Antenatal Malaria Parasitaemia And Haemoglobin Profile Of Pregnant Mothers In Awka, Anambra State, Southeast Nigeria

E Mbanefo, J Umeh, V Oguoma, C Eneanya

Citation

E Mbanefo, J Umeh, V Oguoma, C Eneanya. *Antenatal Malaria Parasitaemia And Haemoglobin Profile Of Pregnant Mothers In Awka, Anambra State, Southeast Nigeria*. The Internet Journal of Parasitic Diseases. 2008 Volume 4 Number 1.

Abstract

Three hundred and two women comprising 242 pregnant women attending antenatal clinic and 60 non pregnant women that served as control group, were tested for malaria parasites using Giemsa stained thick films. The haemoglobin concentration of the mothers were also tested and matched with their infection status. The findings show that malaria parasitaemia and intensity are dependent on pregnancy and parity of pregnancy ($p < 0.05$). It demonstrated that anaemia is a common feature of malaria infection, more severe during pregnancy especially in the first pregnancy. There was a downward gradation in the prevalence of low haemoglobin levels from primiparae to the control group in both infected and uninfected populations. Over 70% of primigravid mothers, 45% of the multiparae and only 22% of the control group recorded haemoglobin levels lower than the World Health Organization benchmark (11.0g/dl). Anaemia was therefore dependent on infection status, pregnancy status and parity of pregnancy ($p <0.05$). The effects of malaria and its clinical features (especially anaemia) on the mother and foetus was again re-stressed with emphasis on availability, affordability and sustainability of malaria control efforts especially for the most vulnerable populations. The study will be of immense value as a public health tool for planning, delivery, monitoring and evaluation of interventions.

INTRODUCTION

Malaria remains one of the leading causes of morbidity and mortality worldwide, causing about 3000 deaths per day (1). Malaria caused by the protozoan parasite of the genus Plasmodium debilitates and kills more people than any other single infectious disease (2). Every year, 300 to 500 million clinical cases of malaria, accounting for over one million deaths are recorded globally (3). Over 90% of all cases of malaria occur in Africa, south of the Sahara (4, 5, 1).

Malaria infection during pregnancy is a major public health problem in the tropics and sub-tropics. In the endemic areas of the world, children under the age of five and women in their first pregnancy are most vulnerable to the disease (2). Each year, approximately 25 million African women get pregnant in malarious areas of Africa, most of who reside in areas of relatively stable malaria transmission (6). The burden of malaria in pregnancy is caused chiefly by Plasmodium falciparum, the most virulent of the Plasmodium parasites, especially in the sub-Saharan Africa (7).

Malaria infection during pregnancy can have adverse effects on both the mother and the foetus, including maternal anaemia, foetal loss, premature labour, intrauterine growth retardation, delivery of low birth weight babies (< 2.5 kg) and sometimes maternal death (8). In areas of stable (high and moderate) malaria transmission, women have gained a level of immunity to malaria that somewhat wanes during pregnancy. Here, malaria infection is more likely to result in severe maternal anaemia and delivery of low birth weight infants, which has been identified as a leading cause of poor infant survival and development in Africa.

In unstable (low) malaria transmission areas, women generally have developed no significant level of immunity and usually become ill when infected. The risk of developing severe disease is 2 to 3 times greater than their non-pregnant counterparts living in the same area (9). In these areas, malaria infection is more likely to result in spontaneous abortions, foetal loss and low birth weight (10). Also, death due to maternal anaemia may occur among pregnant women (11).

Anaemia in pregnancy is an important public health concern in developing countries (more pronounced in primigravidae

than in multigravidae) (12, 13, 14, 15). The aetiology of malaria in pregnancy is multifactorial; causes include poor nutrition, malaria, haemoglobinopathies, advanced HIV infection and infection with other parasites (mainly hookworm), which together contribute to increases maternal and neonatal morbidity and mortality (16, 17, 10). Though most of the causes are preventable, the overall prevalence of anaemia in pregnancy continues to be a common clinical problem in the third world (18).

Anaemia has been reported to contribute significantly to both maternal and foetal morbidity (19) and it is also found to have a serious effect on neonatal birth weight (20). Different studies have confirmed that majority of pregnant women in developing countries are anaemic (21, 14). Pregnant women especially the primigravidae, represent the most important risk group of malaria among the adult population. The objectives of this study is to determine the antenatal malaria parasitaemia and the haemoglobin profile of pregnant mothers attending antenatal clinic in the centre; and to determine the relationship if any, between prevalence of malaria and haemoglobin concentration in pregnant women. The findings from the study will also serve as a tool in evidence based health education on the need to intensify efforts at malaria prevention during pregnancy through prompt access to effective treatment, intermittent preventive treatment and the consistent use of insecticide treated nets.

MATERIALS AND METHODS

STUDY AREA

Awka, the capital city of Anambra state is located at latitude 6.1oN and longitude 7.0oE in the rainforest belt, Southeast, Nigeria. It has an annual rainfall of between 152cm and 203cm. The temperature ranges between 22oC and 33oC. The study site Amaku General Hospital, is the major government owned health care facility and serves as the major reference point for the other public, mission and private health centres in Awka metropolis.

STUDY POPULATION

The study population was drawn from both primigravid and multigravid women, attending antenatal clinic at the general hospital, including a group of non-pregnant women to serve as the control. Prior to sample collection, advocacy was sought from the Board of the Hospital and the research endorsed by the ethical committee. Three hundred and two (302) women comprising 98 primiparae, 144 multiparae and 60 non-pregnant control groups were enlisted after a non-coercive informed consent.

PROCEDURE

Using a sterile syringe, 2ml of venous blood was collected from each of the subjects and transferred into a sterile EDTA container. A drop of blood was used in making thick blood films. The thick films were stained using Giemsa stains as described by (22) and examined microscopically using 100X objective after applying a small drop of immersion oil. The intensity of infection was also estimated based on the number of parasites counted per high power field of the microscope using the plus sign system. The remaining venous blood was then used in the estimation of the Haemoglobin level of each subject and the results matched with the respective malaria infection status. Information on the socio-demographic data, parity of pregnancy, chemoprophylaxis and prophylactic practices of the women were also obtained and recorded using a mini questionnaire. The data was subjected to statistical analysis (chi-square) to determine the significance of the observed differences in the study sample.

RESULTS

Out of the 302 women examined, 118 (39.07%) were positive for malaria parasites (Table 1). Prevalence was highest in the primiparae (52.04%), followed by the multiparae (40.28) and least in the control group (15.00%). The primiparae also recorded the highest intensity of infection (Table 2). There is a gradation of prevalence and intensity from primiparae to the control group. Prevalence and intensity of malaria among the study population were found to be dependent on pregnancy and the parity of pregnancy ($p < 0.05$).

Figure 1

Table 1: Malaria parasitaemia by parity groups

Parity	No Sampled	No Positive (%)	No Negative (%)
Primiparae	98	51 (52.04)	47 (47.96)
Multiparae	144	58 (40.28)	86 (59.72)
Control	60	9 (15.00)	51 (85.00)
Total	302	118 (39.07)	184 (60.93)

Figure 2

Table 2: Intensity of malaria by parity groups

Intensity	Primiparae (%)	Multiparae (%)	Control (%)	Total (%)
1-10/100hpf (54.24)	20 (39.22)	37 (63.79)	7 (77.78)	64
11-100/100hpf (43.22)	28 (54.90)	21 (36.21)	2 (22.22)	51
1-10/hpf	3 (5.88)	0 (0.00)	0 (0.00)	3 (2.54)
11-100/hpf	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total	51 (52.04)	58 (40.28)	9 (15.00)	118 (39.07)

Figure 3

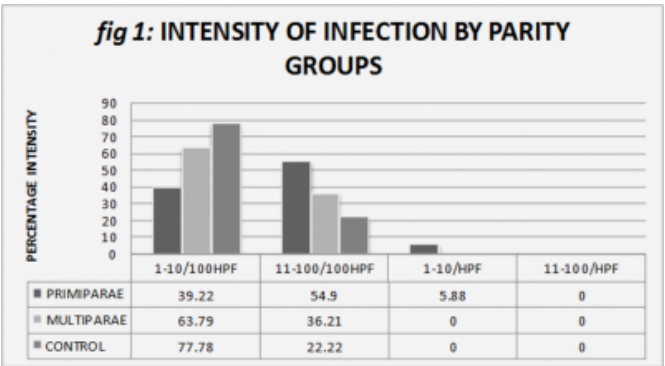

Figure 4

Table 3: Haemoglobin Profile of malaria positive women by parity groups

Haemoglobin	Primiparae (%)	Multiparae (%)	Control (%)	Total
< 9.0	6 (11.76)	5 (8.62)	0 (0.00)	11
9.0-10.9	30 (58.82)	21 (36.21)	2 (22.22)	53
11.0-12.9	11 (21.57)	20 (34.48)	28 (44.45)	59
13.0-14.9	4 (7.84)	12 (20.69)	2 (22.22)	18
> 15.0	0 (0.00)	0 (0.00)	1 (11.11)	1
Total	51 (52.04)	58 (40.28)	9 (15.00)	118

Figure 5

Table 4: Haemoglobin Profile of malaria negative women by parity groups

Haemoglobin	Primiparae (%)	Multiparae (%)	Control (%)	Total
< 9.0	2 (4.26)	1 (1.16)	0 (0.00)	3
9.0-10.9	25 (53.19)	22 (25.58)	2 (3.92)	49
11.0-12.9	15 (31.91)	46 (53.49)	25 (49.02)	86
13.0-14.9	5 (10.64)	17 (19.77)	21 (41.18)	43
> 15.0	0 (0.00)	0 (0.00)	3 (5.88)	3
Total	51 (52.04)	58 (40.28)	9 (15.00)	118

Tables 3 and 4 show that the haemoglobin profile of the women is highly dependent on malaria infection status and the parity of pregnancy. Over 70% of malaria positive primigravid mothers have haemoglobin levels below the World Health Organization benchmark for pregnant women (11 g/dl) while only 22.22% of the control group fall below this point. Even among the uninfected group, the primiparae still recorded a greater prevalence of low haemoglobin levels.

DISCUSSION

Pregnancy and the physiological changes associated with it, has been shown to be a predisposing factor of malaria, its associated maternal anaemia and the resultant reduction in Birth Weight. With increasing number of pregnancies, prevalence and parasite densities are declined and the effect of infection (LBW) is reduced (17).

The findings in this study have confirmed the high susceptibility of primiparae in malaria endemic regions. This could be due to the development of the new immunologically naive uteroplacental vasculature during the first pregnancy. It agrees with results from similar studies in Nigeria, Zaire, Kenya, Tanzania, Papua New Guinea and India (20, 13, 15, 14, 17, 21).

The pregnant women especially the primiparae recorded relatively lower haemoglobin levels as opposed to the control group, thus confirming that anaemia is an intrinsic feature of malaria which is more intense amidst pregnancy especially in the first pregnancy. This observation is attributable to the increased susceptibility to malaria and other infections during pregnancy, due to the suppression of the immune system to ensure the establishment and non rejection of the foetus as a foreign allograft (22).

Anaemia, attributable to malaria during pregnancy is a leading cause of maternal morbidity and mortality, abortion, foetal morbidity, still birth, intrauterine growth retardation and has been shown to have a serious effect on the infant birth weight. Thus, there is an urgent need for an intensified effort against malaria in pregnancy. The only way out of the menace of malaria during pregnancy is to adopt, practice and sustain the simple prophylactic measures targeted at preventing malaria transmission, especially during this inevitable period of immune depression. Prompt attack on malaria by the provision of access to effective treatment; reduction of contact with the vector Anopheles by correct and consistent use of insecticide impregnated bed-nets; and the compulsory and monitored standard chemoprophylactic practice (IPT) when applied in conjunction with other control measures will surely ameliorate the burden of malaria.

A massive health education campaign is recommended to improve the level of awareness of malaria, most importantly, of the preventive steps against the infection. Efforts should

also be geared towards improving availability, affordability and adaptability of these measures especially in the resource constrained settings. Political will, increased investment in interventions and a more intensified research in this area is strongly advocated.

ACKNOWLEDGEMENT

We appreciate the technical assistance from the medical laboratory personnel especially in sample collection and the unflinching support and encouragement from the Management Board of Amaku General Hospital, Awka, Anambra State, Southeast Nigeria.

References

1. Sahr, J. K. 2000. Malaria and its effect on vertebrate host. Clinical Medical Journal. 21: 97-202.
2. Sherman, I. W. 1998. A brief history of malaria and discovery of the parasite lifecycle. In malaria parasite biology, pathogenesis and protection. Sherman I. W. ed.. ASM press, Washington DC.
3. Kondrachine, A. V. and Trigg, P. T. 1997. The current global malaria situation 11-12 in Sherman ed. Malaria parasite biology, pathogenesis and protection. ASM press. Washington DC.
4. World Health Organization. 1995. Vector control for malaria and other mosquito borne diseases. Tech. Report Series, 857, 99pp
5. World Health Organization. 2002. Fact Sheet. No 203. Rool Back Malaria, Geneva
6. World Health Organization. 2004. A strategic framework for malaria prevention and control in African region. WHO document. AFR/MAL/04/01: 1-3
7. Wadie, B. O. 2002. Molecular approach to malaria. Medical Parasitology 28: 1671-1680
8. Kochar, O. K.; Thanvi, L.; Joshi, A.; Agarwal, N. and Jain N. 1999. Mortality trend in falciparum malaria, effects of gender differences and pregnancy. J. Ass. Phys. India. 47: 774-778
9. Luxemburger, C.; Mc Gready and Khan A. 2001. Effects of malaria during pregnancy on infant mortality in an area of low malaria transmission. American Journal of Epidemiology, 154: 459-465
10. Shulman, C. E. 1999. Malaria in pregnancy: Its relevance to safe motherhood programme. Ann. Trop. Med. Parasitology, 93: 39-66
11. Hammerick, A.; Campbell, O. M. and Chandramohan, D. 2002. Unstable malaria transmission and maternal mortality-experience from Rwanda. Trop. Med and Intl Health, 7(7): 573-576
12. Flemming, A. F. 1989. Tropical obstetrics and gynecology 1. Anaemia in pregnancy in Tropical Africa. Trans. Roy. Soc. Trop. Med. Hyg. 83: 441-8
13. Jackson, D. J.; Klee, E. B.; Green, S. D. R.; Mokili, J. L. K.; Elton, R. A. and Cutting, W. A. M. 1991. Severe anaemia in pregnancy: a problem of primigravidae in rural Zaire.. Trans. Roy. Soc. Med. Hyg. 85: 829-32
14. Matteelli, A.; Donato, F. and Shein, A. 1994. Malaria and anaemia in pregnant women in urban Zanzibar, Tanzania. Ann. Trop. Med. Parasitology 88: 475-83
15. Shulman, C. E.; Graham, W. J. and Jilo, H. 1996. Malaria is an important cause of anaemia in primigravidae: evidence for a district hospital in Coastal Kenya. Trans. Royal Soc. Trop. Med. Hyg. 90: 535-9
16. Mahomed, K. 2000. Iron and folate supplementation in pregnancy- Cochrane Database of systemic reviews (computer profile). 2: CD000169
17. Brabin, B. and Piper, C. 1997. Anaemia and malaria attributable low birth weight in two population in Papua New Guinea. Ann. Human Biol. 24: 547-555
18. Harrison, K. A. 1988. Severity of anaemia and operative mortality and morbidity. Lancet 1: 1392-1393.
19. Lassey, A. T.; Klufio, C. A.; Annan, B. D. and Wilson, J. B. 1999. Antenatal haemoglobin profile at Korlebu Teaching Hospital. East Africa Med Journal 76: 228-32.
20. Aribodor, D. N.; Nwaorgu, O. C.; Eneanya, C. I. and Aribodor, O. B. 2007. Malaria among primigravid women attending antenatal clinics in Awka, Anambra state, Southeast Nigeria. Nigeria Journal of Parasitology. 28(1): 25-27.
21. Singh, N.; Shukla, M. M. and Sharma, V. P. 1999. Epidemiology of malaria in central India. Bulletin of the World Health Org. 77: 567-572.
22. Akanbi, O. M.; Odaibo, A. B.; Afolabi, K. and Ademowo, O.G. 2004. Prevalence of Malaria and Anaemia in Pregnancy in Ibadan, South West Nigeria. The Nigeria Journal of Parasitology (25): 51-55.

Author Information

E.C. Mbanefo, B.Sc, M.Sc
Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Nigeria

JM Umeh, B.Sc, M.Sc
Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Nigeria

VM Oguoma, B.Sc, M.Sc
Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Nigeria

CI Eneanya, PhD
Department of Parasitology and Entomology, Nnamdi Azikiwe University, Awka, Nigeria