

## **PREVALENCE OF ANAEMIA AND MALARIA PARASITAEMIA AMONG PREGNANT WOMEN IN NIGERIA: A CROSS-SECTIONAL ANALYSIS**

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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  $1962.50 \pm 220.90$  (parasite/ $\mu$ l) than the multigravidas with parasite density  $446.70 \pm 296.90$  (parasite/ $\mu$ l). 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 haemoglobin and malaria parasite 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 advocates 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.

**Keywords:** 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,<sup>1</sup> 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<sup>1</sup>.

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<sup>2</sup>. 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<sup>1</sup>. Anemia in pregnancy has been associated with maternal morbidity and mortality and is a risk factor for low birth weight.<sup>2</sup>

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<sup>3</sup>. 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<sup>4</sup>. 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<sup>4</sup>. 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<sup>3</sup>. 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<sup>5</sup>. Maternal mortality is twice in pregnant malaria women than among non-pregnant patients with severe malaria<sup>2</sup>. Anaemia is the most common symptom of malaria in pregnancy and usually develops during the second trimester<sup>2</sup>. Cerebral malaria is rare in adults except during pregnancy and is responsible for many maternal malaria deaths<sup>6</sup>. 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<sup>7</sup>. 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 and 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 antenatal and were within the age of 15 – 45years. They comprised of women of different socioeconomic 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.<sup>8</sup>

### 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.<sup>9</sup>

Number of parasites counted  $\times 8000 =$  Number of parasites counted per  $\text{mm}^3$  of blood

Number of leucocytes (WBC) counted

**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 density  $2112.50 \pm 420.90$  than the multigravidae  $446.70 \pm 296.90$  ( $P < 0.05$ ). 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  $\pm$  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  $937 \pm 331.5$  while those within 35 -45 years had the least positive sample 28(6.8%) with the mean parasite density of  $64 \pm 135.6$ . 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 3<sup>rd</sup> trimester 78(64.5) although those in their 3<sup>rd</sup> 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 1<sup>st</sup> trimester were the least infected with malaria parasite 29(40.8%). Figure 1 and 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<sup>10</sup>. 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<sup>2</sup>.

This study, has revealed that anaemia,  $\text{Hb} < 12\text{g/dl}$ , 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.<sup>11</sup>

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<sup>12</sup>, on their work on prevalence of iron deficiency anemia in Nigerian pregnant women and also the work of Achidi et al.,<sup>10</sup> 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.,<sup>10</sup> and also that of Isibor, et al.,<sup>13</sup> 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.,<sup>14</sup> 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 falciparum*) found among the pregnant women in this study is higher than the 32.9% reported in warri Nigeria by Isibor, et al.,<sup>13</sup> and also 44% previously reported in south eastern Nigeria by Uko, et al.,<sup>11</sup>. Enormous cultural and economic differences may account for this variation.

An analysis of malaria in pregnancy in Africa revealed that parasitaemia is significantly common and heavier in primigravidae than multigravidae<sup>15</sup>. 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<sup>2,15</sup>. 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.,<sup>13</sup> Nair and Nair,<sup>16</sup> and Braiin<sup>2</sup> that anaemia is a common problem of the primigravidae. Achidi et al.,<sup>10</sup> 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<sup>16</sup>, Menendez<sup>17</sup>; Nosten et al.<sup>18</sup>, 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<sup>2</sup>. 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<sup>19</sup>.

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<sup>20,21,22</sup> which the pregnant women acquires as the age increases. Lander et al. (2002) however reported no significant association between malaria infection and maternal age<sup>23</sup>.

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.

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