Prevalence Of Malaria Parasitaemia In Pregnant Women Attending Antenatal Clinics At The University Of Ilorin Teaching Hospital, Ilorin, Nigeria

[1]O.J. Abulraheem, [2]J.P. Fabiyi, [3] S.K. Babatunde, [2]M.A. Alayande, [4] A.A Akanbi 11, and [5]A.A Fawole,

Dept of Medical Microbiology and Parasitology, University of Ilorin Teaching Hospital, Ilorin,
[2]Dept. of Parasitology, Faculty of Veterinary Medicine, Usman Danfodio University, Sokoto,
[3]Biological Sciences Dept., Ajayi Crowther University, P.M.B 1066, Oyo.
[4]Dept. of Med. Microbiology and Parasitology, Faculty of Basic Medical Sciences, University of Ilorin,
[5]Dept. of Obstetrics and Gynaecology, Faculty of Clinical Sciences, University of Ilorin

Abstract

The paper studied the prevalence of malaria parasitaemia among pregnant women attending antenatal clinics at University of Ilorin Teaching Hospital, Ilorin, Kwara State. A total of 350 blood samples were collected from consecutive pregnant women registering at the antenatal clinics. It was examined for malaria parasites, using both thick and thin films. Cellulose acetate electrophoresis was used to detect the haemoglobin genotype; haematocrit method was used to determine the packed cell volume (PVC) and tube technique to determine the blood group and rhesus typing of the subjects. An overall prevalence rate of 10.5% was obtained. Prevalence rate for age group 14-20 was 14% while age group 41-50 had no infection. Primigravidae had higher infection rate (14%) than Multigravidae (8%) and the difference was significant ($P<0.05$). The prevalence was highest during the first trimester (15.4%) and it was lowest during third trimester. Intermediate socioeconomic class had the highest infection rate (18%) followed by the lower and higher classes with 11% and 8% respectively. The highest prevalence (12.7%) was recorded among the subjects with secondary level of education, while women with tertiary education had the lowest (5.7%). Moreover, women living in self contained houses had the a lower prevalence (6.2%) than those living in face to face room type of accommodation (13.5%), the difference was statistically significant ($P<0.05\%$). Haemoglobin genotype AA had the mostly occurring infection (13%), followed by AS (6%). Subjects with the blood group AB^+ were more frequently parasitized (14.2%), followed by 0^+ with 11%. The Primigravidea group, the group of women with genotype AA and the group of women with AB^+ separately maintained leading infected group. Government should not relent in its effort through public enlightenment campaign and provision of infrastructural facilities, necessary drugs etc as prevalence is still unacceptably high.

Key words: Parasitaemia, Plasmodium falciparum, Pregnanacy, Socioeconomic status

Correspondence to:

Dr SK Babatunde
Biological Sciences Dept.,
Ajayi Crowther University,
P.M.B 1066, Oyo.
Email: solakemibab@hoo.com

Introduction

Malaria parasite, the causative agent of malaria disease belongs to the genus *Plasmodium*. It is transmitted from person to person through infective bite of female anopheles mosquitoes. The most virulent strain and the one that is widely spread in tropical Africa is *Plasmodium falciparum*[1], other species are: *P. malariae, P. ovale* and *P. vivax.*

Malaria infections continue to be the world's greatest causes of morbidity afflicting 220 million people and, in Africa alone, causing 1 million deaths per year[2]. In addition to these high number of malaria attributable fatalities, it is thought that an additional 300-500 million people contact the disease each year[3] with unmeasured impact on local economics, human health and longevity in general.

In Nigeria, malaria is the most common cause of outpatient visit to the hoispital[4], about 400,000-700,000 people are infected annually and 10% of the reported deaths in Nigeria children under five years and 50% of the population experience at least one episode of the infection per year[5]. Pregnant women are particularly vulnerable to malaria, and the infection is a major cause of perinatal mortality and low birthweight[6]. In pregnant women, many clinical conditions such as hypoglycemia, chronic and acute anaemia have been linked with malaria more often than in non-pregnant ones[6.] It has also been shown that pregnant women are at increase risk of *Plasmodium* infection compared to non-pregnant women living under the same endemic conditions for malaria[5]. Specific investigations to prevalence and scourge of malaria in 551 parturient women in Lagos, the South-Western part of Nigeria and their new born babies, showed that 27% of mothers were infected, and the slides prepared from placenta blood showed that 22.3% babies were similarly infected[7].

This problem is exacerbated with the emergence of *Plasmodium* strains resistant to chloroquine and other common drug[8]. Pregnant women have been reported to lose previously developed immunity to malaria, thus easily succumbing to malaria parasites they have been habouring[6]. Recrudescence or reoccurrence of malaria occurred most frequently in first pregnancy and in all second trimester of all pregnancy[9].

The aims of this study were to determine the prevalence and types of malaria parasites infecting the pregnant women attending University of Ilorin Teaching Hospital and socio-demographic factors affecting its distribution.

Materials and Methods

The research was carried at the University of Ilorin Teaching Hospital (UITH), Ilorin, a tertiary health institution in the departments of Obstetrics and Gynecology and Medical Microbiology and Parasitology. The subjects were pregnant women that reported for registration at antenatal clinics of department of Obstetrics and Gynecology of the hospital. Pregnant women that did not register in the clinics and individuals receiving anti-malaria medications within four weeks preceding data collections were excluded from participation. Pregnant woman that refuse to participate in the study were left out. Subjects of all social strata were included in the study. The postgraduate committee of the institution approved the proposal of the study and gave consent for it to be carried out. The head of the department of Obstetrics and Gynecology was linked with and other researcher was attached to a supervising consultant obstetrician in the department.

The subjects were adequately informed about the purpose and the benefits of this study and were assured of confidentiality of the result. A consent form was signed by the subjects before samples were collected from them. The consent form was a simple structured questionnaire designed to obtained biodata and information on socio-economics status of the subjects.

Thick and thin blood films were made on clean, dry and grease free slides, from blood venous collected into ETDA bottle. Thin films were fixed with absolute ethanol for three minutes. The films were allowed to air dried and labeled. The blood films were strained with Giemsa method, using filtered 1 in 10 dilution of stock Giemsa stain for 45 minutes. The stain was poured off and washed quickly with buffered distilled water at pH 7.2. The slides were drained, dried and examined for malaria parasites using 100x oil immersion objectives of light microscope. Thick films were examined for malaria parasites which have chromatin dots that stained dark red and cytoplasm that were bluish as previously described[10]. The thin films were examined only on positive thick films to identify the malaria species. The parasite density was determined using method previously described by Cheesbrough[11]. Other parameters measured on the patients' blood samples were packed cell volume using centrifugation of capillary tube, haemoglobin genotype using cellulose acetate membrane electrophoresis and blood group including Rhesus factor was determined by tube agglutination method.

Results

Prevalence of parasitic infections is given as the percentage of parasitologically positive individual. The subjects were grouped into four age categories of 10 years intervals. Difference in prevalence between age, classes, gestation period, parity, social classes, educational status, housing types, blood group, haemoglobin genotype and parked cell volume were analysed and compared using chi-square test.

Of the 350 blood samples examined 37 (10.5%) were positive for malaria parasite. *Plasmodium falciparum* was found in all the positive cases with one having mixed infection with *Plasmodium malariae*. Age-group 14-20 years had the highest prevalence (14.4%) than 21-30 years (10%), 31-40 (7.05%) and 41-50 years (none).

Tables 1, 2, 3 and 4 showed prevalence of malaria parasitaemia in relation to gestation period, parity of subjects, economic status and educational status respectively. Table 5 shows prevalence of parasitaemia in relation to blood group, haemoglobin genotype and anaemia (PCV). The parasite density was generally low, 97.3% of the patients have count of <1,000 cells/μI.

Discussion

There was a relatively low prevalence of malaria parasitaemia in pregnant women attending the clinics in Ilorin. The overall 10.5% infection rate in women in this study is higher than the 9.0% rate reported by Ikeh *et. al*.,[12] in Jos, Northern Nigeria. Possible reasons adduced to this low prevalence rate were: early registration of pregnant women, use of health education programme directed toward the distribution and the use of treated nets and regular use of malaria chemoprophylaxis. It has been reported that climatic conditions affect infectivity of mosquito vector[8]. Previous studies confirmed seasonal variation of prevalence rate of malaria parasitaemia between dry and wet season in sub Saharan Africa[14, 15.]

Plasmodium falciparum and *Plasmodium malariae* were the two species found in this work, with *Plasmodium falciparum* being the dominant species. This is in agreement with other authors who reported a prevalence rate of 95% of *Plasmodium falciparum* in

Table 1: Prevalence of malaria parasitaemia in relation to gestation period

Gestation Period in trimesters	No examined	No Positive	% Positive
1st Trimester	110	17	15.4
2nd Trimester	160	15	9.3
3rd Trimester	80	5	6.2

It was noted that parasitaemia was most marked during the 1st trimester with 15.4% prevalence rate followed by 2nd trimester which had 9.3% prevalence rate. The lowest prevalence was recorded among the 3rd trimester (6.2%). There was significant statistical difference between 1st and 2nd trimesters ($p<0.05$).

Table 2: Prevalence of malaria parasitaemia in relation to parity of women attending antenatal clinic

Parity	N0 Examined	No Positive	% Positive
Primigravidae	150	21	14
Multigravidae	200	16	8

The Primigravidae were more frequently parasized (14%) than Multigavidae (8%).
The difference was statistically significant ($P<0.05$)

Table 3: Prevalence of malaria parasitaemia in relation to socio-economic status

Social Class	No Examined	No Positive	% Positive
Lower	90	10	11
Intermediate	144	15	13
Higher	146	12	8

With regards to malaria parasitaemia in relation to social status, it was shown that intermediate socio economic class, had the highest prevalence (13%) which was closely followed by lower socio economic class (11%). However, the difference was not statistically significant ($p>0.05$).

Table 4: Prevalence of malaria parasitaemia in relation to educational status

Educational Status	No Examined	No Positive	% Positive
No formal education	76	9	11
Pri. Cert/Quranic Sch	111	12	10.8
Secondary Sch Cert	96	12	12.7
Tertiary/Graduate	69	04	5.7

The highest prevalence was among the secondary school leavers (12.7%). This was closely followed by primary school leavers (10.8%) and the lowest prevalence was seen among the graduates (5.7%).
The difference between secondary school leavers and the graduates was statistically significant ($P<0.05$).

Table 5: Prevalence of malaria parasitaemia in relation to blood group, haemoglobin genotype and malaria

Blood Group	No Exam	No Positive	Hb Genotype	No Examined	No Positive	PCV	No Examined	No Pos
A+	121	13(9.9)	AA	230	30(13)	21	7	1(14)
A-	-	-	AS	100	6(6)	21-25	82	12(15)
B+	45	3(8.8)	AC	20	1(5)	26-30	102	20(18.6)
AB+	28	4(14)	SS	-	-	31-35	109	4(3.6)
O+	154	17(11)	SC	-	-	>35	50	
O-	2	-						

Subjects with AB+ blood group were frequently parasitized (14.2%) than other blood groups, while those with haemoglobin genotype AA were more frequently parasitized 13% than other haemoglobin genotypes. Subjects with PCV of 26-30 have higher (18.6%) malaria parasites detection than other PCV range.

Ile Ife[16], and 85% of the same species in Benin[17].

Women of age group 14-20 and 21-30 years were more susceptible than older ones in this study. From this study it can be deduced that as women get older, their resistance to malaria become higher due to improvement in lost immunity. This is quite similar with the finding of Aderonmu[18], and McGregor[15], who reported a decline in malaria prevalence rate as age increases and the host immunity, improves, thus reducing susceptibility in later years.

The result also revealed that malaria parasitaemia was higher during the fist trimester with 15.4%, while 9.3% and 6.2% were recorded in second and third trimester respectively. This finding is similar to the previous report by Brabin[9]. The tendency for increasing frequency of parasitaemia in early pregnancy with recovery in late pregnancy has been reported[15,16]. This implies that any malaria control measure that needs to be instituted will be much more effective if started very early in pregnancy[19].

In addition, it was found that there was significant difference in the rate of parasitaemia between the Primigravidae and Multigavidae ($P>0.05$). This correlates with the findings of fleming[20], Egwunyenga[14,] but at variance to the work of okonfua[16] which reported that Multigravidae are more susceptible to malaria infection. The higher rate of parasitaemia in Primigravidae has bee explained on the basis of immunosuppressant action of hormone, notably cortisone on cell-mediated immunity produced regularly during early pregnancy by Primigravidae[21,22].

Malaria parasitaemia rate was lower in women of the higher socioeconomic class than those of both intermediate and lower classes. Reasons adduced to this difference were higher rate of inoculation by vector and possibility of having concomitant malnutrition that would further impair immunity[23]. Subjects with secondary level education have higher prevalence rate than those with no formal education, primary school leaver and degree holders. This implies that more public enlightment need to be done to educate the pregnant women without formal education and in all levels of education. Similarly, women that live in highly populated face to face rented apartment type of accommodation have higher prevalence rate than those that live in low densely populated private apartments. These categories of subject were more likely to have more infective bite of the vector, because of the nature of general unkempt surroundings that may prevail in these environments.

Women with haemoglobin AA genotype showed high prevalence rate of parasitaemia with about 13% as compared with 6% recorded in AS women (This difference was no statistically significant). This is in conformity with Menedez[24] who affirmed that there is no significant advantage of sickle cell trait (AS) against malaria infection in pregnancy. The study also confirms that malaria and anaemia are quite related and that pregnant women with malaria are likely to have anaemia[25] as demonstrated in this study. The highest prevalence of malaria parasitaemia occurred in pregnant women with AB^+ blood group, in contrast to report by Macleod and Rhode[26] in which the prevalence was highest in A^+ subject.

References

1. Bruce-Chwett LJ. Essential Malariology. William Heinemann Medical Books (1985) ELBS edition, pp85-129.
2. World Health Organization. World Malaria Situation, *World Health Statistical Quarterly* (1985); 38: 193-292
3. Butler D. Time to put malaria control on the global agenda. *Nature Medicine* (1997); 386: 535-541
4. Afolabi BM. Knowledge, attitude and practice of malaria in an isolated community. *Malaria and Infectious Diseases in Nigeria* (2000); 6: 6-13
5. World Health Organization. *Roll Back Malaria Advocacy Guide* (2000). Pp 1-58
6. Bruce-Chwett LJ. Malaria in Africa: Infants and children in Southern Nigeria. *Annals of Tropical Medicine and Parasitology* (1952); 46: 173-200
7. Snow RW, Rowan KM, Greenwood BM. The role of shop in the treatment and prevention of childhood malaria on the coast of Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene* (1987); 86: 239-273
8. Steketee RW, Nahlen BL, Parise ME, Manendez C. The burden of malaria in pregnancy in malaria endemic areas. USA Department of Health and Human Service (2002). No 30333
9. Brabin BJ. Malaria in pregnancy: Its importance and control Part II. *Post-graduate Doctor* (Afirica) (1989); ii: 100-101
10. Ukoli FMA. Introduction to Parasitology in Tropical Africa (1990). Longman Publisher, Ibadan
11. Cheesbrough M. Medical Laboratory Manual for Tropical Africa (1987). Longman publisher, Ibadan.
12. Ikeh EI. Akuda SN. Uguru VE. Prevalence of malaria parasitaemia in pregnant women attending antenatal clinic at Jos University Teaching Hospital. *Africa Journal of Clinical and Experimental Microbiology* (2005) 6 (2): 91-92
13. Snow RW. Rowan KM. Greenwood RM. A trial of premethrin-treated bed nets in the prevention of malaria in Gambian children. *Transaction of the Royal Society of Tropical Medicine and Hygiene* (1997); 31: 563-567
14. Egwunyenga OA. Ajayi JA. Oluyinka A. Popoola DD. Transplacental passage of *Plasmodium*

falciparum and sero evaluation of congenital malaria in the Northern Nigeria. *Journal of communicable Diseases* (1995); 24 (2); 73-78

15. McGregor IA. Wilson ME. Billewkz WZ. Malaria infection of placenta in Gambia. *Transaction of the Royal Society of Tropical Medicine and Hygiene* (1983); 77 (2): 232-244

16. Konofua F. Adeniran M. Adetugbo D. Nganwuchu A. Prevalence of malaria parasitaemia in pregnant women attending antenatal clinic at Obafemi Awolowo University Teaching Hospital, Ile-Ife; Nigeria. *Medicare* (1990); 25: 8-17.

17. Asagba AO. Guidelines for management of malaria in Nigeria. *Bulletin of Epidemiology* (1987); 1: 215-220

18. Aderonmu AF. Salako LA. Walker, O. Chloroquine sensitivity to *Plasmodium falciparum* in Ibadan, Nigeria. *Transaction of the Royal Society of Tropical Medicine and Hygiene* (1981); 75: 637-640

19. Bray RS. Anderson, MJ. Falciparum malaria and pregnancy. *Transaction of the Royal Society of Tropical Medicine and Hygiene* (1979); 60: 360-370

20. Fleming AF. The prevention of anaemia in pregnancy Primigraviaes in Guinea Savanna of Nigeria. *Annals of Tropical Medicine and Parasitology* (1986); 22: 21-23

21. Brabin BJ. An analysis of malaria in pregnancy in Africa. *Bulletin of the World Health Organization* (1983); 61: 1005-1016

22. Beer TB. Assessment of incidence and prevalence of clinical malaria in semi-immune children exposed to intense and perennial transmission. *American Journal of Epidemiology* (1987); 176 (2): 120-122

23. Gillies GS. Malaria, anaemia and pregnancy. *Annals of Tropical Medicine and Parasitology* (1985); 63: 243-263

24. Menedz E. Malaria during pregnancy: Research and control. *Parasitology Today* (1995); 5: 178-183

25. Shulman CE. Gerhma WJ. Jilo H. Loer BS. New L. Obiero J. Snow RW. Marshi K. Malaria as an important cause of anaemia in Primigravidae: Evidence from a district Hospital in Coastal Kenya. *Transaction of the Royal Society of Tropical Medicine and Hygiene* (1996); 90: 535-539

26. Macleod J. Rhode R. Retrospective follow-up of malaria deaths and their associated risk factors in the rural district of Tanzania. *Tropical Medicine and International Health* (1998); 3: 130-137