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Prevalence of malaria among pregnant mothers and possible relationship to parity in Abakaliki, Southeast Nigeria

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ABSTRACT

The study on the prevalence of Plasmodium falciparum infection among pregnant women attending antenatal clinics at Ebonyi State University Teaching Hospital Abakaliki was conducted using microscopic examination of thick smear. A total of 312 pregnant women were tested for P. falciparum with 131 (42.00%) of the pregnant women testing positive for the P.falciparum parasite. They were grouped within the three trimesters of pregnancy viz: First, Second and Third trimester respectively. In the first trimester group, 31, were examined of which 15 (41.7%) were infected. Also 138 were examined in the second trimester of which 60 (43.5%) were infected, and in the third trimester 138 were examined of which 56 (40.6%) were positive with P. falciparum infection. They were also studied with regard to their parity. The primigravidae (P_o were 76 and 32 (40.8%) were positive; P_1-P_3 were 56, 27 (45.8%) were infected, P_7-P_{11} were 17, 7 (36.8%) were infected. Statistical analysis showed no significant differences between the three trimester and parity groups measured ($P<0.05$). The problem of P. falciparum in pregnant women can be prevented by the preventive package of Intermittent Preventive Treatment (IPT) with Sulfadoxine Pyrimethamine (SP) at 2 doses given to the pregnant women during their antenatal clinical visits. The use of insecticide treated nets (ITNs) all through the period of pregnancy and the first few weeks after delivery, and effective case management of malaria illness is recommended.

Keywords: Plasmodium, Pregnancy, Trimester, Parity, primigravidae.

INTRODUCTION

Human malaria is caused by the protozoan parasite of the genus *Plasmodium*. It lives in the red blood cells and is transmitted by the female anopheles mosquito. Malaria is a disease with major health problems that has attracted global concerns; hence it is regarded as the most important parasitic disease (Onolade, 2003). In Africa, 30 million women living in malaria endemic areas become pregnant each year. For these women, malaria is a threat both to themselves and to their babies, with up to 2 million newborn deaths each year as a result of malaria in pregnancy (WHO, 2003b). Pregnancy exacerbates malaria through a non-specific activity of the immune system. The protective anti-plasmodial activity is suppressed at pregnancy, which has clinical consequences with important public health implications on pregnant women (Steketee, 2001, Onolade, 2003) The symptoms and complications of malaria during pregnancy differ with the intensity of malaria transmission and the level of immunity the pregnant

women has acquired (WHO, 2003a). Malaria infection of the mother may result in a range of adverse pregnancy outcomes, including spontaneous abortion, neonatal death, low birth weight and intrauterine growth retardation.

In these areas, the principal impact of malaria infection is associated with malaria related anaemia in the mother and with the presence of the parasites in the placenta. The resultant impairment of foetal nutrition contributing to low birth weight is a leading cause of poor infant survival and development. In the areas of Africa with stable malaria transmission, *P. falciparum* infection during pregnancy is estimated to cause as many as 10,000 maternal deaths each year, 8% to 14% of all low birth weight babies and 75,000 to 200,000 of all infant deaths each year (Shulman, 1999). In Nigeria, there is an estimated 25-30% of mortality in children under five and 300,000 deaths each year due to malaria (Odaibo, 2005). Antenatal clinic visits is a key for delivery of the prevention package for pregnant women. Studies have shown that 40% of pregnant African women present for the first time to antenatal clinics in the second trimester of their pregnancy. The ITNs, part of the prevention package delivered during the first antenatal clinic visit would provide additional protection for the mother during the remaining trimesters of pregnancy and into the post-partum period, as well as protection for the newborn through at least the first year of life (WHO, 2003b)

Intermittent Preventive Treatment (IPT) with anti-malaria drugs should be made available as a routine part of antenatal care to pregnant women in their first and second pregnancies in highly endemic areas is recommended (WHO, 2003b). At present, sulfadoxine-pyrimethamine (SP) is given. IPT with at least two treatment doses of SP is highly effective in reducing the proportion of women with anaemia or placental malaria infection at delivery (Shulman, 1999, Parise, 1998, Shultz, 1994)

MATERIALS AND METHODS

Study Area

This study was done in Ebonyi State University Teaching Hospital Abakaliki, which is situated in Abakaliki Urban. Ebonyi State is bordered in the East by Ogoja, South by Afikpo and North/West by Enugu State. It is made up of 4 areas, Izzi, Ikwo, Ezza and Mgbo with Eight Local Government Areas. It has over 2million inhabitants who are the indigenes. Their major occupation is farming, fishing and quarry work. Few people are petty traders, artisans and civil servants.

Ebonyi State University Teaching Hospital is the only teaching hospital in the state. It is managed by the state government, and the hospital authority and it is a major health centre for accessing health service in the state.

ETHICAL CONSIDERATION

Ethical approval of this study was based on the already established protocols of routine blood sample collection for the routine investigations of these pregnant women attending Antenatal Clinics at EBSUTH Abakaliki for their first time to book for the present pregnancy. The findings in this research work would be treated with utmost confidentiality.

SAMPLE AND SAMPLING TECHNIQUE

312 pregnant women in their various trimesters who came to the ANC of the EBSUTH Abakaliki, for routine pregnancy care at their first antenatal care booking since commencement of pregnancy were used. The booking day in this facility is usually Wednesdays of each week. These women were verbally notified before sample collection, and their consent was duly obtained. Of these women examined, using the microscopy of thick smear by Giemsa staining Technique, 131 (42.00%) tested positive for *Plasmodium* infection. Chi-square (X^2) was used to test the hypothesis of the objectives. Statistical significance was achieved if P-value is more than 0.05 (P>0.05).

RESULTS

This study comprised of 312 pregnant women who were tested for *Plasmodium* infection, of which 131 women infected. Out of the 131 women infected, 117 (89.3%) had parasitaemia level of (+), 13 (10.0%) had (++) whereas 1 (1.0%) had (+++). *P. falciparum* was identified in all the cases. Relating malaria to obstetrics history such as parity and pregnancy trimesters, it was observed that the prevalence of positive malaria smears was higher among multigravidae (40.8%) than the primigradae (40.8%), the difference was not statistically significant (P<0.05). Although the women in their second pregnancy trimester had more malaria parasite – positive smears (43.5%) than

those in their (41.7%) and third (40.6%) trimester, statistically there was no significant difference in the trend (P<0.05).

Table 1: The number of women positive for *P. faciparum* infection according to the parity

Parity	No of Women Examined	No of Women Infected	% of Women Infected
Primigravidae (P_0)	76	32	42.1%
P_1 - P_3	158	66	41.8%
P_4 - P_6	59	26	44.1%
P_7 and above	19	7	36.8%
Total	312	131	42.0%

From the table above, a total number of 312 pregnant women were examined according to their parity. The primigravidae (P_o) were 76 and 32 (42.1%) were infected, P_1 –P_3 were 158, 66 (41.8%) were infected, P_4 –P_6 were 59, 26 (44.1%) were infected, P_7 and above were 19, 7 (36.8%) had *P. falciparum* infection in their blood. Their results showed no significant difference (P<0.05). This showed that the number of women infected is independent of their parity.

Table 2: The Number of Women Positive for *P.falciparum* Infection According to Trimester

Trimesters/ Gestational Age	No of Women Examined	No of Women Infected	% of Women Infected
T_1 (1-12 weeks)	36	15	41.7%
T_2(13-24weeks)	138	60	43.5%
T_3 (25-36weeks)	138	56	40.65%
Total	312	131	100%

From the above table, 36 women in their first trimester (1-12 weeks) were examined, and 15 (41.7%) out of the number were infected, 138 were in their second trimester (13-24 weeks) were examined, and 15 (41.7%) out of the number were infected, 138 were in their second trimester (13 – 24 weeks) who were examined had 60 (43.5%) of *P. falciparum* infection, whereas those in their trimester (25-36 weeks) were 138, 56 (40.6%) had parasitaemia.

Table 3: The Rate of *Plasmodium falciparum* in the Different Parity Groups Examined

Party	No of Women Examined	Plasmodium falciparum infection (%)			Total No Infected
		+	++	+++ and above	
P_0 (Primigravidae	76	28(36.8%)	3(3.9%)	0(0%)	31
P_1 – P_3	160	58(36.3%)	7(4.4%)	1(0.63%)	66
P_4 – P_6	59	25(42.4%)	2(3.4%)	0(0%)	27
P_7 and above	19	6(31.6%)	1(5.3%)	0(0%)	7
Total	**312**	**117**	**13**	**1**	**131**

From the table above, the primigradae (P_0) were 76 examined, 31 infected out of which 28 (36.8%) had parasitaemia of (+), 3 (3.9%) had (++) and none had (+++). The P_1 –P_3 group were 160, 66 were infected, 58 (36.3%) of the women had parasite density of (+), 7 (4.4%) had (++) and 1 (0.6%) had (+++). P_4 – P_6 group were 59, 27 had *P. falciparum* infection, out of which 25 (42.4%) had (+), 1 (5.3%) had (++) and none had (+++), then P_7 and above, 19 of the women were examined, 6 (31.6%) had a parasite density of (+) and 1 (5.3%) had (++) parasitaemia giving a total number of 7 women who were positive for *P.falciparum* infection. The statistical analysis of the result showed that there is no significant difference (P<0.05). This means that the rate of *P. falciparum* is independent of their parity

Table 4: The Rate of *Plasmodium falciparum* in the Different Trimesters Examined

Trimester/	NO OF	*P. falcipamm*		Injection	Total
Gestational	Women attended				No Intuited
Age		+	++	+++ & Above	
T1 (1-12)wks	36	12(333.3%)	2(5.6%	(2.8%)	15
T2(13-4wks)	138	49(35.5%)	10(7.2%	1(0.7%)	60
T3(25-36wks)	138	46(33.3%)	4(2.9%)	6(4.3%)	56
Total	**312**	**107**	**16**	**8**	**131**

From the table above, those women in their first trimester (1-12weeks) were 36, a total of 15 were infected with *P. falciparum*. Out the numbers, 12 (33.3%) had (+), 2(5.6%) had (++) and 1 (2.8%) had (+++). Those in their second

trimester, (13-24 weeks) were 138 examined , of this number, 49 (35.5%) had (+), 10 (7.2) had (++) and 1(0.7%) had (+++). Those in their third trimester (25-36weeks) were 138, 46 (33.3%) had (+), 4 (2.9%) had (++) and 6 (4.3%) had (+++) parasitaemia levels in their blood when analyzed giving a total number of 56 pregnant women that were infected. Statistical analysis of the result showed that there was no significant difference between the proportions ($P<0.05$). This means that the rate of *P. faciparum* parasite density is independent of the Trimesters.

DISCUSSION

According to the African Malaria Report Bulletin (Nair and Nair, 1993), adult women in areas of stable transmission have a high level of immunity, but this is impaired especially in the first pregnancy (i.e. primigravidae) with the result that the risk of infection increases, inversely with the level of parasitaemia which is high in primigravidae. This is in agreement with (Matteeli *et al*., 1997) that the primigravidae are more susceptible to malaria infection than the multigravidae.

In this present study, the maternal malaria prevalence rate of (42.0%) which was the prevalence of parasitaemia found during the first prenatal visit was obtained. While this is so in this study, it was not comparable with a study conducted in this same EBSUTH Facility in 2006 were the parasitaemia was (16%), and in some other malarious areas like the sub-Saharan Africa including Eastern Sudan where the prevalence of malaria among pregnant woman was 17.4% (Adam, *et al*., 2005). In recent times, the relatively lower prevalence rates of malaria infection among pregnant woman who assess their antenatal care in the sub-region may not be as a result of the development of higher levels of the acquired ant-malaria immunity among them. But a more plausible explanation to this lower prevalence rate could be attributed to increased malaria awareness among women of child- bearing age in many endemic areas of the sub-Saharan Africa and the intensified efforts of various health authorities at the local, regional and national levels in the control and prevention of malaria in pregnancy. The World Health Organization currently recommended that women in areas of high malaria transmission in Africa receive intermitted preventive treatment with an effective anti- malaria drug at regularly scheduled ANC visits after quickening is being implemented in many malaria endemic areas.

In relation to parity, the prevalence of parasitaemia, was higher among the multigravidae (42.4%) than the primigravidae (40.8%) ($P>0.05$). These results were not in accordance with the findings from similar studies conducted in many other malarious areas of the tropics. This is because while those findings including the one conducted in this EBSUTH centre in 2006 are of the view that parasitaemia was significantly higher in primigravidae than in multigravidae (Nair and Nair, 1993, Rogerson *et al*., 2000, Brabin 1983), indicating a strong relationship between parity and malaria infection with mean parasite density levels decreasing as the number of gestation increased thus confirming that the African primigravidae remain unquestionably the most susceptible (Rogerson et al., 2000, WHO 2003b) but this contrary to this particular work which showed that the multigravidae are the most susceptible group which inversely agrees with (Dicko *et al*., 2003) that the protective immunity in pregnancy is not a function of parity. This is further explained by (WHO 2002) that in the first and second pregnancies, women are especially vulnerable to *P. falciparum* parasitaemia. One of the surprising findings in this study was that none of the pregnant women complained of nor showed any symptoms of malaria but tested positive to the parasitaemia level of (+++) in their blood sample when analyzed. Malaria infection is highly controlled by the immune system and as such may be clinically unrecognized unless diagnosed or investigated making pregnant women to be particularly at risk (Odaibo, 2005), Brabin, 1983).

This study in relation to trimesters showed that prevalence of maternal malaria and the parasite density was highest among women in their second trimester (43.5%) followed by those in their first trimester (41.7%) but there was no significant difference in the trend ($P<0.05$) statistically. This findings corresponds with a number of previous studies in other malarious areas of sub-Saharan (Nair and Nair, 1993), but contrasted with studies conducted in Bandiagara, Mali; where the level of malaria parasitaemia among pregnant women was significantly higher among individuals in their first trimester of gestation (Dicko *et al*., 2003), and in Eastern Sudan were the risk of malaria infection was significantly associated with the third trimester (Adam et al., 2005)

However, it is established that immunosuppression is evident during the second trimester of pregnancy, and this possibly results from the presence of high adrenal steroid levels, as well as chorionic gonadotrophin and fetoprotein in the blood, there may also be depression of the lymphocyte activity. This may have been the reason for the higher susceptibility to malaria by women in their second trimester of pregnancy, as recorded in most of the studies

including this particular one. The mechanism of the differential response to parasitaemia infection is idiopathic and the epidemiology has not been studied in pregnant women living under malaria endemic conditions until a clearer picture of what happens is available, it will not be possible to determine why this alteration in host susceptibility occurs

In conclusion, the ability to conduct a comprehensive evaluation of the prevalence of *P. falciparum* parasitaemia infection among the pregnant women was a major challenge. *P. falciparum* is playing a considerable role in causing anaemia in pregnancy in this part of the globe. In most parts of the developing world, material and child health services should be given the utmost support at every level for the prevention and control of malaria in pregnant women.

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