that in hyper endemic areas, newborns more

rarely becomes ill with malaria because of passive maternal antibody and high level of fetal hemoglobin (Ahmed *et al,* 1998, Logic and Mc gregor 1970, Redd *et al.,* 1996).

The high burden of childhood malaria in endemic regions of the world has been associated with malaria during pregnancy (Murphy and Breman 2001). In sub-Saharan African for instance, malaria affects an estimated 24 million pregnant women and each year between 75,000 and 200,000 infant deaths are attributed to malaria infection in pregnancy globally. Pregnant women residing in malaria endemic areas often experience a high frequency and density of parasitemia, resulting to high rates of maternal morbidity including fever and severe anaemia, with abortion and stillbirth, and with high rates of placental parasitisation (Brabin 1983; Menendez and Mayor 2007; Uneke, 2007b). The disease can be observed in a day-old baby or be delayed for weeks or months (Hashemzadeh and Heydarian, 2005). In 80% of the cases of congenital malaria, the most common clinical features include fever, anaemia and splenomegaly (Remington and Klien, 1995). Some reports have noted that other signs and symptoms which could manifest are hepatomegaly, jaundice, regurgitation, loose stools, and poor feeding, and occasionally, drowsiness, restlessness, and cyanosis (Remington and klein 1995; Hashemzadeh and Heydarian 2005, Behrman *et al.,* 2004 & Reinhrdt *et al.*, 1978).

It has been postulated that the possible mechanisms include direct penetration through chorionic villi, premature separation of the placenta, and the possible physiologic transfusion of maternal red blood cells to the foetal circulation in utero or at the time of delivery (De Silva *et al*., 1982; Menendez and Mayor, 2007.)

Although malaria may affect birth weight through malaria-induced anemia, it also may reduce birth weight via the effects of placental infection (Okoko *et al.,* 2002). In this case, parasites directly cause a mechanical compromise of placental circulation via widespread trophoblast basement thickening and increased fibrinoid necrosis and cytrophoblast prominence or indirectly interfere with placental functions and/or induce pathological lesions (Guyatt and Snow 2007). Despite the prevalence of placental infections for women of all gravidities, ranging from 5 percent to 52 percent, infection-associated LBW risk is elevated two to four times in various studies (Akum *et al.,* 2005, Guyatt and Snow 2001), (Chawala and Haulston 1998. Brabin 1992).

In southern Malawi, a higher prevalence of fetal anemia occurred with increasing peripheral *P. falciparum* parasite densities were higher in babies with fetal anemia than in those without it. (Brabin *et al.,* 2004).

The objective of this study was to assess the prevalence of malaria in pregnant women, their baby placenta, cord and peripheral blood in order to ascertain the congenital malaria situation in Uyo, Akwa Ibom State, Nigeria.

MATERIALS AND METHODS

Study Site.

The Study Area (Fig. 1) lies between latitude 5.5°N and 6°N and longitude 6.0 °E and 6.5°E of the greenwish meridian in Uyo the capital city of Akwa Ibom State, Nigeria. It is located in the rain forest belt with an elevation of less than two feet above sea level. In spite of its present status as the capital of Akwa Ibom State The city is still dotted with palm trees, banana, plantain and fruit tree with poor drainage. The area has warm humid climate condition but high temperature and heavy rains distribute almost all year round. The maximum temperature is between 26 - 28°C and means annual rainfall is 362.5mm. The climate present two distinct season; a rainy season (May to October), and a dry season, (November to April). Uyo is an endemic area for malaria.

The study was conducted from May to November 2011. the subjects were near-term (close to delivery) pregnant women who were delivered of their babies at the hospital sample sizes were determined from the number of pregnant women that attended antenatal care during the period

of study. Medical records of the mothers attending antenatal and post natal and those of their babies between day 1 and 14 old were examined with the help of the medical officers on duty for malaria episode and clinical symptoms. In the 3 selected medical institutions namely University of Uyo Teaching Hospital. Uyo, St. Luke General Hospital, Anua and Ubong-Abasi Specialist Clinic Uyo.

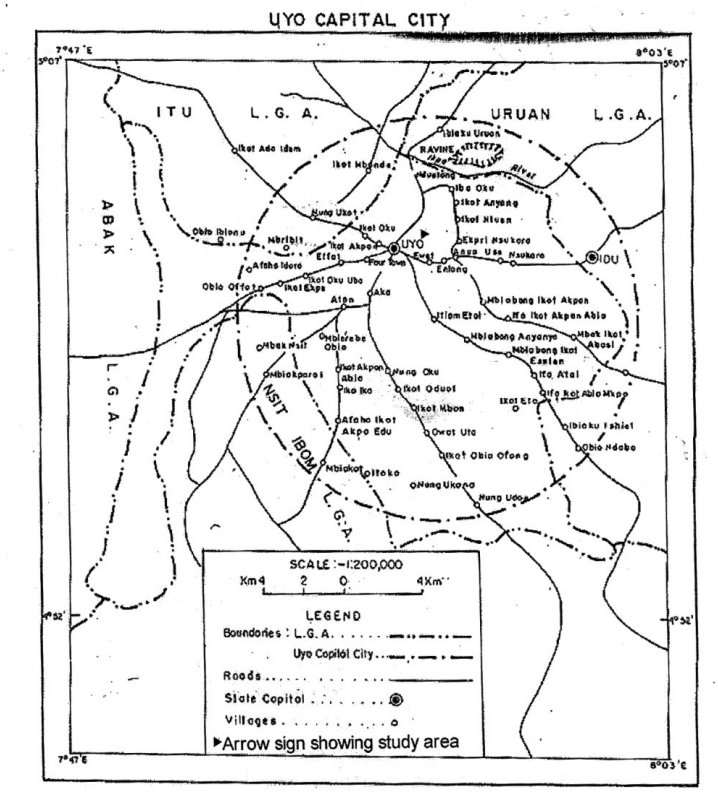

Fig. 1: Map of Uyo Metropolis showing study area

Ethical consideration: all works were performed according to guide line for human experimentation in clinical research stated by the Federal Ministry of Health of Nigeria. This study was approved by ethical committee of the Hospitals and all the pregnant women were orally informed and they gave their consent.

Sample collection.
The blood sample was obtained from the peripheral blood of 432 near-term pregnant women using sterile syringes. After delivery blood was collected from the placental biopsies.

The placentae were incised between the material and foetal surface and a small quantity of blood pipette out from the intervillous with a sterile syringe. Cord blood was collected immediately after separation of placenta, and peripheral blood of neonates was collected by heel pricking using a sterile blood lancet on clean glass slides. Labeled ethylene-diamine tetra-acetic acid (EDTA) bottles were used in collecting blood samples for parasitological examinations. Blood collections were made possible with the assistance of midwives on duty during the child delivery. Blood samples were also collected from 100 nonpregnant women. The ages, types of birth, and weights of newborn babies were recorded parasitological Examination thick and thin blood films were stained with 100% Giemsa and read for malaria parasite by two trained microscopists following standard quality control procedure. Parasitemia was expressed as the number of asexual forms of *P. falciparum* and *P malariae* per microlitre; a result was considered negative after a reading of 1000 leucocytes in the microscope (x 1000).

Parasitaemia was graded as low (1-999/ul), moderate (1000 – 9999ul). And high (<10000/ul). Transplacental passage of *Plasmodium falciparum* was confirmed by detection of malaria parasite in the placental and cord blood.

Statistical Analysis.
All data were analysed using SPSS version 10.1 for windows, descriptive statistics were computed for all relevant data. Chi square analysis and two tail pearson correlation were used to compare proportions within and among groups, for statistical significance.

RESULTS

A total of 432 mothers who delivered in the hospitals were examined during the periods of the study. From this number 188(43.5% were infected with malaria parasites out of which 140 (74.5%) 28 (14.9%) and 20 (10.6%) were infected with *Plasmodium falciparum. P. malariae* and mixture of both respectively.

Table 1: Summary of prevalence of malaria infection among mothers and babies (1 – 14 days old)

Patients	No. Examined	No (%) Infected	Distributed Of Plasmodium Parasite		
			Plasmodium falciparum	. *P. malariae*	*P. falciparum* + .*P. malariae*
MOTHERS	432	188 (43.5)	140 (74.5)	28 (14.9)	20 (10.6)
BABIES	468	78(16.7)	55(70.5)	12(15.4)	11 (14.1)
TOTAL	900	266 (29.6)	195 (73.3)	40(117.7)	31 (11.7)

Similarly, from a total of 468 babies from the 432 mothers examined during the same period,78 (46.7% were infected with malaria parasites out of which 55 (70.5%), 12 (15.4%) and 11 (14.1%) babies were infected with *P. falciparum, P. malariae* and a mixture of both respectively (Table 1). There was a significant difference in malaria infections between the mothers and the children ($x2 = 42.45\%$ $p < 0.05$, $df = 1$) Placental parasitaemia was 20 (4.2% while cords blood parasitaemia was 25(5.34%) The trophozoites of *Plasmodium falciparum* were exclusively found in the placental parasitaemia. There was a remarkable difference between monthly prevalence of malarial infections between the babies and their mothers. The mothers show higher percentage of infections than their babies. In both cases, the highest level of infections were recorded in the month of September for the Mother 29 (49.3%) and that of the babies was 13 (19.7%), (Table 2)

Table 2 Monthly Prevalence Of Malaria Among Mothers And Babies 1 – 14 Days Old

2011	Mother No. Examined	No. (%) Infected	Babies Weeks Under 2 Weeks No Examined	No. (%) Infected
MAY	58	26 (44.8)	64	10(15.6)
JUNE	55	24 (43.6)	59	9(15.5)
JULY	68	30 (44.1)	74	12 (16.2)
AUGUST	66	28 (42.4)	70	11 (15.7)
SEPTEMBER	60	29 (48.3)	66	13(19.69)
OCT	71	27 (38.0)	75	14(18.6)
NOV.	54	24 (44.4)	60	9(15.0)
TOTAL	432	188	468	768

There was no significant relationship between monthly malaria infections of their mothers and the babies ($r = 0.50g$, $p > 0.05$).

Table 3 Prevalence Of Malaria Infection From Each Of The Hospital Sampled

NAME OF HOSPITAL	NO OF (%) MOTHERS EXAMINED	NO (%) MOTHERS WORTH + MP	NO OF CHILDREN EXAMINED	NO (%) CHILDREN WITH +MP
University of Uyo Teaching Hospital (UUTH)	202	89 (44.1)	218	38(17.4)
St. Luke General Hospital	150	69 (46.01)	163	26 (15.0)
Ubong Abasi Specialist Clinic	80	30 (37.5)	82	14 (16.1)
Total	432	188 (43.5)	468	78 (16.7)

The result in table 3 shows that 202 pregnant women were examined from UUTH out of which 89 (44.1%) were infected with malaria parasite and from their 218 babies 38(17.4%) were infected with malaria parasites. From St. Luke General Hospital, 150 pregnant women were screened for malaria parasite of this number 69 (46.01%) were infected and 26(15.0%) of their babies numbering 163 had malaria infection. In Ubong Abasi Specialist Clinic 80 pregnant women were examined of this number 30(37.5%) were infected while their babies numbering 82 were equally examined for malaria parasite and 14(16.1%) had the infection.

Although different prevalence rates of positive cases of malaria infections were obtained in each of the hospital sampled, there was no significant different when analysed statistically ($P>0.05$).

Table 4: Frequency of malaria episode vs congenital malaria

Frequency of occurrence of malaria during pregnancy	No. of mothers infected	No. of babies infected	Percentage of babies infected
5 times and above	35	30	74.3
4 times	46	26	56.5
3 times	63	20	65.2
2 times	28	2	7.1
1 time	16	0	0
Total	188	78	

The result in Table 4, shows that the higher the frequency of occurrence of malaria infection in the mothers during the gestation period the higher the percentage of congenital malaria infection. The highest percentage of 74.3% occurred in babies whose mothers has 5 episodes of malaria infection during pregnancy while mothers with only one episode of malaria infection during gestation period has zero infection in their children. (Table 4, Fig. 2).

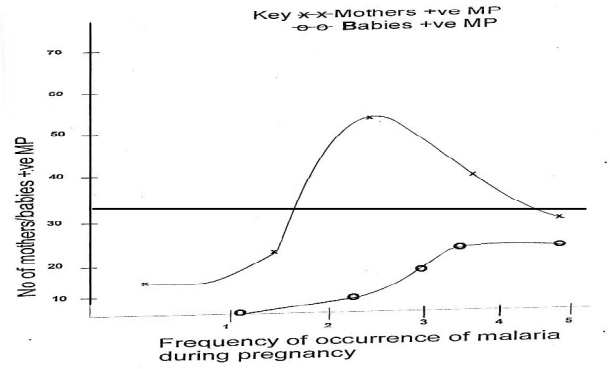

Fig. 2: Graph showing incidence of congenital malaria during pregnancy.

There was a significant correlation between frequency of occurrence of malaria during pregnancy and number of babies infected. ($r = 0.636$, $P < 0.01$).

Table 5: Prevalence of congenital malaria infection versus low birth weight

	No. of babies with normal birth weight	No (%) of babies with low birth weight	Total
Babies infected with malaria infection	54 (69.2)	24 (30.8)	78
Babies without malaria infection	350 (89.7)	40 (10.3)	390
Total	404	64 (13.7)	468

The result in table 5 shows that 24 (30.8%) of the 78 babies infected with malaria had low birth weight and 40 (10.3%) of the 390 babies were without low birth weight there was a significant differences in low birth weight of babies infected with malaria and those without malaria infection
($P < 0.05$,df = 1)

Table 6: Subject related prevalence of congenital malaria based on clinical symptom.

Subject	Sex	No. Examined	No.(%) + v.MP	No.(%) + ve	No.(%) +ve Mp	(%) + ve	(%) +ve Mp	(%) + ve	(%) +ve Mp	No(%) + ve	No(%) +ve Mp	No.(%) + ve	No.(%) +ve Mp	No.(%) + ve	No.(%) +ve Mp	No.(%) + ve	(%) +ve Mp	No.(%) + ve	(%) +ve Mp
Mother	F	432	188 (43.5)	222 (50.9)	132 (30.6)	52 (12.0)	26 (6.0)	276 (63.9)	144 (33.3)	221 (51.2)	112 (25.9)	18 (4.2)	7 (1.6)	0 0%	0 0%	168 (38.0)	102 (23.6)	218 (50.5)	123 (68.5)
Babies	M	216	36 (16.7)	50 (23.1)	30 (13.9)	10 (4.6)	5 (2.3)	30 (13.9)	7 (3.2)	18 (8.3)	8 (3.7)	32 (14.8)	29 (13.4)	10 (4.6)	8 (3.7)	11 (5.1)	7 (3.2)	0	0
Babies	F	252	42 (16.7)	49 (19.4)	30 (11.9)	12 (4.8)	5 (2.4)	36 (4.2)	9 (3.6)	20 (7.9)	12 (4.8)	34 (13.5)	27 (10.7)	11 (4.4)	8 (3.2)	17 (6.7)	9 (3.6)	0	0
Babies	M+F	468	78 (6.7)	99 (21.1)	60 (12.8)	22 (4.7)	10 (2.1)	66 (14.1)	16 (3.4)	38 (8.1)	20 (4.3)	66 (14.1)	56 (12.0)	21 (4.5)	16 (3.4)	28 (6.0)	16 (3.4)	0	0
% infected mother		43.5		59.5		50.0		52.2		50.7		38.9		0		60.7		56.4	
Babies	M	16.7		60.0		50.0		2.3		44.4		90.6		80.0		63.6			
Babies	F	16.7		61.2		41.7		2.7		60.0		79.4		72.7		52.9		0	
Babies	M+F	16.7		60.6		45.5		2.1		52.6		84.8		76.2		57.1		0	

The result in Table 6 shows that with regard to clinical symptoms 22(50.9%) of the pregnant women had fever out of which 132 (30.6%) were infected with malaria parasites while 276 (63.9%) had vomiting out of which 144 (33.3%) were infected with malaria. Loss of appetite occurs in 221 pregnant women in which 112 (25.9%) were infected with malaria parasites. Out of 468 babies examined 216 were males while 252 were females. There was no significant difference in malaria infections between the male and females ($p > 0.05$). Twenty-two babies had anaemia out of which 10 (2.1%) were infected with malaria parasites and out of 66 babies with vomiting only 16 (3.4%) had malaria parasites.

DISCUSSION

The disparity in number of mothers (432) and babies (468) was a result of multiple birth by some mothers. The present of placental parasiteamia, cord parasiteamia and malaria infections in babies aged between one day and 14 days is an indication of congenital malaria infection, since malaria parasites clinical symptoms usually appears 2 weeks (14 days) after infection with slide variations depending on species of the parasite (WHO 1991).

The 14.2% transplacental infection is in agreement with previous percentages reported in babies born in malaria exposed pregnancies (Chukwuemeka *et al.* 2012). The high prevalence of infection due to *P. falciparum* in transplacental transmission is consistent with previous reports by Yamava *et al.* (1989). Many researchers have reported high prevalence of malaria in pregnancy in different parts of Nigeria, ranging from 199.70% to 72.00% [Agomo *et al* 2009, Okwa, 2005 and Kagu *et al* 2007] The prevalence of malaria in pregnant women in this study was 43.5%,though consistent with the reported Nigeria situation, the relatively high percentage could be due to the fact that the study was carried out during the rainy season, a period of high mosquito density and, high level malaria transmission rates. This is contrary to Chukwuemeka *et al* (2012) who reported a low prevalence of malaria infections in pregnant women however their work was conducted during the dry season period. This observation supports that in areas of malaria endemicity, pregnancy is associated with increased susceptibility to malaria, arising from pregnancy-induced altered immunity (Chukwuemeka *et al 2012),* immunosuppression from raised serum cortisol, loss of cell-mediated immunity, effect of a new organ, the placental and the loss of typ 1 cytokine responses (Meneded and Major 2007).

The correlation between frequency of occurrence of malaria infection in mothers with a corresponding increase in number of infection in the babies indicates that persistent infections couple with the poor management of pregnancies with malaria infections causes resistant of the parasites and persistent penetration of the placental wall by the parasite. Most of the effective drug for treatment of malaria can cause adverse effect to pregnancy and this compound the effective treatment of malaria during pregnancy as previously documented by Steketee *et al* (1996 a & b)

The clinical sign of malaria shows a variation between some symptoms in mothers and their babies. The exclusive appearance of headache in mother does not mean that babies do not have headache but lack expression. The absent of convulsion in mothers could be as result of protein exposure which over the years build up some level of acquired immunity which is deficient in babies thereby leading to complications and celebral malaria (Brabin 1983).

The 30.8% low birth weight in malaria babies is slightly higher than previous report by Motteclli *et al* (1990). The low birth weight may be caused by malaria inducer anaemia. There is a significant correlation between low birth weight and prevalence of malaria infection in babies as previously reported by Okoko *et al* (2002). The high level of vomiting in Mothers could be due to some hormonal harmful reaction in the Mother during pregnancy and not necessarily as a result of malaria Infection.

The higher level of jaundice and anemia in the babies could not be attributed to malaria infection alone but some cases could be trace to poor nourishment of their mothers during the gestation period.(Uneke *et al* 2008) the high levels of fever in the mothers and their babies without corresponding high level of malaria parasiteamia indicate that fever is not malaria specific symptoms, other infection and diseases can induce fever.

CONCLUSION

A very vital lesson derived from this study on congenital malaria is that the disease is no longer an uncommon occurrence. Congenital malaria has now assumed a public health concern both in malaria endemic and semi-endemic areas. As countries all over the world and international aid agencies such as WHO intensify efforts towards the control of malaria it is important that such efforts do not neglect congenital malaria control.

Since the frequencies of malaria infection of pregnant women may lead to spontaneous abortion, neonatal death, death of the mother, low birth weight and cerebral ,malaria (Aribodo *et al*. 2007). It is important to determine ways of limiting placental malaria and its adverse effect on foetal outcomes. Implementation of such result from such studies will help in

improving child survival and development, thus reducing the burden of malaria in Akwa Ibom State.

ACKNOWLEDGEMENT

The author gratefully acknowledge the assistance of the medical staff for the use of their laboratory facilities and medical records of the hospitals.

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