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A study of anemia in women with asymptomatic malaria parasitaemia at their first antenatal care visit at the General Hospital, Ikot Ekpene, Akwa Ibom State, Nigeria

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ABSTRACT

Objective: To assess the prevalence of anemia and asymptomatic malaria parasitemia and the effect of prior antimalarials therapy on the parasite density in pregnant women at their first antenatal visit at the secondary level health care facility in Nigeria. **Methods:** This cross sectional observational study was carried out in the antenatal clinic of General Hospital, Ikot Ekpene, Akwa Ibom State, Nigeria for 3 months period (1st June to 31st August, 2009). Five hundred and fourteen women attending their first antenatal registration visits in the hospital were recruited in the study. Socio-demographic information was obtained using pre-tested questionnaires. The malaria parasite was obtained by examining thick and thin blood films prepared on 2 glass slides while the hematocrit was obtained through 2 capillary tubes read by a Hawksleys microhematocrit reader. **Results:** A total of 514 pregnant women participated in the study with a mean maternal age of 21.4 years and a mean gestational age at booking of 18.3 weeks. The primigravid women booked at significantly lower gestational age than multigravidae (16.2 weeks vs 21.6 weeks). Most of the women (59.3%) were anemic, out of which 60.4% were primigravida. More than half of the women had moderate to high parasite density and only 6.8% had no malaria parasitemia. All patients with severe anemia were parasitemic. Out of the 479 (93.2%) women with parasitemia, a third had taken antimalarial drugs. A majority (60.3%) of those without prior antimalarial drugs had moderate to high density parasitemia. **Conclusions:** This study shows high prevalence of anemia in women with asymptomatic malarial parasitemia, particularly the primigravida. The severity of anemia is directly related to the density of malaria parasitemia. Those with effective antimalarial therapy appear to have low density parasitemia and therefore mild anemia. Routine screening for anemia and malaria parasites at booking, prompt parasite clearance and correction of anemia would reduce the associated maternal and perinatal complications.

1. Introduction

The adverse effects of anemia in pregnancy on both mother and the growing fetus are well documented. Hemoglobin being a driving force for oxygen and nutrients for both mother and fetus, a reduction below acceptable levels can be detrimental to both. With World Health Organization (WHO) definition of anemia in pregnancy of hemoglobin concentration below 11.0 g/dL or packed cell volume (PCV) less than 33.0%, anemia is the commonest

medical condition encounter in pregnancy^[1,2], while in most developing countries the burden of this problem is often under estimated^[2,3]. About half of all pregnant women worldwide are anemic with over two third of them residing in the developing countries^[4–6]. The commonest identified causes of anemia include excessively rapid destruction of red blood cells, bleeding during pregnancy, inadequate hematopoiesis and infections such as HIV^[3,4,7].

Though micro- and macro- nutritional (iron, folate and vitamins) deficiencies are usually implicated in Sub-Saharan African countries^[6–8], the importance of acute severe symptomatic malarial infestations on anemia are also well recognized^[9–11], but the impact of asymptomatic parasitemia on this disease is often not fully appreciated nor emphasized^[11]. Though the main mechanism why

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malaria causes anemia is not very clear, increase hemolysis of parasitized and non-parasitized red blood cells are suggested^[10]. Severe placental infestations are presented even in asymptomatic patients with low parasitemia while serious maternal and perinatal consequences^[10–14].

Immunological and other unknown mechanisms are also involved^[13]. Though general adults living in endemic areas acquire protective immunity against developing severe malaria, many pregnant women still remain asymptomatic, even with severe parasitemia. Despite, absence of maternal malarial symptoms, high placental parasitemia is still present with associated perinatal complications^[12,13,15].

Therefore, in areas with stable malaria like Akwa Ibom State of Nigeria, majority of infestations with *Plasmodium falciparum* in pregnancy may remain asymptomatic, undetected and untreated^[9,15]. Effective treatment of asymptomatic malaria in pregnant has been shown to reduce maternal and perinatal complications associated with the disease^[14,15]. Consequently, because of the impact of this disease on the health and productive capacity of the patients in our society, most people including pregnant women often take antimalarial medications (both orthodox and traditional preparations) without prescriptions by qualified personnel^[16,17]. These medications do not seem to show much positive impacts in reducing parasite density and improving anemia. The reported high prevalence of malaria disease in the Niger Delta region of Nigeria like Akwa Ibom State coupled with the lack of sufficient data on impact of asymptomatic malarial parasitemia in pregnancy prompted this study to document baseline data and information on malaria in pregnancy in the area.

This study was therefore conducted in the General Hospital, Ikot Ekpene, Akwa Ibom State of Nigeria with aims of determining the baseline prevalence of anemia in asymptomatic malaria parasitemia in pregnant women and to assess the impact of wide spread intake of antimalarial medications on the density of parasitemia. It is hoped that the result of this study will assist the government and other stakeholders to assess the effect of current malarial preventive strategies and other initiatives on the burden of the disease on pregnant women in the rural areas in Nigeria.

2. Materials and methods

2.1. Subjects and setting

This prospective study was conducted in the antenatal clinic of General Hospital, Ikot Ekpene, Akwa Ibom State of Nigeria over a three month period (1st June to 1st August, 2009). The hospital is a secondary level referral health care facility in the state which is located in the Niger Delta region of Nigeria. The hospital has an estimated 500 antenatal women per month and an annual delivery of 1 200 maternities.

After an ethical permission was obtained from the relevant authority in the hospital, and unwritten informed consent

from the women who participated in the study a pre-tested semi structured questionnaire was administered to each of them by the authors to obtain demographic and reproductive information. The information obtained included age, social status, parity, menstrual history and malaria treatment prior to the visit.

2.2. Collection of samples

The procedures were adequately explained to the pregnant women. After an aseptic preparation, a sterile lancet was used to pierce ball of the palmar surface of the left thumb.

Two capillary tubes, properly labeled for each woman, were filled with blood and one end sealed with a plasticin gum for determination of packed cell volume. The average of the two values was used for calculation to ensure accuracy. Several samples were assembled in the centrifuge (hematocrit machine) and spurned at 5 000 revolutions per minute for 5 minutes. When the machine had rotated to a halt, the cover was opened and the PCV read from Hawksleys microhaematocrit reader. All the samples were read by one of the authors to remove inter-observer errors. Anemia was considered as a packed cell volume below 33% based on the World Health Organization recommendation^[9,17]. The PCV was chosen for this study as against hemoglobin concentration because the former is routinely use to screen for anemia in most antenatal women in Nigeria and can easily be correlated in the clinical settings.

2.3. Malaria parasite

Two glass slides were then labeled for each woman. Thin and thick blood films were prepared and stained with Giemsa stain. These slides were read under oil immersion with a 100× objective magnification. For negative slides up to 300 fields were examined before conclusion was drawn. Parasite enumeration was done using the WHO approved method^[9,17]. Parasite density was determined using Garcia parasitemia determination protocol. Thin film: Counting the number of infected cell per 1 000 red blood cells. Thick film: counting the number infected cell per 1 000 white blood cell count. Both thick and thin film were then calculated and converted to infection in microliter (μ L) of blood. Quantification of parasite density (per microliter) used in this study is as follows: Low <10 000; Medium 10 000–100 000; and high >100 000. To remove observer errors all the samples were process by the same laboratory staff and supervised by one of the authors.

2.4. Statistical analysis

The minimum sample size of 464 women for the study was calculated from an earlier pilot study by the authors based on a prevalence of malaria parasitemia of 54.0% in 40 pregnant women at first antenatal visit. The findings of this study were subjected to statistical analysis using EP1 – Info 2002 statistical software of the Centre for Disease Control

and Prevention, Atlanta, USA. A P -value of <0.05 was considered significant.

2.5. Exclusion criterion

The following women were excluded from the study: those with symptomatic malaria infections or on treatments for other acute medical conditions; immunodeficiency virus sero-positive women on or without drugs; patients treated for anemia after diagnoses has been established or sickle cell disease in pregnancy; those who refuse to give consent. Patients assured of receiving standard care the pregnancy despites their refusal to participate in the study.

3. Results

A total of 514 pregnant women participated in the study with a mean maternal age of 21.4 years and a gestational age at booking of 18.3 weeks. The primigravid women booked at significantly lower gestational age than multigravidae (16.2 weeks vs 21.6 weeks). Most of the women (306, 59.3%) were anemic, out of which 60.4% were primigravida, 60.4% (165) were primigravida, and 58.5% (141) were multigravida.

Table 1 represents severity of anemia and density of malaria parasite in pregnant women. A total of 246 (47.9%) of the women had medium to high density parasitemia and only 35(6.8%) had no parasitemia. All the 13(2.5%) women with severe anemia had medium to high parasite density. In 208(40.5%) of those without anemia 175(84.1%) had malarial parasite in their blood film but with only 1% high density parasitemia.

Out of the 479 (93.2%) women with malaria parasitemia, significantly high number among them (88.7%) had taken one form of antimalarial drugs or the other. Among those without antimalarial drugs 60.3% had higher density parasitemia ($P<0.001$, $\chi^2=24.8$).

Table 1

Severity of anemia and density of malaria parasite in pregnant women.

PCV %	Density of malaria parasite (%)				Total
	None	Low	Medium	High	
≤ 32	2 (0.7)	127 (41.5)	161(78.2)	16 (52.6)	306(59.5)
≥ 33	33 (15.9)	106 (50.9)	67 (32.2)	2 (1.0)	208(40.5)
Total	35 (6.8)	233 (45.3)	226(43.9)	20 (4.0)	514 (100)

4. Discussion

The incidence of anemia in this study is higher than reports from Ibadan in Nigeria and Greytown in South Africa [6] but lower than the findings of 71% from Lagos[12] and 67.4% in Enugu[7], both in the southern part of Nigeria. The prevalence of anemia in pregnancy varies greatly from place to place due to a number of factors such as background nutritional status of the society, high parity, infections (such as bacteria, helminthes, HIV) and effective utilization of

other reproductive health facilities by the women[2,3,5,7,15]. The factors that influence the prevalence of anemia in this study is not very clear and may not be a true reflection of prevalence in our society. The prevalence in this study appear to be high because most of our women registered in the second trimester when malaria tend to cause anemia (mostly between 16 – 29th weeks of pregnancy) which may develop suddenly in severe parasitemia and persist into third trimester[2,5-7,15]. On the contrary, the prevalence in this study may be reduced by the fact that many pregnant women in Nigeria do not attend antenatal clinics and tend to deliver outside orthodox health facilities thereby reducing the number with this medical problem in our clinic. Also, many patients with possible anemia were excluded from this study by certain conditions. These findings however, demonstrate the burden of anemia in the pregnant population and the impact on maternal and perinatal consequences seen in Nigeria[12,15]. Nevertheless, the high prevalence of malaria parasitemia in this study shows its contribution to anemia during pregnancy[7,8]. Both malaria and anemia in pregnancy therefore pose serious public health challenge in Akwa Ibom State of Nigeria. This study like others[10-12,15] from high malarial areas shows high level of asymptomatic malaria parasitemia even among those without anemia and the density correlated directly with severity of the anemia. It therefore, suggests that malaria should not only be considered as important etiology factor for anemia but in its severity. Thus, treatment with effective antimalarial chemotherapy and subsequent parasite clearance would result in improvement in the level of anemia before the third trimester or labor. This will particularly, be of immense benefits to the primigravidas in our state who do not only have higher prevalence of anemia and parasitemia but register at earlier gestational age for antenatal care than multigravidas counterpart. The high prevalence of this symptomatic parasitemia in this study suggest that the current preventive measures by government do not really reach the target vulnerable populations. Thus, more effort is required to enlighten the public.

It is of great concern that even though significantly large number of pregnant women in this study had taken one form of antimalarial therapy or the other during the index pregnancy majority of them were still having malaria parasitemia. It appears that some of these drugs were not prescribed by the medical personnel and may not contain effective antimarial agents. Also, with widespread antimalarial resistant strains against the common plasmodium specie (*Plasmodium falciparum*) in our environment some of the agents may not be potent enough to clear these parasites. This is particularly so since most of these patients had low density parasitemia. Others have also documented that use of over the counter antimicrobial agents including herbal preparations without prescriptions among our people is common[16]. Most of these patients who indulge in self medications cited high cost and non availability of the government approved agents as reasons. These findings therefore, suggest that to improve compliance

most the potent safe antimalarial agents can be provided free of charge or highly subsidized and made available in most common dispensing outlet across the state.

In conclusion, the prevalence of anemia and malaria parasitemia among pregnant women at booking for antenatal care is high in Akwa Ibom State of Nigeria. The commonly use antimalaria therapy significantly reduce the number patient high density parasitema. It is therefore necessary to intensify effort at making the current preventive strategy by all involve to reach the vulnerable target populations. In particular, more effective antimalarial therapy should given free to all pregnant women to reduce the parasitemia and consequently anemia.

Conflict of interest statement

We declare that we have no conflict of interest.

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