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The Impact of Anaemia and Malaria Parasite Infection In Pregnant Women. Nigerian Perspective

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Abstract: *Malaria and anaemia during pregnancy is still a major health problem in endemic countries with clinical consequences including death of both mother and child. In Nigeria, statistics shows that as many as 300,000 lives especially those of children and pregnant women are lost annually due to malaria. This study was aimed at assessing the impact of malaria and anaemia among pregnant women living in Calabar South Local Government Area of Cross River State, Nigeria, which is characterized by unstable transmission of malaria. .A total of 664 subjects were enrolled in the study made up of 414 pregnant women attending antenatal clinic in the University of Calabar Teaching Hospital Calabar, Nigeria and 250 age-matched non-pregnant women served as control group. Full blood count was done using PCE-210 automatic cell counter, malaria parasite detection was through examination of peripheral blood smears and malaria parasite count/density was done using WHO standard method (WHO, 1991). Anaemia was significantly(P <0.05) higher among the pregnant women 253(61.1)(Hb<11g/dl) than in the non-pregnant women 96(38.3%)(Hb<12g/dl).The prevalence of malaria parasite infection was 290(70.1%) in pregnant women and 152(60.8%) in the control group. Prevalence of anaemia and malaria parasite was found to be higher in the primigravidae than in the multigravidae. Primigravidae were more susceptible to the parasite especially Plasmodium falciparum with mean parasite density of 1962.50 ± 220.90 (parasite/µl) than the multigravidas with parasite density 446.70 ± 296.90 (parasite/µl). Malaria parasite density increased significantly with gestational age but anaemia was more prevalent in the second trimester than in the other trimesters. There was a negative correlation between haemglobin and malaria parsite density in both pregnant and non-pregnant women (r = -0.1964). The results showed that malaria infection caused by P. falciparum had serious effect on pregnant women living in the study area. Malaria in pregnancy should be recognized as a global priority in health care services.The study advocate the need for pregnant women to undergo routine haemoglobin estimation and early malaria prophylaxis considering the deleterious effects of anaemia on them and their foetus.*

Key words: *Malaria, pregnancy, Anaemia,*

I. Introduction

Anemia is defined as a reduction in the concentration of hemoglobin, packed cell volume or red blood cell count below that which is normal for the age and sex of an individual in a population. According to the World Health Organization Scientific Group,[1] the levels of hemoglobin below which anemia is likely to occur for population living at sea level are: 11g/dl for children aged six months to six years, 12g/dl for children aged between 6 and 14 years, 13g/dl for adult males, 12g/dl for non-pregnant adult females and 11g/dl for adult pregnant females[1].

Anemia is one of the clinical problems in pregnancy, this is usually caused by increase demand imposed by the growing fetus. Malaria is also a common clinical problem in malaria endemic countries and this is one of the causes of anemia in pregnancy[2]. Association of malaria and anemia will therefore pose a great risk to the health of the mother and fetus. The symptoms and complications of malaria during pregnancy differ with the intensity of malaria transmission, parasite load and thus with the level of the immunity the pregnant woman has acquired[1]. Anemia in pregnancy has been associated with maternal morbidity and mortality and is a risk factor for low birth weight.[2]

Malaria remains the single most important infection causing morbidity and mortality in the world and is second only to Mycobacterium tuberculosis as the single most important infection agent[3]. It is one of the biggest impediments to progress in Africa and is the biggest killer in Africa, with 90% of the global malaria deaths occurring in this continent[4]. It is responsible for one in four deaths below the age of 5 years and could most times lead to miscarriage at the early stage of pregnancy[4]. In the endemic countries of Africa, children under the age of five and pregnant women bear the brunt of the burden of malaria disease, this is because they have lower immunity to the disease compared to other people in the same environmental locations. The malaria situation is deteriorating as a result of climate changes, including global warming, civil disturbances, increasing travel and increasing drug resistance[3]. According to World Health Organization report, malaria is one of the leading selected causes of mortality with fatality rate put at 1.5 to 2.7 million annually while it comes second

among the leading selected causes of morbidity with about 300 to 500 million people reporting to hospital due to the infection[5]. Maternal mortality is twice in pregnant malaria women than among non-pregnant patients with severe malaria [2]. Anaemia is the most common symptom of malaria in pregnancy and usually develops during the second trimester [2]. Cerebral malaria is rare in adults except during pregnancy and is responsible for many maternal malaria deaths[6]. Severe *falciparum* malaria may cause deformities in the genital tract to make conception impossible or if conception does occur it may prevent normal implantation and development of the placenta[7]. Although so much work have been published on the prevalence of malaria in major cities of Nigeria but little information is available about the prevalence of this disease and anaemia associated with it in the suburbs or outskirts of major cities where transmission is unstable but high as a result of topography, attitude, rainfall, poor drainage system and high human-vector contact to mention a few. This work was therefore aimed at assessing the impact of anaemia and malaria in pregnant women living in Calabar South, Calabar, Cross River State, Nigeria

II. Materials And Methods

Data collection

This study was conducted at antenatal clinic of University of Calabar Teaching Hospital, Calabar South Eastern Nigeria. Ethical clearance was obtained from the ethical committee of the hospital and informed consent was also obtained from every participant. The subjects were 414 pregnant women at different gestational period who came for antenantal and were within the age of 15 – 45years. They comprised of women of different socio-economic class who were not suffering from any known disease. Two hundred and fifty apparently healthy non-pregnant women within the same age group were used as controls. They were drawn from female workers in university of Calabar Teaching Hospital and women living within Calabar South Local Government Area. Questionnaire were given to each pregnant woman requesting information on age, parity and gestational age and also to determine those on antimalaria prophylaxis. Gestational age was calculated from the last menstrual period and confirmed by ultrasound scan.

Methods

Four ml of blood was collected from an ante-cubital vein of each woman into EDTA sample bottles for full blood count. Full blood count was carried out using full automatic blood cell counter, PCE-210 version 5.10 by ERMA INC. Tokyo.

For the laboratory diagnosis of malaria parasite infection, thick films were prepared for each of the subject and stained using Giemsa staining method as described by Chessbrough.[8]

Malaria parasite density determination.

Malaria parasites were counted against white blood cell. A minimum of 1000 white blood cells were counted and the number of malaria parasites counted per the 1000 white cells counted was recorded. The parasite density was then converted to parasite per milliliter of blood according to WHO formula.[9]

$$\frac{\text{Number of parasites counted}}{\text{Number of leucocytes (WBC) counted}} \times 8000 = \text{Number of parasites counted per mm}^3 \text{ of blood}$$

Statistical analysis - The data generated in this study were analysed for level of significance ($P< 0.05$) using Chi-square test.

III. Result

Six hundred and sixty four subjects made up of 414 pregnant and 250 non-pregnant women were enrolled in the study. Of the 414 pregnant women, 253(61.1%) were anaemic while 290(70.1%) had malaria parasite as shown in table 1. This result showed that the prevalence of anaemia and malaria parasite was statistically significant ($P<0.05$).

The distribution of anaemia and malaria parasite among pregnant women according to gravidity is shown in table 2. Primigravidae were found to be susceptible to malaria with a significantly higher parasite density2112.50±420.90 than the multigravidae 446.70±296.90 ($P<0.05$). Anaemia was also found to be higher 89(64.4%) in primigravidae than in multigravidae 164(60.7%) ($P<0.05$). Table 3 shows the mean ± SEM of malaria parasite density in relation to age of pregnant women. The pregnant women within the age bracket of 25 - 34 years had the highest number of positive sample 189(45.7%) with the mean parasite density 937±331.5 while those within 35 -45 years had the least positive sample 28(6.8%) with the mean parasite density of 64±135.6. The prevalence of anaemia and malaria parasite among pregnant women according to their gestational age is presented in table 4. Pregnant women appear to be more anaemic in their second trimester 146(65.8%) than the 3rd trimester 78(64.5) although those in their 3rd trimester were more infected with malaria parasite 97(80.2%) than the pregnant women who were in their second trimester 150(67.6%). The pregnant

women who were in their 1st trimester were the least infected with malaria parasite 29(40.8%).Figure 1and 2 shows that there was a negative correlation between haemoglobin and parasite density in both pregnant and non-pregnant women (r=-0.1964).

IV. Discussion

Anaemia in pregnancy has been associated with maternal morbidity and mortality and is a risk factor for low birth weight[10]. Malaria infection during pregnancy can have adverse effect on both mother and fetus, to include maternal anaemia, fetal loss, premature delivery, intrauterine growth retardation and delivery of low birth weight infants[2].

This study, has revealed that anaemia, Hb<12g/dl, is present in 38.3% of our non-pregnant women and the same population had malaria parasite prevalence of 60.8%. This agrees with the frequent observation of mild anaemia among healthy population in developing economic conditions in Nigeria which is also malaria endemic area.[11]

The prevalence of anaemia among pregnant women in UCTH Calabar was found to be 61.1% in this study. This is slightly lower than 79.1% reported by Usanga *et al*[12], on their work on prevalence of iron deficiency anemia in Nigerian pregnant women and also the work of Achidi *et al*.,[10] who reported a prevalence rate of 68.9%. Severe anaemia was found in 14(5.5%) of anaemic pregnant women, this is significantly higher than 1.3% previously reported by Achidi, *et al.,*[10] and also that of Isibor, *et al.,*[13] who reported no case of severe anaemia in their study. Mild to moderate anaemia is more common in our pregnant first time attenders with a relatively low incidence of severe anaemia. As much as 70.1% of the pregnant women in this study had malaria parasite. This confirms the previous report by Ilona, *et al.,*[14] that malaria infection is one of the major causes of anaemia among pregnant women in malaria endemic area. The 70.1% prevalence rate of malaria parasite (*plasmodium falciparium)* found among the pregnant women in this study is higher than the 32.9% reported in warri Nigeria by Isibor, *et al.,*[13] and also 44% previously reported in south eastern Nigeria by Uko, *et al*.,[11]. Enormous cultural and economic differences may account for this variation.

An analysis of malaria in pregnancy in Africa revealed that parasiteamia is significantly common and heavier in primigravidae than multigravidae [15]. This study showed high level of infection in primigravidae (Table 2). This is because in an area where transmission is high and the level of acquired pregnancy immunity against malaria is expected to be significant, primigravidae is more affected [2,15]. Incidence of anaemia was reported to be slightly higher in the primigravidae (63.6%) than in the multigravidae (59.8%). This agrees with the earlier report by Isibor *et al.,* [13], Nair and Nair,[16] and Braiin[2] that anaemia is a common problem of the primigravidae. Achidi *et al*.,[10] also recorded a higher prevalence of anaemia among the primigravidae (52.1%) than in the multigravidae(47.9%).

In this study the prevalence and intensity of malaria parasite infection increased as the gestational age increases, This finding disagree with those of Nair and Nair[16], Menendez[17]; Nosten et al.[18], who reported higher frequency of malaria parasite infection in the second trimester than others. The sequential increase in the intensity of malaria parasite infection as the gestational age increases observed in this study may be due to the depressed immunity usually associated with pregnancy[2]. It was also observed that anaemia is more common in the second trimester than in others, this agrees with the previous report that anaemia due to malaria is more common and severe between 16-29 weeks of gestation[19].

Pregnant women within the age bracket of 20 to 30 years recorded the highest number of positive result while those of the age group of above 40 years recorded the lowest or no result at all (Table 2). This result supports the existing knowledge that high prevalence at lower ages and low prevalence at higher ages is due to the existence of natural immunity to infectious disease including malaria[20,21,22] which the pregnant women acquires as the age increases. Lander et al. (2002) however reported no significant association between malaria infection and maternal age [23].

The negative correlation observed in both pregnant and non-pregnant women suggests that malaria parasite infection contributes significantly to anaemia.

V. Conclusion

This research has shown that malaria and anaemia have serious impact on the health of mother and foetus. Thus these indicators should be dealt with during pregnancy to ensure mother and foetus health care. Prophylactic drugs should be administered to pregnant women in other to prevent malaria infections.

References

[1]. INACG/WHO/UNICEF.(1998)Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia. International Nutritional Anemia Consultation Group/World Health Organization/United Nations Children's Fund. Stoltzfus RJ, Dreyfuss ML. ILSI Press, International Life Science Institute, Washington, USA.
[2]. Brabin, B. J., (1998). Analysis of malaria in pregnancy in Africa. *Bulletin of the World Health Organization. 61:* 1005-1006.
[3]. Greenwood, B. M., (1997). The Epidemiology of Malaria. Ann. Trop. Med. Parasitol., 91: 763 - 769.
[4]. Bulter, D., (1997). Time to Put Malaria Control on the Global Agenda. Nature, 386: 535-541.
[5]. World Health Organization (WHO) (1997): Malaria in tropics disease research. 13th programme report. WHO, Geneva, pp. 40-61

[6]. Macleod, C., (1988). Parasitic Infections in pregnancy and New born. Oxford Medical Publishers, pp. 10-25.
[7]. Burrow, N. G. & Ferris, F. T. (1988). Medical complications during pregnancy, 3rd Edition, WB. Saunders Company, pp. 34-37, 425-427, 320-321.
[8]. Cheesbrough, M. L., (1991). Medical laboratory manual for tropical Countries.Third edition. London, Heineman, 122-123.
[9]. World Health Organization, (1991). *Basic laboratory methods in medical parasitology*. London: Oxford Press.
[10]. Achidi, C. E., Kuoh, A. J., Minanag, J. I., Ngum, B., Achimbom, B.M. & Moltoze, S. C. (2005). Malaria infection in pregnancy and its effects on heamoglobin level in women from a malaria endemic area of Fako division, south west province, Cameroon. *Journal of Obstetrics and Gynaecology, 25:* 235--239.
[11]. Uko, E. K., Emeribe, A. O. & Ejezie, G. C. (1998). Pattern of malarai parasitaemia in pregnancy in Calabar. *Journal of Medical Laboratory Science, 7:* 18--20.
[12]. Usanga, E. A., Chilaka, M. & Archibong, E. A. (1994). Prevalence of iron deficiency anaemia in Nigerian pregnant women. *Journal of Medical Laboratory Science*, 4: 105-133.
[13]. Isibor, C. N., Omokara, E. U., Anonkha, I., & Isibor, J. A., (2003). Prevalence of malaria parasitaemia and anaemia among pregnanat women in Warri, Nigeria. *Journal of Meidcal Laboratory Sciences, 12:* 53--58.
[14]. Ilona, A. C., Thomas, S., John, P. A., Lusingu, R., Malima,J. U. & Chris J. D. (2006). Modeling the relationship between the population prevalence of *plasmodium falciparum* malaria and anaemia. *American Journal of Tropical Medicine and Hyqiene, 75:* 82
[15]. McGregor, I. A. (1984). Epidemiology, Malaria and Pregnancy. Am. J. Trop. Med. Hyg., 33: 517-525.
[16]. Nair, L.S. and Nair, S. A. (1994). Effects of Malaria infection on pregnancy. *India Journal of Malaria,* 4, 207-225.
[17]. Menendez, C., (1995). Malaria during pregnancy: A priority area of malaria research and control. Parasitol. Today, 11: 178-183.
[18]. Nosten, F., Kuile, F. O., Maelankirri, L., Decludt, B. & White, N. J. (1991). Malaria during pregnancy in an area of unstable endemicity. Trans. Res. Soc. Trop. Med. Hyg., 85: 424-429.
[19]. Kakkilaya, B. S., 2006. Pregnancy and malaria, complications in *P. vivax/p malariae* infections. *Journal of Obsterirics and Gynaecology, 6:* 93--96.
[20]. Oduola, A. M., Sowunmi, W. R., Kyle, D. E., Martin, R. K., Walker, O. & Salako, L. A., (1992). Innate resistance to new anti-malaria drugs in *Plasmodium falciparum* from Nigeria. Trans. Royal Soc. Trop. Med. Hyg., 86: 123-126.
[21]. Rogerson, S. J., VandenBroek, N. R., Chaluluka, E., Qongwane, C., Mhango, C. G., & Molyneux, M. E., (2000). Malaria and anemia in antenatal women in Blantyre, Malawi: A twelve-months survey. Am. J. Trop. Med. Hyg., 62: 335-340.
[22]. Bouyou-Akotet, M. K., Ionete-Collard, D. E., Mabika-Manfoumbi, M., Kendjo, E., Matsiegui, P. B., Mavoungou, E., & Kombila, M., (2003). Prevalence of *Plasmodium falciparum* infection in pregnant women in Gabon. Malar. J., 2: 18.
[23]. Lander, J., Leroy, V., Simonon, A., Karita, E., Bogaerats, J., Clercq, A. D., Van de Perre, P., & Dabis, F. (2002). HIV infection, malaria and pregnancy: A prospective cohort study in Kigali, Rwanda. Am. J. Trop. Med. Hyg., 66: 56-60.

Table 1 Prevalence of anaemia and parasitaemia among non-pregnant and pregnant women

	Total Number Of Subjects	Number infected (%)	No anaemic (%)	No with Severe anaemia(%)	Mean Parasite ± SEM Den. (par./µl bld.)
Pregnant	414	290(70.1)	253(61.1)	14(5.5)	2112.50 ± 420.90
Non-pregnant	250	152(60.8)	96(38.8)	-	246±320.41
P –Value		P<0.05	P<0.05	P<0.05	P<0.05

Table 2 Distribution of anaemia and parasitaemia among pregnant women according to gravidity.

	Total Number Of Subjects	Number infected (%)	No anaemic (%)	No with Severe anaemia(%)	Mean Parasite ± SEM Den. (par./µl bld.)
Primigravidae	140	100(71.4)	86(63.6)	5(3.6)	1962.50 ± 220.90
Multigravidae	274	190(69.3)	164(59.8)	9(3.3)	446.70±296.90
P –Value		P<0.05	P<0.05	P>0.05	P<0.05

SEM: Standard error of mean.

Table 3. Mean ± SEM malaria parasite density in relation to age of pregnant women.

Age group (year)	positive sample (%)	Mean parasite density ± SEM (parasites/µl)
15-24	73(17.6)	937 ± 331.50
25-34	189(45.7)	866.80 ± 539.40
35-45	28(6.8)	564±135.6
TOTAL	290(70.1%)	2112.50±420.90

SEM: Standard error of mean.

TABLE 4 Prevalence of anaemia and parasitaemia among pregnant women according to their gestational age

Gestational Age	NO of Subjects	No. anaemic (%)	No. infected (%)	Mean parasite denstiy ± SEM (Parasite/ul of blood)
1st Trimester	71	29(40.8)	43(60.6)	577.40 ± 320.60
2nd Trimester	222	146(65.8)	150(67.6)	885.60 ± 364.10
3rd Trimester	121	78(64.5)	97(80.2)	1913 ± 554.70
P-VALUE		P< 0.05	P< 0.05	P< 0.05

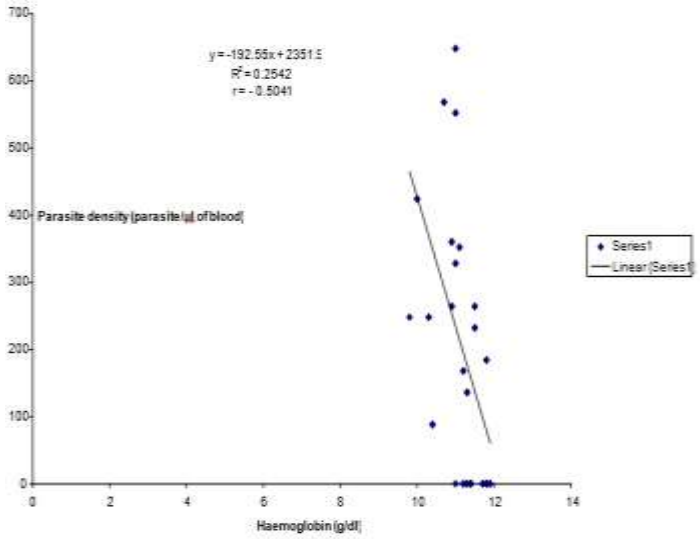

Figure 1- Correlation between haemoglobin and parasite density in non-pregnant women

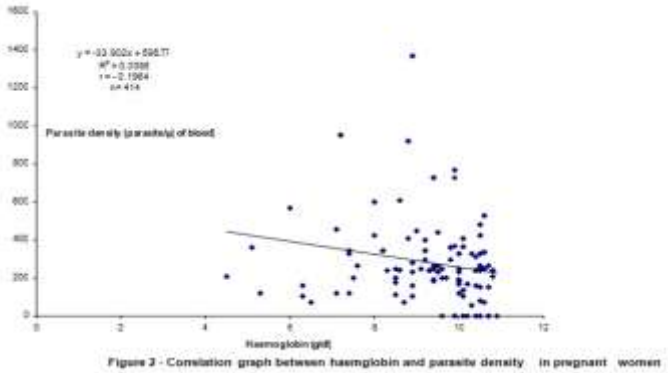

Figure 2 - Correlation graph between haemglobin and parasite density in pregnant women