

MALARIA PARASITAEMIA AND ANAEMIA AMONG FIRST ANTENATAL CLINIC ATTENDEES IN ILORIN, NIGERIA

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ABSTRACT

The burden of malaria and anaemia in pregnancy is unknown in Ilorin, Nigeria despite malaria being threat to 2.4 billion lives world-wide including Nigerians particularly the children and pregnant women. To determine the prevalence of malaria parasitaemia and anaemia in pregnancy among first antenatal clinic attendees at the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria. 500 consecutive, consenting pregnant women presenting for antenatal care at UITH, Ilorin for the first time were screened for malaria parasitaemia and anaemia over a 1 year period starting from June, 2008. Information about participants' socio-demographic data, fever, anti-malaria therapy including prophylaxis using intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp/SP) among others were also obtained at recruitment. The prevalence of malaria parasitaemia and anaemia in the women were 32.4% and 25.8% respectively. The women's age, parity and educational level did not affect either malaria parasitaemia (MP) or mean parasite density (MPD) but gestational age (GA) significantly ($F = 6.02$, $p = 0.002$) affected MPD as women in the first trimester (35.7%) were most infected. The mean haemoglobin concentration (MHC) was significantly associated with maternal age ($f=3.33$, $p=0.005$) and parity ($f= 23.97$, $p=0.000$), and varied inversely as the MPD. Maternal fever was not a good predictor of MP as only 7 (46.7%) of 162 (32.4%) malaria parasitaemic women were febrile. There was no significant difference ($f= 1.4$, $p=0.23$) in the mean malaria parasite densities of anaemic compared with non-anaemic women but there was significant difference in the prevalence of MP ($X^2 = 1.135$, $p=0.0007549$) and anaemia ($X^2=8.634$, $p=0.0000$) among users and non-users of IPTp/SP. Malaria parasitaemia and anaemia remains a threat in pregnancy in Ilorin, Nigeria with the affected often afebrile. Since users of IPTp/SP in pregnancy were better protected against malaria parasitaemia and anaemia in pregnancy, early antenatal booking and use of IPTp/SP is desired.

Key words: malaria parasitaemia, anaemia, pregnancy, nigeria.

INTRODUCTION

Malaria is a parasitic disease to which 2.4 billion people in 100 countries representing 40% of the world population is at risk every day ¹. It is the world most important tropical disease responsible yearly for about 300-500 million infections and 1 million deaths ²⁻⁴. Malaria is a major public health problem in Nigeria being responsible for 60.0% of outpatient hospital visits, 30.0% of childhood mortality and 11.0% of maternal mortality ⁵. Malaria infection in pregnancy poses substantial risk to the mother, her foetus and the neonate ⁶. This is because malaria due to *Plasmodium falciparum* in holoendemic regions like Nigeria is often asymptomatic, making affected persons presenting most times first with complications. Asymptomatic malaria in pregnancy, believed to be related to the acquired immunity, is commoner among primigravidae and secundigravidae, and associated with complications like maternal anaemia and placental malaria ⁷⁻⁸. Anaemia in pregnancy could be multi-factorial and maternal malaria may be an exacerbating or predisposing factor ⁹. Immune destruction of parasitized erythrocytes, excessive removal of non-parasitized erythrocytes and impaired erythropoiesis due to bone marrow dysfunction and pancytopenia of malaria associated hypersplenism are among the mechanisms of malaria induced anaemia ¹⁰⁻¹². In endemic countries of Africa, 50.0% of pregnant women develop anaemia in pregnancy and malaria accounts for 3.0-5.0% of the anaemia with 25.0% of these being severe anaemia ¹³. Placental malaria, a condition of sequestration of infected erythrocytes in the placental vascular space, is another important contributor to maternal anaemia ⁸ which in addition adversely affects the foetus and the neonate. Placental malaria due to the associated impaired placental circulation often results in low birth weight (LBW) and intrauterine growth retardation (IUGR). Malaria contributes up to 15.0% of maternal anaemia, 14.0% of LBW, 30.0% of preventable LBW, 70.0%

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of intrauterine growth retardation, 36.0% of premature delivery and 8.0% of infant mortality⁸. To control malaria in pregnancy and its attendant adverse effects, the World Health Organization (WHO) recommended intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp/SP) starting at 20 weeks of gestation or after quickening¹⁴ in addition to insecticide treated net (ITN) use as prescribed under the roll back malaria initiative. IPTp/SP has been accepted in principle in Nigeria and since implemented in our hospital: the University of Ilorin Teaching Hospital, Ilorin, Nigeria. However, the burden of malaria in pregnancy and the necessity for IPTp/SP in pregnancy is unknown in our hospital bearing in mind the geographic variation in the intensity of this infection. Similarly, the prevalence of malaria related anaemia in pregnancy in our hospital remains undocumented despite its adverse effect on the mother and the unborn child. This study therefore was designed to determine the prevalence of malaria parasitaemia and anaemia among pregnant women attending ante-natal clinic at the University of Ilorin Teaching Hospital, Ilorin, Nigeria and identify any factor/s associated.

METHODOLOGY

This study which is a descriptive, cross-sectional was conducted at the University of Ilorin Teaching Hospital, Ilorin, Nigeria over a one year period starting from June, 2008. The hospital attends to people in the Ilorin metropolis, surrounding communities and receives referral from health facilities in the middle belt and south-western Nigeria. Ilorin is in the middle belt region of Nigeria and about 400km north of Lagos. It has a guinea Savannah type of vegetation and lies at 8° 30' N and 4° 30' E. There are two seasons in the year comprising of the raining season occurring between April and November and dry season spanning between December to March. Malaria transmission is stable throughout the year. All consecutive pregnant women who presented for antenatal care at the antenatal clinic of the hospital for the first time and consented to the study were recruited during the study period until a total of 500 participants were attained. The socio-demographic data, history of fever, anti-malaria therapy including prophylaxis using intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp/SP) among other relevant information of each participant were obtained at recruitment. Pregnant women who were on anti-malaria drugs but not prophylaxis (IPTp/SP) within the last 14 days and on follow-up antenatal clinic visits were excluded from the study. Five millilitres (5ml) of blood specimen were aseptically collected from each participant into ethylene di-amine tetra acetic acid (EDTA) bottle which were transported into the laboratory section of the hospital for examination. Haemoglobin concentration of the blood specimens was determined using Sysmex KX 21 automated haematology analyzer according to the manufacturer's instructions and the degree of anaemia graded as mild (10.0-11.0g/dL), moderate (7.0-9.9g/dL) and severe (<7g/dL). Thick and thin smears of all the blood specimens were made on clean grease free slides in duplicates. The thick films were dried at 37°C inside incubator for 1 hour. Thin films were left to air dry on bench and fixed with alcohol. All smears were then stained in 3% solution of giemsa at pH 7.2 for 30 minutes. The slides were washed gently after staining with tap water before being allowed to dry in upright position. The stained thick films (STF) were the first to be examined under oil immersion lens (X100) scanning up to 200 fields to determine the presence of malaria parasites. Smears were declared negative when no parasite is seen in 200 high power fields (HPF). For all positive STF, parasite density was determined by counting the numbers of parasites within the oil immersion fields until 200 leucocytes have been seen. The parasite counted was then multiplied by 40 to give parasites/ μ l of blood assuming 8000 leucocytes/ μ l of blood. Parasite density was graded as low (+ = 1-999 parasite / μ l), moderate (++ = 1000-9999 parasite / μ l), high (+++ = 10, 000 - 99, 999 parasite / μ l) and very high (++++ $\geq$ 100, 000 parasite / μ l). Stained thin films of the corresponding positive STFs were examined similarly under x100 objective for parasite speciation. Data was imputed into Microsoft Office Excel and EPI-Info version 15 statistical software packages for analysis and results presented in tables. Comparisons of categorical data were by Chi-Square (X^2) analysis or Fisher exact tests.

RESULTS

A total of 500 pregnant women whose age ranged between 14 and 44 years (mean=28.6, SD=4.95) participated in the study. Most, 295 (59.0%) were primiparous and majority, 293 (58.6%) were in the second trimester at recruitment with mean gestational age of 22.7 weeks (SD=7.44). Most of the women, 336 (67.2%) had tertiary education and 485 (97.0%) were married, as presented in Table 1. The overall prevalence of malaria and anaemia in the women were 32.4% and 25.8% respectively. There was no significant difference ($f=1.4$, $p=0.23$) in the mean malaria parasite densities of anaemic compared with non-anaemic women. Mild anaemia was the most common type found in 100 (20.0%) of the women (Table 2). With reference to parity, 25.0%, 31.5% and 34.0% of nuliparous, primiparous and multiparous women respectively were malaria parasitaemic (Table 3) with all belonging to either moderate 76 (15.3%) or high 86 (17.2%) grade of malaria density. Only 18 (4.0%) of the 444 qualified women (in 2nd and 3rd trimesters) were on malaria prophylaxis (IPTp/SP) out of which 7 (38.9%) had malaria parasitaemia and 2 (11.1%) were anaemic. However, of the 426 (95.9%) qualified women not on IPTp/SP, 135 (31.7%) had malaria parasitaemia and 117 (27.5%) were anaemic (Tables 3 and 4). There was significant difference ($X^2=1.135$, $p=0.0007549$) in the prevalence of malaria parasitaemia among users of IPTp/SP (38.7%) and non-users

(31.7%). Similarly, a significant difference ($X^2=8.634$, $p=0.0000$) was noted when anaemia prevalence among users of IPTp/SP (11.1%) and non-users (27.5%) was compared. *Plasmodium falciparum* was the only type of malaria parasite seen in the parasitaemic women. The women's age, parity and educational level did not affect either malaria parasitaemia or mean parasite density and maternal fever was not a good predictor of malaria as only 7 (46.7%) of 162 (32.4%) malaria parasitaemic women were febrile. However, gestational age was found to be significantly ($F = 6.02$, $p = 0.002$) related to malaria parasite density with the infection commoner in the first trimester (35.7%). The mean haemoglobin concentration unlike the mean parasite density is related to maternal age ($f=3.33$, $p=0.005$) and parity ($f= 23.97$, $p=0.000$). Furthermore, the mean haemoglobin concentration varied inversely as the mean malaria parasite density but the two wasn't statistically associated ($f=2.13$, $p=0.13$) as presented in Table 5.

Table 1: Socio-demographic characteristics of the participants

VARIABLES	n (%)	RANGE	MEAN $\pm$ SD
Age (years)			
≤ 19	19 (3.8)	14 – 44	28.6 $\pm$ 4.95
20-24	65 (13.0)		
25-29	225 (45.0)		
30-34	128 (25.6)		
35-39	50 (10.0)		
≥40	13 (2.6)		
Parity			
Nulliparous	8 (1.6)		
Primiparous	295 (59.0)		
Multiparous	197 (39.4)		
Gestational age (weeks)			
1 st Trimester	56 (11.2)	4-42	22.7 $\pm$ 7.44
2 nd Trimester	293 (58.6)		
3 rd Trimester	151 (30.2)		
Educational Level			
No formal education	12 (2.4)		
Primary	39 (7.8)		
Secondary	113 (22.6)		
Tertiary	336 (67.2)		
Marital Status			
Single	15 (3.0)		
Married	485 (97.0)		

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Table 2: Comparing socio-demographic characteristics, fever and IPTp use with malaria parasitaemia and parasite density

Parameter	No of Participants	Malaria Parasitaemia		X ² and p-value	Parasite density grade			
		Positive (%)	Negative (%)		Low	Moderate	High	Very high
Age (years)								
≤ 19	19	5	14 (73.7)	X ² =8.04 p=0.15	0 (0)	2 (2.6)	3 (3.5)	0 (0)
20-24	65	(26.3)	40 (61.5)		0 (0)	11 (14.5)	14	0 (0)
25-29	225	25	161 (71.6)		0 (0)	32 (42.1)	(16.3)	0 (0)
30-34	128	(38.5)	84 (65.6)		0 (0)	21 (27.6)	32	0 (0)
35-39	50	64	28 (56.0)		0 (0)	10 (13.2)	(37.2)	0 (0)
≥40	13	(28.4)	11 (84.6)		0 (0)	0 (0.0)	23	0 (0)
		44					(26.7)	
Gestational age (weeks)								
1 st	56	22	36 (64.3)	X ² = 0.39 p= 0.82	0 (0)	13 (17.1)	(14.0)	0 (0)
2 nd	293	(44.0)	198 (67.6)		0 (0)	47 (61.8)	2	0 (0)
3 rd	151	2	104 (68.9)		0 (0)	16 (21.1)	(2.3)	0 (0)
		(15.4)						
Parity								
Nulliparous	12		5 (41.7)	X ² =0.54 p=0.76	0 (0)	1 (1.3)	7	0 (0)
Primiparous	39	2 (25.0)	27 (69.2)		0 (0)	43 (56.6)	(8.1)	0 (0)
Multiparous	113	93 (31.5)	72 (63.7)		0 (0)	32 (42.1)	48	0 (0)
	336	67 (34.0)	234 (69.6)		0 (0)		(55.8)	
							31	
							(36)	0 (0)
								0 (0)
								0 (0)
							1	0 (0)
							(1.2)	
							50	
							(58.1)	0 (0)
							35	0 (0)
							(40.7)	
Educational Level								
No formal education	15	7	8 (53.3)	X ² =1.44 p=0.49	0 (0)	4 (5.3)		
Primary	485	(58.3)	330 (68.0)		0 (0)	72 (94.7)		
Secondary		12						
Tertiary		(30.8)						
		41	11	X ² =0.36 p=0.55	0 (0)	2 (2.6)	7	0 (0)
	18	(36.3)	(61.1)		0 (0)	74 (97.4)	(8.1)	0 (0)
	482	102	327 (67.8)				3	
		(30.4)					(3.5)	
Fever							25	
Febrile		7					(29.1)	
Afebrile		(46.7)					51	
							(59.3)	
IPTp/SP								
Yes		155						
No		(32.0)						
		7					3	
		(38.9)					(3.5)	
		155					83	
		(32.2)					(96.5)	
							5	
							(5.8)	
							81	
							(94.2)	

Table 3: Distribution of mean malaria density and haemoglobin concentration relative to socio-demographic characteristics and drug use

Parameter	No of Participants	Malaria Parasitaemia			Anaemia		
		Positive (%)	Mean Density $\pm$ SD	F stat. and p-value	No anaemic (%)	Mean haemoglobin concentration $\pm$ SD	F stat. and p-value
Age (years)							
≤ 19	19	5 (3.1)	12377 $\pm$ 4017.9	F = 0.85 P = 0.51	10 (7.8)	9.72 $\pm$ 1.74	F = 3.33 P = 0.005
20-24	65	25 (15.4)	12729 $\pm$ 6159.4		15 (11.6)	10.70 $\pm$ 1.13	
25-29	225	64 (39.5)	12150.1 $\pm$ 7375.4		56 (43.4)	10.60 $\pm$ 1.76	
30-34	128	44 (27.2)	10243.5 $\pm$ 4258.5		36 (27.9)	10.22 $\pm$ 2.21	
35-39	50	22 (13.6)	11441.7 $\pm$ 5631.8		8 (6.2)	11.22 $\pm$ 1.46	
≥ 40	13	2 (1.2)	4327.5		4 (3.1)	10.22 $\pm$ 1.11	
Gestational age (weeks)							
1 st trimester	56	20 (35.7)	9667.4 $\pm$ 4971.97	F = 0.26 P = 0.77	10 (7.8)	10.9 $\pm$ 1.25	F = 0.34 P = 0.71
2 nd trimester	293	47 (31.1)	14129.3 $\pm$ 6613.82		87 (67.4)	10.4 $\pm$ 1.86	
3 rd trimester	151	93 (57.4)	11854.9 $\pm$ 6207.6		32 (24.8)	10.5 $\pm$ 1.95	
Parity							
Nulliparous	12	2 (1.2)	8970 $\pm$ 4539	F = 2.14 P = 0.098	0 (0.0)	13.85 $\pm$ 3.93	F = 23.97 P = 0.00
Primiparous	39	93 (57.4)	11854.9 $\pm$ 6207.6		95 (73.6)	10.21 $\pm$ 1.85	
Multiparous	113	47 (31.1)	14129.3 $\pm$ 6613.82		34 (26.4)	10.88 $\pm$ 1.36	
Educational Level							
No formal education	15	7 (4.3)	15604.7 $\pm$ 4645.9	F = 0.16 P = 0.688	5 (3.9)	10.27 $\pm$ 1.25	F = 2.01 P = 0.111
Primary	485	12 (0.7)	9718.7 $\pm$ 5213.8		10 (7.8)	11.15 $\pm$ 2.39	
Secondary	18	41 (25.3)	12825.5 $\pm$ 6939.6		28 (21.7)	10.62 $\pm$ 1.65	
Tertiary	482	102 (63.0)	11164.7 $\pm$ 5833.9	F = 0.77 P = 0.41	86 (66.7)	10.44 $\pm$ 1.78	F = 0.09 P = 0.767
Fever							
Febrile							
Afebrile							
IPTp/SP							
Yes							
No							

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		(95.7)	5935.2				
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NB- IPTp/ SP – intermittent preventive treatment with sulfadoxine/pyrimethamine

Table 5: Correlation of parasite density with anaemia

ANAEMIA	Malaria Parasitaemia			
	No of Participants	Positive (%)	Mean Density $\pm$ SD	F stat. and p-value
Mild	100	35	11388.2 $\pm$ 4608.7	f = 2.13 P = 0.13
Moderate	15	2	16228.5 $\pm$ 11208.2	
Severe	14	4	17758 $\pm$ 15355.5	

DISCUSSION

The overall prevalence of malaria parasitaemia in this study was 32.4%. This finding is far higher than 8.4%¹⁵ recorded in Ibadan and 6.8%¹⁶ in Calabar but lower than 57.4%¹⁷ from Abeokuta, all in Nigeria. Compared with elsewhere outside Nigeria, malaria parasitaemia prevalence in the present study is nearly twice 18.0%¹³ of Kenya and a little higher than 25.1%⁶ found in Burkina Faso but roughly halve of 67.0%¹⁸ recorded in India. The differences in malaria parasitaemia prevalence may be related to geographical climatic variation and socio-economic characteristics of the women studied. The occurrence of species of plasmodia other than *P. falciparum* in some regions like Burkina Faso and India as reported in studies from these places may also be contributory. The prevalence of malaria parasitaemia recorded in this study notwithstanding, there is need to reduce the prevalence of malaria parasitaemia among pregnant women in Ilorin since only 46.7% of the parasitic women were febrile making the infected asymptomatic ones stand the risk of not being detected and developing complicated malaria. Only 4.0% of the women were on IPTp/SP. This defers from the finding in Ibadan where up to 68.0% and 16.4% of primigravidae and multigravidae respectively were already on antimalarial drugs at antenatal booking¹⁹. The low usage of IPTp/SP found in our study is however not surprising because of the difference in the socio-economic status of the women in Ilorin and Ibadan. Furthermore, the women were presenting late for antenatal care as the mean gestational age at booking of the women was 22.7 $\pm$ 7.44 weeks. Earlier antenatal booking is therefore desired for every pregnant woman to be captured for IPTp/SP in Ilorin, Nigeria. The women already on IPTp/SP as found in this study may have been placed on this drug by the referring hospital though some educated women, conscious of the risks of malaria in pregnancy, may have commenced the treatment on their own since it is easy to access such drugs on counter in our country. Noteworthy however is the significant difference ($X^2 = 1.135$, $p = 0.0007549$) in the prevalence malaria among users of IPTp/SP (38.7%) and non-users (31.7%). Similarly, there was significant difference ($X^2 = 8.634$, $p = 0.0000$) in the prevalence of anaemia among users of IPTp/SP (11.1%) and non-users (27.3%). This finding underscores the importance of IPTp/SP in pregnancy and its necessity in our setting having ensured early antenatal booking. All parasite infected women in this study had either moderate (15.3%) or high (17.2%) grade of malaria parasite density. This is against the finding in Malawi where all grades of parasitaemia was observed and age, season and trimester (gestational age) at booking were strong predictors of malaria parasitaemia at the first antenatal visit⁹. Maternal chronological age, parity and educational level did not

affect either malaria parasitaemia or parasite density in this study. However, gestational age significantly ($F = 6.02$, $p = 0.002$) affected malaria parasite density with the infection commoner in the first trimester

fever and anaemia were predictors of malaria

related factors in future research. The prevalence of anaemia in this

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