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The Relationship Between Socio-Demographic Characteristics and Malaria Parasite Density among Pregnant Women in Ilorin, Nigeria

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Abstract: To determine the relationship between socio-demographic characteristics and parasite density among pregnant women at booking in Ilorin, Nigeria. Women who came for booking at the UITH between 1st May and 31st July 2010 were selected to participate in the study. Data were collected with questionnaire and their blood analyzed for malaria parasite and parasite density. A total of 412 women participated out of which 327 women (79.4%) had parasitaemia. Most of the primigraviae (81.2%) and secundigravidae (77.9%) were positive for malaria parasite. So also 87.5% of the teenagers were positive for malaria. Parasite density was higher among the primigravidae and younger women. The mean parasitaemia was also found to be higher in the second trimester than the first and third trimesters ($p = 0.04$). The young and the primigravidae are more at risk of malaria in pregnancy. It is therefore important to implement an effective diagnostic and prevention regimen of malaria prophylaxis for all at risk group.

Key words: Malaria, parasitaemia, antenatal clinic, pregnancy, Ilorin, Nigeria

INTRODUCTION

Malaria continues to be one of the main public health problems in the world, especially in the majority of African countries (Jimoh, 2004). Each year approximately 300 million people are affected and >1 million deaths occur from malaria in Africa, Asia, Oceania, Central and South America (Gravet and Sampson, 1994; Nnaji *et al*., 2006). Currently, it is endemic in about 100 countries, affecting 40% of world population (Jimoh, 2006). Annual mortality due to malaria is estimated to be between 0.5-2.5 million people (Jimoh, 2006). Nine out of ten cases of malaria occur in sub-Saharan Africa (Gravet and Sampson, 1994).

In Nigeria, malaria accounts for >60% of general out-patient visits, 30% of childhood mortality and 11% of maternal mortality (FMH, 2001). The incidence of acute malaria during an unprotected pregnancy is about 20% even with the currently recommended chemoprophylaxis the figure is still about 8% (Eugene, 2005).

A number of studies in malaria endemic regions have documented the influence of socio-demographic variables on malaria parasitaemia in relation to maternal morbidity and birth outcome. These variables include age, parity, marital status, ethnicity, educational status, locations, socio-economic status and gestational age at booking. Malaria parasitaemia was observed to be higher among primigravidae and teenagers compared with secundigravidae and multigravidae (Tayo *et al*., 2009; Bouyou-Akotet *et al*., 2003).

The educational status, geographical locations, socio-economic status, ethnicity and gestational age at booking were also observed to impact on malaria parasitaemia in pregnancy with its attendant sequelae as regards maternal and perinatal morbidity and mortality (Tayo *et al*., 2009; Bouyou-Akotet *et al*., 2003; Dolo *et al*., 2005).

The deleterious effects of malaria on pregnancy necessitate this study on evaluation of its prevalence and the influence of socio-demographic variables on malaria parsitaemia at booking in the centre, University of Ilorin Teaching Hospital. This will afford us the opportunity of assessing the burden of malaria at booking and reinforce the implementation of the Intermittent Preventive Treatment strategy.

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MATERIALS AND METHODS

This study was conducted at the University of Ilorin Teaching Hospital (UITH), one of the main referral centers in North central region of Nigeria. Subjects were all pregnant women who attended booking clinic at the Maternity wing of UITH between 1st May 2009 and 31st August 2009. Those pregnant women who are currently on drug treatment for malaria infection were excluded from the study.

Subjects were selected using systematic random sampling technique. The selected subjects were informed and counseled about the study. Consent was obtained from each patient before enrollment into the study. The researcher and the research assistants interviewed each patient and collected data with a designed questionnaire. The validity and reliability of the questionnaire was pre-tested in a pilot study at Okelele Basic Health Centre, Ilorin using 10% (37 pregnant women) of sample size.

Peripheral blood samples were taken from each patient. Thick and thin films of the peripheral blood were prepared on glass slides. Each slide was examined under the light microscope using x100 oil immersion objective. A positive smear is the one that contains any of the parasites. All the slides were double-checked. Parasitaemia was graded as low (parasite <1000 μL^{-1}), moderate (>1000-9999 μL^{-1}) and high (>10,000 μL^{-1}) (Greenwood and Armstrong, 1991). Malaria parasite species identification was determined by examining the thin blood film (Greenwood and Armstrong, 1991). Data obtained were analyzed using EPI-Info 3.4.1 statistical package. The results were presented as tables and charts. Comparisons of categorical data were by Chi-square analysis or Fisher exact tests. The level of significance based on 95% confidence interval was set at $p<0.05$. Ethical approval was obtained from the University of Ilorin Teaching Hospital Ethical Review Committee.

RESULTS

Data was obtained from 412 pregnant women. Patients socio-demographic characteristics are shown in Table 1. The age range of the subjects was between 14 and 43 years, mean age at booking was 29 years ±4.8 (Mean±SD). The modal parity group was the primigravidae group with 37.4% of the participants in this group.

The mean gestational age at booking was 19.2 weeks ±7.0 (Mean±SD). About one quarter of the subjects 101 (24.5%) booked in the first trimester. Most (60.0%) of the participants had tertiary school education. Table 2 shows the comparison of socio-demographic characteristics, fever and chemoprophylaxis between those with and those without malaria parasitaemia. Malaria prevalence in this study was 79.4% (n = 327).

Majority of patients with fever (96.7%) had malaria parasitaemia and this was statistically significant (p = 0.00). Table 3 shows the mean parasite density relative to socio-demographic characteristics, fever, chemoprophylaxis and symptomatology. The mean parasite density was higher among younger age groups though not statistically significant (p = 0.35).

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%)
Number of participants	412
Mean age (years) ±SD	28.96±4.75
Age group	
≤19	8 (1.9)
20-24	59 (14.3)
25-29	147 (35.7)
30-34	145 (35.2)
≥35	53 (12.9)
Parity	
Primigravidae	154 (37.4)
Secundigravidae	113 (27.4)
Multigravidae	145 (35.2)
Educational status	
Primary	49 (11.9)
Secondary	110 (26.7)
Tertiary	247 (60)
No formal	6 (1.5)
Gestational age (weeks)	
1st trimester	101 (24.5)
2nd trimester	243 (59)
3rd trimester	68 (16.5)

Table 2: Comparison of socio-demographic characteristics, fever and chemoprophylaxis between those with malaria parasitaemia and those without malaria parasitaemia

		Malaria parasitaemia		
Parameters	N	Positive (%)	Negative (%)	χ^2 and p-value
Age group				
≤19	8 (1.9)	7 (87.5)	1 (12.5)	$\chi^2 = 4.41$
20-24	59 (14.3)	51 (86.4)	8 (13.6)	p = 0.35
25-29	147 (35.7)	118 (80.3)	29 (19.7)	
30-34	145 (35.2)	108 (74.5)	37 (25.5)	
≥35	53 (12.9)	43 (81.1)	10 (18.9)	
Parity				
Primigravidae	154 (37.4)	125 (81.2)	29 (18.8)	$\chi^2 = 0.51$
Secundigravidae	113 (27.4)	88 (77.9)	25 (22.1)	p = 0.78
Multigravidae	145 (35.2)	114 (78.6)	31 (21.4)	
Education				
Primary	49 (11.9)	41 (83.7)	8 (16.3)	$\chi^2 = 5.94$
Secondary	110 (26.7)	93 (84.5)	17 (15.5)	p = 0.11
Tertiary	247 (60.0)	187 (75.7)	60 (24.3)	
No formal	6 (1.5)	6 (100.0)	0 (0.0)	
Fever				
Yes	214 (51.9)	207 (96.7)	7 (3.3)	$\chi^2 = 79.8$
No	198 (48.1)	120 (60.6)	78 (39.4)	p = 0.00
C/Prophylaxis				
Yes	61 (15.0)	51 (83.6)	10 (16.4)	$\chi^2 = 0.51$
No	346 (85.0)	272 (78.6)	74 (21.4)	p = 0.47
Trimester				
1st	101 (24.5)	78 (77.2)	23 (22.8)	$\chi^2 = 0.41$
2nd	243 (59.0)	194 (79.8)	49 (20.2)	p = 0.81
3rd	68 (16.5)	55 (80.9)	13 (19.1)	

Table 3: Relationsip of socio-demographic characteristics fever and chemoprophylaxis to malaria parasite density

Parameters	N	Malaria parasitaemia		F stat. and p-value
		Positive (%)	Mean density±SD	
Age group				
≥19	8 (1.9)	7 (87.5)	6328.57±2514.43	F = 0.53
20-24	59 (14.3)	51 (86.4)	6423.92±6063.90	p = 0.72
25-29	147 (35.7)	118 (80.3)	6340.51±6045.72	
30-34	145 (35.2)	108 (74.5)	5771.11±5682.51	
≥35	53 (12.9)	43 (81.1)	5025.47±5145.03	
Parity				
Primigravidae	154 (37.4)	125 (81.2)	6456.8±5893.360	F = 1.28
Secundigravidae	113 (27.4)	88 (77.9)	5191.48±5160.71	p = 0.28
Multigravidae	145 (35.2)	114 (78.6)	6101.1±6009.850	
Education				
Primary	49 (11.9)	41 (83.7)	7234.51±6977.27	F = 2.20
Secondary	110 (26.7)	93 (84.5)	6804.41±5293.88	p = 0.09
Tertiary	247 (60.0)	187 (75.7)	5298.66±5553.11	
No formal	6 (1.5)	6 (100.0)	6533.33±7903.08	
Fever				
Yes	214 (51.9)	207 (96.7)	6976.30±6050.49	t = 17.33
No	198 (48.1)	120 (60.6)	4294.83±4765.40	p = 0.00
C/Prophylaxis				
Yes	61 (15.0)	51 (83.6)	6010.78±5691.51	t = 0.00
No	346 (85.0)	272 (78.6)	5958.18±5805.08	p = 0.95
Trimester				
1st	101 (24.5)	78 (77.2)	4605.06±4721.20	F = 3.20
2nd	243 (59.0)	194 (79.8)	6544.33±6065.70	p = 0.04
3rd	68 (16.5)	55 (80.9)	6012.36±5714.45	
Symptoms				
Yes	265 (64.3)	246 (92.8)	6508.31±5917.57	F = 8.17
No	147 (35.7)	81 (55.1)	4425.06±4932.21	p = 0.00

Primigravidae had the highest mean parasite density. Febrile patients had higher mean parasite density compared with afebrile patients and this was statistically significant (p = 0.00). The parasite density was higher among women who booked in the second trimester compared with first and third trimesters (p = 0.04). Similarly, symptomatic patients had higher mean parasite density than asymptomatic patients (p = 0.000).

DISCUSSION

The prevalence of malaria parasitaemia in the study population was 79.4%. This is in consonance with 79.3, 72 and 72% obtained in Nnewi, Ife and Osogbo, respectively (Nnaji *et al*., 2006; Okonofua *et al*., 1991; Adefioye *et al*., 2007). However, the rates were far higher than figures obtained from other similar studies in the same country (Egwunyenga *et al*., 2001; Anorlu *et al*., 2001). Findings from other countries in the Sub-Saharan Africa were lower than what was obtained in this study (Wakibara *et al*., 1997; Van Den Broek *et al*., 2000; Shulman *et al*., 1999). This disparity may be related to geographical and climatic variations in the transmission of malaria parasite with the highest prevalence occurring during the rainy season and the lowest during the dry season (Falade *et al*., 2008). This study was carried out during the peak of the rainy season thus the higher prevalence rate of malaria parasitaemia is not surprising. Also, the capillary blood sample that was used in this study may be contributory to higher level of malaria parasitaemia since the yield is better than venous blood.

In this study, malaria parasitaemia was higher in the primigravidae than the secundigravidae and multigravidae although, the observed difference was not statistically significant. Other similar studies in Nnewi (Nnaji *et al*., 2006), Lagos (Tayo *et al*., 2009), Ibadan (Falade *et al*., 2008) and reports from Gabon (Bouyou-Akotet *et al*., 2003) established a significant difference between parity and malaria parasitaemia in pregnancy. This is because the primigravidae lack the specific immunity to placenta malaria parasite that is acquired from exposure to malaria parasite during pregnancy.

The higher prevalence of malaria parasitaemia observed among teenagers though not statistically significant from older women may be attributed to the fact that majority of the teenagers are likely to be primigravidae and are expected to have higher malaria parasitaemia. Also, there could be limited awareness of malaria preventive measures in this age group. In most cases, many of these teenagers are not employed or under-employed and as such belong to low socio-economic class which is associated with increased malaria parasitaemia. Among other socio-economic factors that could affect the teenage pregnant women in taking appropriate measures for malaria prevention in pregnancy includes paternity dispute and destitution, etc.

The higher malaria parasitaemia among teenagers found in this study was corroborated by reports from studies done in Gabon (Dolo *et al*., 2005) and Ibadan (Falade *et al*., 2008) where age group of <20 years was reported to be at a high risk.

This study showed that malaria prevalence decreased with increasing age but increased in women that were 35 years or more. Adefioye *et al*. (2007) and Bouyou-Akotet *et al*. (2003) in Osogbo, Southwest, Nigeria and Gabon reported similar observation, respectively. This may be due to the fact that many of the pregnant women in this age group presumed to be experienced on pregnancy related issues and therefore may not likely adopt appropriate preventive measures in pregnancy.

In this study, 15% of the subjects had chemoprophylaxis with Sulphadoxine-pyrimethamine prior to booking at UITH. Of the subjects that had chemoprophylaxis, 83.6% had malaria parasitaemia. A possible reasons for this observation could be that the efficacy of the drugs and the source could not be

ascertained as many obtained the drugs from peripheral clinics, drug hawkers and chemist shops. In any case, chemoprophylaxis use does not offer 100% protection against malaria parasitaemia in pregnancy.

Having fever was also significantly associated with patient parasitaemia and high parasite density. This is because the commonest cause of fever in the study area is malaria being an endemic region for malaria infection and that the study was conducted during the peak of malaria transmission.

Therefore, there is need for prompt and effective treatment of symptomatic malaria to reduce the consequences of malaria infection in pregnancy. The pattern of late booking during the second and third trimesters for antenatal care recorded in this study is in keeping with previous reports (Bouyou-Akotet *et al*., 2003; Mwanziva *et al*., 2008).

Undesirable as this might be for safe motherhood, it still affords a significant proportion of the clients the opportunity of receiving the first dose of chemoprophylaxis at booking and instructions to come for the second dose one month after booking in keeping with the Nigeria's national guidelines for malaria prevention and control during pregnancy.

CONCLUSION

Malaria parasitaemia was high among pregnant women in Ilorin. The mean parasite density observed in this study was significantly higher among pregnant women at second trimester and women who were symptomatic for malaria. Pregnant women particularly at risk group should be given special attention including screening for malaria parasitaemia at the first antenatal clinic visits. All antenatal clinic attendees should also be placed on chemoprophylaxis except when contraindicated and early antenatal booking encouraged. The need for further studies, possibly multicentre into malaria and the influence of other bio-social variables on its prevalence cannot be over-emphasized.

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