

BURDEN OF MALARIA PARASITAEMIA AND ANAEMIA AMONG PREGNANT WOMEN AT FIRST ANTENATAL VISIT AT THE UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL, MAIDUGURI, NIGERIA.

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ABSTRACT

Background: Malaria and anaemia in pregnancy constitute a risk to both the mother and her unborn child but there is paucity of data regarding the magnitude of the problem in our region.

Objective: This study was conducted with the main objective of determining the prevalence of asymptomatic malaria parasitaemia and anaemia among our pregnant women at first antenatal booking.

Methods: Four hundred pregnant women who attended antenatal care (ANC) at the UMTH, Maiduguri were studied. Packed cell volume estimation and peripheral blood smear for malaria parasites were done.

Results: The prevalence of malaria parasitaemia and anaemia at booking were 60.3% (241/400) and 62.3% (249/400) respectively. The mean parasite density was 701.04 ± 382.22 parasite/ μ l and the anaemia was malaria parasite density dependant ($p=0.000$). Young maternal age, low parity and late booking were risk factors for malaria parasitaemia.

Conclusion: There was a high prevalence of malaria parasitaemia with a high parasite density among pregnant women at booking. The prevalence of anaemia was also high and it was associated with malaria parasite density. There is need to educate the populace about malaria preventive measures to reduce the exposure of the pregnant woman to the malaria infection. The use of intermittent preventive treatment, insecticide treated nets and routine haematinics in pregnancy should be intensified.

Key words: Malaria parasitaemia, Anaemia, Ante-natal, UMTH

INTRODUCTION

Malaria is a global public health problem with at least 40% of the world population at risk.¹ In Africa, 30 million women living in malaria endemic areas become pregnant each year^{2,3} and they constitute the main adult risk group for malaria infection. For these women malaria is a threat to them and their unborn child. Malaria is said to be responsible for up to 200,000 newborn deaths per year². In Sub-Saharan Africa, malaria in pregnancy causes 400,000 cases of severe anaemia with an estimated 10,000 maternal deaths annually.⁴ In Nigeria, malaria is responsible for about 11% of maternal mortality.⁵

Women living in endemic areas have high immunity to malaria, the infection is frequently asymptomatic, and severe disease is uncommon. During pregnancy, this immunity to malaria is altered but infection is still frequently asymptomatic⁶ and many cases go undetected. However even the asymptomatic malaria parasitaemia may be associated with placental and congenital malaria.^{7,8} This often leads to low birth weight, an important contributor to early infant death.⁹

Malaria is thought to cause anaemia through a number

of different mechanisms including haemolysis of parasitized red cells, immune and non-immune haemolysis of non infected red cells, increased splenic clearance, dyserythropoiesis, and reduced red cell survival.¹⁰ Even though many other factors, including both nutritional and non-nutritional ones (eg helminthiasis, bacteria infections etc) can cause anaemia in malaria endemic areas,^{11,12,13} several other studies have reported malaria as the primary reason for anaemia among pregnant women.^{14,15}

Maiduguri is a Malaria hyper-endemic area and is characterized by stable transmission all year round with peaks during the rainy season.¹⁶ The city is located in the north-east geo-political zone of Nigeria with about 138,625 women¹⁷ of reproductive age. These women are at risk of malaria infection in pregnancy but the prevalence is unknown. The level of malaria parasitaemia at booking may be a reliable index for subsequent development of active malaria in pregnancy. Detection of the prevalence of malaria parasitaemia and anaemia at booking may further justify the routine use of malaria prophylaxis and haematinics in pregnancy. This study sets out to find the prevalence of malaria parasitaemia and anaemia in women

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attending ANC in the University of Maiduguri Teaching Hospital, to quantify the magnitude of the problem and, advice health workers, policy makers and, the public on the need for malaria prevention during pregnancy.

MATERIALS AND METHODS

This was a hospital based cross-sectional study to determine the prevalence of malaria parasitaemia among pregnant women who booked for antenatal care at the UMTH Maiduguri from 3rd July 2007 to 25th September 2007.

The subjects of the study were recruited from the population of pregnant women at booking using stratified random sampling along their sitting position at the booking clinic. Relatively healthy women were recruited and women who had antimalarial treatment prior to booking and, women with other diseases such as HIV infection, sepsis, pregnancy induced hypertension, diabetes mellitus, sickle cell disease were excluded. The sample size was obtained using Tailors¹⁸ formula to be 384 and this was rounded to the nearest 100 to increase the sensitivity of the study. Therefore, 400 patients that satisfied the inclusion criteria were recruited.

Patients so recruited were counselled and informed consents obtained. Their finger prick blood samples were obtained for both packed cell volume and thick blood film. The first drop of blood was discarded and a capillary tube was used to take the sample for the packed cell volume. This was put in a centrifuge machine and allowed for five minutes at a revolution of 3000/minute after which the packed cell volume was read using the microhematocrit reader. Another drop or two of blood was placed on a clean 76mm x 25mm microscope glass slide and dispensed to fill a large circle at the middle of the slide making thick blood film. The films were air dried and stained with 1 in 10 dilution of Giemsa stain. The slides were then washed and viewed at $\times 100$ oil immersion lens of light microscope by a laboratory scientist. Malaria parasite was looked for and, where present, the estimation of parasite density was done by multiplying the average number of parasites per high power field (HPF) by a factor of 500 as proposed by Greenwood and Armstrong.¹⁹ Thirty fields were examined

to determine the average number of trophozoites per high power field. This was recorded in a proforma designed for the study. Other information on age, parity, gestational age at booking and use of insecticide treated net were also recorded.

The data obtained was analyzed using SPSS version 13 (SPSS, Chicago, IL, USA). Where appropriate, risk was estimated using odd ratio and Chi-square used to test for significance at 95% confidence interval. Tables and graphs were used to illustrate pattern in the variables.

RESULTS

During the study period, 400 women who consented for the study were recruited. The mean age and parity of the patients were 27.2 ± 5.5 years and 2.3 ± 2.1 respectively. Only 2.3% (9/400) of the women were sleeping under insecticide treated net.

The prevalence of malaria parasitaemia at booking was 60.3% (241/400) with a mean parasite density of 701.04 ± 382.22 parasites/ μ l. The peak age specific prevalence of malaria parasitaemia at booking of 82.1% (92/112) occurred in the age group 20-24 years followed by 75% (15/20) among the teenagers while those in the age range 40-44 years had the lowest prevalence of 25% (2/8) as shown in table 1. Also shown in table I was the high prevalence of malaria parasitaemia among primigravida and secondigravida of 77% (97/126) and 72.4% (42/58) respectively. The grandmultiparous women had the lowest prevalence of 26.7% (16/60). These differences were all statistically significant.

The prevalence of anaemia (PCV < 33%) at booking was 62.3% (241/400). The odds ratio of having anaemia in those with malaria parasitaemia was 2.22 (CI=1.46-3.37). The prevalence of anaemia was highest, 81.8% (9/11) among women with malaria parasite density of 1501-2000 parasite/ μ l and lowest at 64.3% (81/126) among those with parasite density of ≤ 500 parasite/ μ l ($\chi^2=18.32$, $p=0.001$) at booking as shown in Table 2. Similarly, a steady decline in mean packed cell volume with increasing malaria parasite density was also noticed as shown in figure 1 ($f=13.74$, $df=4$, $p=0.000$).

TABLE 1 : Relationship of Age, Parity and Trimester of Booking to Malaria Parasitaemia

Age in years	MP Positive	MP Negative	Total
15-19	15(75%)	5(25.0%)	20(100%)
20-24	92(82.1%)	20(17.9%)	112(100%)
25-29	68(57.1%)	51(42.9%)	119(100%)
30-34	46(48.9%)	48(51.1%)	94(100%)
35-39	18(38.3%)	29(61.7%)	47(100%)
40-44	2(25%)	6(75.0%)	8(100%)
Total	241(60.3%)	159(39.7%)	400(100%)
	$\chi^2=43.34$	$p=0.000$	

Parity	MP Positive	MP Negative	Total
0	97(76.9%)	29(23.1%)	126(100%)
1	42(72.4%)	16(27.6%)	58(100%)
2	34(64.1%)	19(35.9%)	53(100%)
3	33(56.9%)	25(43.1%)	58(100%)
4	19(42.2%)	26(57.8%)	45(100%)
≥ 5	16(26.7%)	44(73.3%)	60(100%)
Total	241(60.3%)	159(39.7%)	400(100%)
	$\chi^2=53.29$	$p=0.000$	

GA at booking	MP Positive	MP Negative	Total
First	10(35.7%)	18(64.3%)	28(100%)
Second	220(63.0%)	129(37.0%)	349(100%)
Third	11(47.8%)	12(52.2%)	23(100%)
Total	241(60.3%)	159(39.7%)	400(100%)
	$\chi^2=9.65$	$p=0.008$	

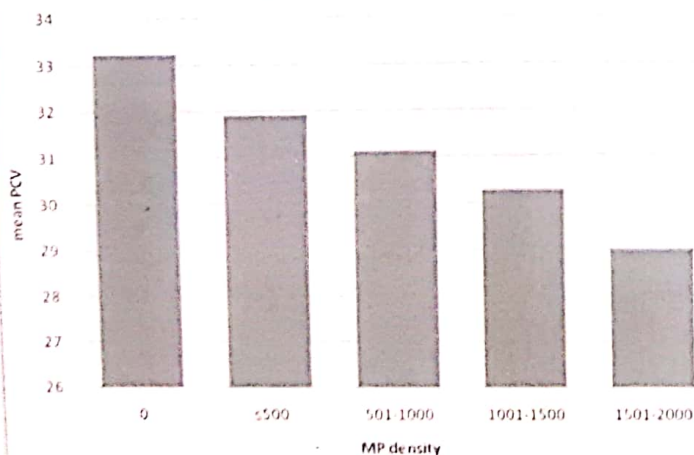
MP = malaria parasite. GA = gestational age (in trimesters)

TABLE 2 : Relationship of Malaria Parasite Density to Anaemia.

MP density	Anaemic	Normal	Total
0	81(50.9%)	78(49.1%)	159(100%)
<500	81(64.3%)	45(35.7%)	126(100%)
501-1000	57(73.1%)	21(26.9%)	78(100%)
1001-1500	21(80.8%)	5(19.2%)	26(100%)
1501-2000	9(81.8%)	2(18.2%)	11(100%)
Total	249(62.3%)	151(37.7%)	400(100%)
	$\chi^2=18.32$	$p=0.001$	

MP = malaria parasite

figure 1: Relationship of malaria parasitaemia to packed cell volume



DISCUSSION

In this study, a high prevalence of malaria parasitaemia of 60.3% at booking was found. This is higher than the 31% reported by Agbogboroma in Abuja²⁰ but corresponds with the finding of Okwo in Lagos who found a prevalence of 60%.²¹ The difference in prevalence with the Abuja study may be because of difference in sample size (400 vs. 1156), more over the patients booked during the peak of rainy season in the months of July, August, and September when malaria transmission is highest. It may also be because of low use of ITN, as only 2.3% of the women were sleeping under it. The cost and non availability of the ITN makes it inaccessible to the common woman.

The highest age specific prevalence was 82.1% seen among those in the age group 20-24 years and this was slightly higher than 75% seen among the teenagers. The lower prevalence in the teenagers may be because they constituted only 5% of the studied population. This finding disagrees with the finding of Bouvou-Akotet et al in Gabon who found parasitaemia to be highest among the teenagers.²² In this study we found a high prevalence of malaria parasitaemia among women of low parity as primigravidas and secondigravidas had a prevalence of 76.9% and 72.4% respectively at booking compared to 26.2% amongst the grandmultiparous ($\chi^2=53.29$, $p=0.000$). This is in keeping with the findings of earlier workers in Nigeria and Ghana respectively.^{23,24} Plasma antibodies from malaria-exposed pregnant women recognize variant surface antigens on infected erythrocytes in a parity-dependent manner and block parasite adhesion to chondroitin sulfate A. These antibodies are protective from malaria in pregnancy and they develop over successive pregnancies.²⁵

Various workers have linked malaria parasitaemia to anaemia in pregnancy^{26,27,28} and similar assertion can also be made in this study. The anaemia is also found to be directly related to the malaria parasite density, with obvious increase in severity of anaemia with increasing malaria parasite density noted. Similar findings has also been reported by earlier workers.^{27,29} The anaemia in malaria is due to destruction of parasitized red cells, increase in reticulo-endothelial activity through autoimmune mechanism and defective red cell production due to depressing erythropoiesis.^{21,30} The prevalence of anaemia at booking of 62.3% falls within the range of 35.5 to 75.6% reported in southwestern Nigeria and Kwazulu-Natal in South African^{31,32,33,34}, but is lower than the 23.2%³⁵ and 35.5%³⁶ reported in Port-Harcourt and Enugu located in the south-south

and south-eastern part of Nigeria respectively. These differences may be because other causes of anaemia have not been excluded in this study.

CONCLUSION

Malaria parasitaemia in pregnancy is associated with development of anaemia. Young maternal age, low parity and late booking are risk factors for malaria parasitaemia.

The high prevalence of malaria parasitaemia of 60.3% at booking calls for a renewed effort at educating women to

imbibe malaria preventive life style, which entails environmental sanitation, use of insecticides, and sleeping under insecticide impregnated mosquito nets. There is the need for mass public enlightenment on the strategies on malaria prevention and early booking during pregnancy to allow early institution of malaria prophylaxis. Policy makers and health workers should also be made aware of the high prevalence of malaria parasitaemia to foster malaria prevention. There is also the need to investigate for other causes of anaemia in our environment.

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