

PREVALENCE OF MALARIA PARASITE INFECTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINICS IN PORT HARCOURT, RIVERS STATE, NIGERIA

WOGU^{1*}, M. N., NDUKA¹, F. O. and WOGU², M. D.

¹Parasitology unit, Department of Animal and Environmental Biology, Faculty of Science, University of Port Harcourt, Rivers State, Nigeria.
P.M.B 5323, Choba, Rivers State.

²Department of Basic Sciences, Faculty of Basic and Applied Sciences, Benson Idahosa University, Edo State, Nigeria.
P.M.B 1100, Benin City, Edo State.

*Correspondence author e-mail: michael.wogu@yahoo.com

ABSTRACT

Aim: To evaluate the prevalence of malaria parasites among some pregnant women attending antenatal clinics in Rivers State, Nigeria.

Materials and Methods: Peripheral blood samples were collected using venous procedure and the presence of malaria parasites was observed microscopically on thick and thin blood smears prepared from each sample. Personal data were collected through questionnaires and the general results gotten during this study were analyzed statistically using Chi – square test of significance.

Results: The only species of malaria parasite identified in this study was *Plasmodium falciparum*. A total of 104 (26%) pregnant women were infected with *P. falciparum* in this study. Pregnant women in their first, second and third trimesters had prevalence rates of 27%, 27.3% and 21.8% respectively ($P<0.05$). Prevalence rates for primigravidae, secundigravidae and multiparous women were 26.1%, 31.5% and 20% respectively ($P<0.05$). Prevalence rates of 26.9%, 27.8% and 21.5% were observed in pregnant women between the ages of 11 – 20, 21 – 30 and 31 – 40 respectively ($P<0.05$).

Conclusion: Malaria still needs to be given more attention due to its negative impact on pregnant women and their unborn children.

Keywords: Prevalence, Malaria, Pregnancy, Women, Plasmodium, Gestation period, Parity, Age

1. INTRODUCTION

Malaria is a life – threatening parasitic disease transmitted mostly by female *Anopheles* mosquitoes and caused by different species of *Plasmodium* parasites. An increased risk of malaria during pregnancy was observed over 60 years by Wickramasariya [Steketee and Mutabingwa, 1999]. The protection of pregnant women living in malaria – endemic countries has been of particular interest to many National Malaria Control Programmes because of their reduced immunity. The recent World Malaria Report, which indicated that Nigeria accounts for a quarter of all malaria cases in the 45 malaria-endemic countries in Africa, clearly showed the challenge of malaria in Nigeria [WHO, 2008]. The principal impact of malaria infection is due to the presence of parasites in the placenta causing maternal anemia (potentially responsible for

maternal death when severe) and low birth weight (LBW) [Newman *et al.*, 2003; Rogerson and Boeuf, 2007].

Despite considerable efforts to control malaria, it is still the most prevalent and most devastating disease in tropical Africa (with pregnant women and children below five years the highest risk groups). With the government of Nigeria interested in various malaria control strategies, this study was undertaken to provide part of the much needed baseline data to effectively plan and control malaria especially among the population at risk, the pregnant women.

2. MATERIALS AND METHOD

2.1 Study Subjects and Duration of Study: The study subjects consisted of 400 pregnant women attending antenatal clinics between April and September 2011. The pregnant women were selected randomly without prior knowledge of their clinical and family history.

2.2 Data Collection: The consent of the pregnant women was taken before commencing this study. Questionnaires to determine age, parity and gestation period, were distributed to and completed by the pregnant women. Peripheral blood samples were collected using venous procedure. Standard and careful laboratory procedures were adopted in collecting blood samples from the pregnant women. Thick and thin blood films were made on clean slides and labeled accordingly as recommended by WHO [Agomo *et al.*, 2001].

2.3 Microscopic Examination: Thick blood films were stained using Field's staining method while thin blood films were stained using Leishman staining method. Stained slides were examined under the light microscope using x100 objective lens (immersion oil) [Meeusen *et al.*, 2001].

2.4 Statistical Analysis: The data collected from this study were subjected to statistical analysis using chi – square test (χ^2) of significance. $P < 0.05$ was considered significant.

3.0 RESULTS

3.1 Overall Malaria Prevalence

Plasmodium falciparum was the only malaria parasite observed in the blood samples of the pregnant women examined in this study. Out of the 400 pregnant women examined for malaria parasites, 104 (26%) were positive for malaria infection while 296 (74%) were negative for malaria infections ($P < 0.05$). Malaria prevalence rates according to healthcare centres are shown in Table 1.

Table 1: Prevalence of malaria parasites among pregnant women

HEALTHCARE FACILITIES	NE	NI (%)
University of Port Harcourt Teaching Hospital	150	42 (28%)
Aluu Health Center	100	23 (23%)
Golden Hands Hospital	50	16 (32%)
Zeta Hospital	50	13 (26%)
Ebony Hospital	50	10 (20%)
TOTAL	400	104 (26%)

NE = Number Examined; NI = Number Infected

3.2 Effect of Gestation and Parity on Malaria Prevalence

Highest prevalence of 27.3% was observed among women in the second trimester of pregnancy followed by 27% in the first trimester, with the least seen in the third trimester with 21.8% ($P<0.05$) (Table 2). Parity was statistically significant ($P<0.05$) as primigravidae (26.1%) and secundigravidae (31.5%) were more infected than multiparous women (3rd pregnancies and above) with 20% infection (Table 2).

Table 2: Effect of gestation and parity on the prevalence of malaria in pregnant women

GESTATION PERIOD	NE	NI (%)
First trimester	137	37 (27%)
Second trimester	176	48 (27.3%)
Third trimester	87	19 (21.8%)
PARITY	NE	NI (%)
First pregnancy	153	40 (26.1%)
Second pregnancy	127	40 (31.5%)
Third and above (Multiparous)	120	24 (20%)

NE = Number Examined; NI = Number Infected

3.3 Effect of Age on Malaria Prevalence

Malaria parasitemia was more prevalent in those between 21 – 30 years (27.8%), followed by the younger females of 11 – 20 years (26.9%) and was least in older females between 31 – 40 years (21.5%) (Table 3). Age was significant ($P<0.05$).

Table 3: Effect of age on prevalence of malaria in pregnant women

AGE (YEARS)	NE	NI (%)
11 – 20	145	39 (26.9%)
21 – 30	162	45 (27.8%)
31 – 40	93	20 (21.5%)

NE = Number Examined; NI = Number Infected

4. DISCUSSION

The overall prevalence of *Plasmodium falciparum* infection in this study was 26%. This rate is higher than 7.3% reported in Port Harcourt [Ibeziako *et al.*, 1980] and 6.8% reported in Calabar [Uko *et al.*, 1998]; comparable to 23% reported in Mozambique [Saute *et al.*, 2002], 26.75% reported in Malawi [Rogerson *et al.*, 2003] and 29% reported in Abakaliki [Nwonwu *et al.*, 2009] but much lower than 42% reported in Ghana [Mockenhaupt *et al.*, 2000], 57.5% reported in Gabon [Boyou – Akotet *et al.*, 2003], 54% reported in South East Nigeria [Nduka *et al.*, 2006] and 41% observed in Uyo [Opara *et al.*, 2004]. The low malaria prevalence rate observed in this study may be due to the location of this study (an urban environment) because the prevalence of malaria parasitemia is usually higher in rural environments where mosquito breeding and malaria transmission is more intense [Robert *et al.*, 2003; Byrne, 2007]. Also, the attitude of the pregnant women (starting pre – natal early in pregnancy and also adequately protecting themselves from mosquito bites) could be responsible for the reduced malaria prevalence rate in this study.

The high prevalence obtained within the first and second trimesters in this study, agreed with those of other studies which observed peak prevalence in weeks 10 – 20 of pregnancy [Zhou *et*

al., 2002; Anosike *et al.*, 2004]. This may be attributed to the expression of adherent proteins on the surface of infected red blood cells (IRBCs), enabling the IRBCs to adhere to micro – vascular capillaries of vital organs causing severe pathological condition [Miller *et al.*, 2002]. Also, parity played a role in the prevalence rates. Primigraviidae and secundigraviidae accounted for 26.1% and 31.5% respectively of the infection as against 20% in the multiparous pregnant women. This result is lower than the 64% reported in Gabon [Boyou – Akotet *et al.*, 2003]. It is comparable to the 26.2% reported among the primigraviidae in Malawi [Rogerson *et al.*, 2003] but disagrees with another research carried out in Mozambique [Saute *et al.*, 2002] that observed no significance in prevalence levels with parity. A study suggested that the early onset of efficient antibody response in multigraviidae and the delayed production of antibodies in primigraviidae appeared to account for the gravity – dependent and differential prevalence of *Plasmodium* malaria in pregnant women [Okoko *et al.*, 2003]. Furthermore, the study also reported that malaria infection of the placenta causes a shift from Th2 to Th1 cytokine profile that may be detrimental to pregnancy [Okoko *et al.*, 2003]. Another study showed that plasma from Kenya multigravid women inhibited adhesion of placental parasites to Chondroitin Sulfate A (CSA) [Duffy and Fried, 1999]. Malaria parasitemia in relation to age showed that pregnant women between 21 – 30 years had the highest prevalence rate of 27%, followed by the younger females of 11 – 20 years with a rate of 26% and was least in older females between 31 – 40 years with a rate of 21%. This report is similar to some other research carried out in Nigeria [Nduka *et al.*, 2006; Nnaji *et al.*, 2006]. The different malaria prevalence rates observed among these age groups could be attributed to the varying levels of awareness on malaria preventive measures.

5. CONCLUSION

The main epidemiological factor to *P. falciparum* infection in pregnancy should be considered in relation to the endemic malaria conditions under which women are living. Pregnancy is one of the factors affecting the rate of malaria parasite infection in women living in malaria – endemic communities. Proactive steps such as cleaning of waterways, maintaining a healthy environment condition (which discourages the breeding of mosquitoes) and other effective malaria control strategies would all have a synergistic effect in controlling malaria infection among pregnant women.

COMPETING INTEREST

Authors have declared that no competing interest exists

REFERENCES

- Agomo, P. U., Okonkwo, C. A., Asianya, O. O., Okoh, H. I. and Nebe, O. J. (2001). Comparative Evaluation of Immuno – Chromatographic Test (ICT) and Parasight ® - F for the Rapid Diagnosis of *Falciparum* Malaria in Nigeria. *Afri J Clin Exp Microbiol* 2: 45.
- Anosike, J. C., Nwoke, B. E. B., Njoku, A. J., Ukaga, C. N. and Onyekwere, O. C. (2004). A study on the prevalence of Malaria in pregnant women visiting antenatal clinic in Federal Medical Centre, Owerri. *A paper presented at the 28th annual conference of The Nigerian*

Society for Parasitology, September 22nd – 25th 2004, held at Imo State University Owerri.

Boyot – Akotet, M. K., Lonete – Collard, D. E., Mabika – Manfoumbi, M., Kendjo, E., Matsiegui, P. B., Mavoungou, E. and Kombila, M. (2003). Prevalence of *Plasmodium falciparum* infection in pregnant women in Gabon. *Malar J* **2**: 18 – 24.

Byrne, N. (2007). Urban malaria risk in sub – Saharan Africa: where is the evidence? *Travel Med Infect Dis* **5**(2): 135 – 7.

Duffy, P. E. and Fried, M. (1999). Malaria during pregnancy; parasites, antibodies and chondroitin sulphate – A. *Biochem Soc Trans* **27**: 478 – 482.

Ibeziako, P. A., Okerengwo, A. A. and William, A. I. O. (1980). Malaria immunity in Pregnant Nigerian Women and their babies. *J Gynaecol Obstet* **18**: 147 – 149.

Meeusen, E. N., Bischof, R. F. and Lere, C. S. (2001). Comparative T.Cell responses during pregnancy in large animals and humans. *Am J Reproach Immunol* **46**: 169 – 179.

Miller, L. H., Baruch, D. I., Marsh, K. and Doumbo, O. K. (2002). The pathogenic basis of Malaria. *Sci* **45**: 673 – 679.

Mockenhaupt, F. P., Rong, B., Till, H., Eggelte, T. A., Beck, S., Gyasi – Sarpong, C., Thompson, W. N. and Bienzle, U. (2000). Submicroscopic *Plasmodium falciparum* infections in pregnancy in Ghana. *Trop Med Int Health* **5**: 167 – 173.

Nduka, F. O., Egbu, A., Okafor, C. and Nwaugo, V. O. (2006). Prevalence of malaria parasites and anaemia in pregnant and non – pregnant women in Aba and Okigwe towns of Southeast Nigeria. *Ani Res Int* **3**(3): 508 – 512.

Newman, R. D., Hailemariam, A., Jimma, D., Degifie, A., Kebede, D., Rietveld, A. E., Nahlen, B. L., Barnwell, J. W., Steketee, R. W. and Parise, M. E. (2003). Burden of malaria during pregnancy in areas of stable and unstable transmission in Ethiopia during a non – epidemic year. *J Infect Dis* **187**: 1765 – 1772.

Nnaji, G. A., Okafor, C. I. and Ikechebelu, J. I. (2006). An evaluation of the effect of parity and age on malaria parasitemia in pregnancy. *J Obstet Gynaecol* **26**(8): 755 – 8.

Nwonwu, E. U., Ibekwe, P. C., Ugwu, J. I., Obarezi, H. C. and Nwagbara, O. C. (2009). Prevalence of malaria parasitemia and malaria related anaemia amongst pregnant women in Abakaliki, Southeast Nigeria. *Nig J Clin Pract* **12**:182 – 6.

Okoko, B. J., Enwere, G. and Ota, M. O. C. (2003). The epidemiology and consequences of Maternal Malaria. A review of immunological basis. *Acta Tropica* **7**: 193 – 205.

- Opara, K. N., Ibanga, E. S., Wali, N. B. and Usip, L. P. (2004). *Falciparum* Malaria and susceptibility to genetic markers of pregnant women in Uyo, Southeast Nigeria. *Abstract of the 28th Annual Conference of the Nigeria Society of Parasitology* held at Imo State University Owerri. Pp 76.
- Robert, V., MaCintyre, K., Keating, J., Trape, J. F., Duchemin, J. B., Warren, M. and Beier, J. C. (2003). Malaria transmission in Urban sub – Saharan Africa. *Am J Trop Med Hyg* **68**: 169 – 76.
- Rogerson, S. J. and Boeuf, P. (2007). New approaches to malaria in pregnancy. *Parasitol* **134**: 1883 – 1893.
- Rogerson, S. J., Mkundika, P. and Kanjala, M. K. (2003). Diagnosis of *Plasmodium falciparum* Malaria at delivery: Comparison of Blood Film Preparation Methods and of Blood Films with Histology. *J Clin Microbiol* **41**: 1370 – 1374.
- Sauté, F., Menendez, C., Mayor, A., Aponte, J., Gomez – Olive, X., Dgedge, M. and Alonso, P. (2002). Malaria in Pregnancy in Rural Mozambique: The role of Parity Submicroscopic and Multiple *Plasmodium falciparum* infection. *Trop Med Int Health* **7**: 19 – 28.
- Steketee, R. W. and Mutabingwa, T. K. (1999). Malaria in Pregnant Women: Research, Epidemiology, policy and practice. *Annals of Trop Med and Parasitol* **93**: s7 – s9.
- Uko, E. K., Emeribe, A. O. and Ejezie, G. C. (1998). Malaria infection of the placenta and Neonatal Low Birth Weight in Calabar. *J Med Lab Sci* **7**: 7 – 20.
- WHO (2008). World Malaria Report 2008, Switzerland. Pp 99 – 101.
- Zhou, A., Megnekou, R., Leke, R., Fogako, J., Metenou, S., Trock, B., Taylor, D. W. and Leke, R. F. (2002). Prevalence of *Plasmodium falciparum* infection in Pregnant Cameroonian women. *Am J Trop Med Hyg* **67**(6): 566 – 570.