

Histopathological Determination of Placental Malaria and its Relation to Fetal Birth Weight

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Abstract

Background: Placental malaria (PM) is a serious public health concern especially in endemic areas among primigravidae. This form of malaria does not just affect the woman but the foetus. It has been identified as the leading cause of complications and high morbidity during delivery in the tropics. Methods: This is a cross-sectional study involving 181 randomly selected pregnant women at the point of delivery. Placental samples were collected from a healthy pericentric area, fixed in 10% neutral buffered formal saline, processed into paraffin wax and 5µm thin sections stained by Haematoxylin & Eosin (H&E) and Giemsa's method and then viewed microscopically. A standard questionnaire was also administered at the point of delivery and analysed. Other information collected at point of delivery include vital status at birth, birth weight, sex, malformation (if any) and placental weight. Results: Placental malaria was recorded in 30 (16.6%) of the subjects, while only 13.3% of those with PM had babies with low birthweight. 97.8% of the women were on prophylactic drugs and about the same percentage attend Antenatal care (ANC). Conclusion: Our study shows that if pregnant women attend ANC and are placed on prophylactic drugs, placental malaria may not lead to low birthweight and other complications associated with the infection.

Keywords: Placental malaria, birthweight, pregnant women

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1 Introduction

Malaria is a vector-borne infectious disease caused by protozoan parasites. It is widespread in tropical and subtropical regions, including parts of the Americas, Asia, and Africa. Each year, there are approximately 515 million cases of malaria, killing between one and three million people, the majority of whom are young children in Sub-Saharan Africa. 90% of malaria related deaths occur in Sub-Saharan Africa. Malaria is commonly associated with poverty, but is also a cause of poverty and a major hindrance to economic development[1]. It has been shown that greater percentage of women in the tropics present with malaria during or immediately after delivery[2]. The mortality rate among pregnant women in this region is 5-10 times greater than it is among non pregnant women. Placental malaria (Maternal malaria) on the other hand is malaria infection in pregnancy with the parasite spreading all over the system especially the placenta. The placenta is found within the uterus during pregnancy and is a means by which embryo is attached to the uterus. Placental malaria is a serious public health concern especially in endemic areas among the primigravidae. This form of malaria does not just affect the woman but also the foetus. Placental malaria has been identified as the leading cause of complication and high morbidity during delivery in the tropics. It has been shown that in addition to death, maternal malaria is implicated in premature delivery, intra uterine growth retardation(IUGR), prenatal mortality in the infants, anaemia in the mother and reduction in weight of the foetus[3]. Placental malaria is a common complication where malaria is endemic. Placental histology is considered the “gold standard” of malaria diagnosis in pregnancy for epidemiological studies. However, due to limited technical expertise, it is rarely available in endemic areas. Examination of thick film of blood sample obtain by placenta incision is comparatively easier as compared to histology, sensitivity and specificity of this method to be 76% and 99% respectively[4]. A lower birth weight and a higher risk of delivering low birth weight babies were associated with parasitisation of the placenta in the Gambian population. Four folds increases in the risk of delivering low birth weight babies among the infected groups were observed. A similar occasion was observed elsewhere in sub-saharan Africa endemic for malaria. There , the incidence of low birth weight range from 6% to 8% and was important contributor to 3.1 million low birth(320g).

2 Materials and Methods

2.1 Study Area

The study area is Jos metropolis. Jos is the capital city of plateau state which has over 30 different ethnic groups. The 2006 Nigerian Provisional census put the population of the state at 3,128,712 with 1,585,679 females[5]. Plateau State lies on latitude 7o and 11o North and Longitude 7o and 25o East. The city capital Jos stretches for approximately 104km from North to South and 80Km from east to west, covering an area of about 8,600Km with a height of 1,200sqm above sea level.

2.2 Ethics Statement

The hospitals used include Plateau State specialist Hospital, Matanmi Hospital and Maternity and Jama'a Nursing Home, all located in Jos North Local Government of Plateau

State. Ethical clearance could only be obtained from the Plateau State Specialist Hospital which had a properly constituted ethical committee (IRB). The Medical Directors of the other two private hospitals gave approval for the research on the condition that we must obtain an informed consent from each subject. The written informed consents were obtained after the entire study was explained to the subjects and each participant was thereafter allowed to decide if they wanted to participate in the research or not. The consent of each subject was recorded and the consent forms duly filed for record purposes. This procedure was approved by the ethical committee of the Plateau State Specialist Hospital and the Medical Directors of the clinics used as part of the ethical clearance process.

2.3 Study Population

This is a cross sectional study involving one hundred and eighty one(181) pregnant women at point of delivery that were randomly selected. The major inclusion criterion for selection of the subjects was term pregnant women undergoing normal delivery while the exclusion criteria were pregnant women undergoing Caesarian section; pregnant women with complications in pregnancy and pregnant women who are immunocompromised. A standard questionnaire was used to obtain data from the participants such as socio-demographic factors(age, residence, educational level, marital status) history of past pregnancy(gravidity, parity), malaria preventive measures(chemoprophylaxis, use of bed nets, etc) and data regarding the new born at delivery(vital status at birth, birth weight, sex, presence of twins, malformation and placental weight).

Maternal peripheral blood was collected within an hour of delivery, to assess anemia(if present), and a full thickness of placental biopsy was collected from a healthy pericentric area and placed in 10% neutral buffered formal saline. A Sample of the placenta was randomly taken from the fixed placental tissue and processed into paraffin wax. The processed tissue was sectioned at 5 μ m and subsequently stained with Haematoxylin and Eosin[6] and Giemsa stain[7] then viewed under the microscope for the presence of malaria pigment or parasite in intact red blood cells . Babies 2.4kg or below (≤ 2.4) were considered Low birth weights while 2.5kg and above (≥ 2.5) were considered normal birth weight. The result is presented as tables and analyzed using statistic Package for Social Science (S.P.S.S) and photo micrographs taken.

3 Results

From the total of 181 samples of placental tissue collected from women at the point of delivery 30(16.6%) were positive of placental malaria while 151(83.4%) were negative. Out of the 30 that were positive for Placental Malaria, 26(14.4%) had normal birth weight while 4(2.2%) had low birth weight. 177(97.8%) of the women took prophylaxis during pregnancy while 4(2.2%) did not. 176(97.2%) went for antenatal care while 5(2.8%) did not. 124(68.5%) had normal PCV while 57(31.5%) had low PCV.

Table 1: Shows the relationship between Placental Malaria and birth weight of Babies

Birthweight	Non infected placenta No.(%)	Infected placenta No.(%)	Total No.(%)
Low Birthweight	11(6.1)	4(2.2)	15(8.3)
Normal Birth weight	140(77.3)	26(14.4)	166(91.7)
Total	151(83.4)	30(16.6)	181(100)

Table 2: Shows relationship between Placental Malaria, Birth weight and use of Prophylaxis

Prophylaxis	Placental Malaria	Birth weight(Kg)		Total No.(%)
		Low Birth weight	Normal Birth weight	
		No.(%)	No.(%)	
Yes	Yes	4(2.2)	25(13.8)	29(16)
Yes	No	11(6.1)	137(75.6)	148(81.7)
No	Yes	0(0)	1(0.6)	1(0.6)
No	No	0(0)	3(1.7)	3(1.7)

Table 3: Shows relationship between Placental Malaria, Birth weight and Antenatal care

Antenatal Care	Placental Malaria	Birth weight(Kg)		Total No.(%))
		Low Birth weight	Normal Birth weight	
		No.(%)	No.(%)	
Yes	Yes	4(2.2)	26(14.4)	30(16.6)
Yes	No	10(5.5)	137(75.6)	146(80.6)
No	Yes	0(0)	0(0)	0(0)
No	No	1(0.6)	4(2.2)	5(2.8)

4 Discussion

The placenta malaria prevalence of 16.6% obtained in this study is much lower than 64.4% reported in South Eastern Nigeria[8], and higher than 3.6% reported in Yemen[9]. The reasons for the varied prevalence are hard to proffer but maybe majorly associated with the amount of rainfall/vegetation. The amount of rain/vegetation on the Jos Plateau is lower than that in the South Eastern Nigeria and higher than what obtains in Yemen. A longitudinal decline in the density of malaria mosquito vectors has been associated with

changes in the pattern of monthly rainfall[10]. The relatively much lower levels reported in Yemen was attributed to the use of peripheral blood films for the study instead of placental histology, which is the Gold standard for estimating malaria in pregnancy. The reasons for the very high prevalence reported in South Eastern Nigeria include poor quality antenatal care received by pregnant women and possibly drug resistance. In this study area, progress has been made in showing that the average pregnant woman can access good antenatal care with affordable prophylactic drugs provided and distribution of treated bed nets. However, the larger population of women in rural areas have not been reached with these services and some of them still depend on poorly trained traditional birth attendants. The association of placental malaria and birth weight of babies as shown in Table 1 reveals that low birth weight was reported in only 8.3% of the babies born to mothers with placental malaria. Birthweights below 2.5kg was considered low in this study. Out of the 30 babies with placental malaria, 26(86.7%) had normal birth weight. This does not support the assertion by several authors that placental malaria is associated with low birth weight[11]. However, some authors have reported that there is an association between low birth weight and placental malaria[7,8]. No conclusive evidence of this has been provided. Generally, placental malaria has been associated a variety of prenatal outcomes which include preterm delivery, intrauterine growth retardation, low birth weight, fetal anemia, congenital anemia, reduced fetal anthropometric parameters and several others. The role of prophylaxis and antenatal care in improving pregnancy outcome is clearly shown in Tables 2 and 4. The number of babies with normal birth weights compared to those with low birth weights shows that prophylaxis minimizes malaria infection and promotes child and maternal health. It is however noteworthy that 13.8% of women had prophylaxis and still showed placental malaria. This may be due to resistance or fake drugs which are still major challenges in malaria control in Nigeria[7]. The contribution of maternal packed cell volume (PCV) to low birth weight was also observed. It

was observed that when maternal PCV is normal, most of the babies are born with normal birth weight compared to when maternal PCV is low. This underscores the need for prophylaxis to prevent anemia due to malaria infection and the use of haematinics for all pregnant women. The causes of anemia have been identified as nutritional (iron, folate and protein deficiency) and non-nutritional factors (hookworm or HIV infection and hemoglobinopathies)[12,13]. Since many of these causes of anemia occur concurrently in pregnancy, it is difficult to evaluate the contribution made to anemia in pregnancy by placental malaria[12,13,14 and 15]. maternal anemia is reported that to contribute to population at risk (PAR) ranging from 7% to 18% and less than 48% for intra Uterine Growth Retardation-low birth weight[16].

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