Manifestations of falciparum malaria in pregnant women of Eastern Sudan

Ishag Adam, *MD,* *Daw M. Ali,* *MD,* *Mustafa I. Elbashir,* *MD, PhD.*

ABSTRACT

Objective: This study was conducted to investigate the morbidity pattern of malaria during pregnancy in New Halfa Teaching Hospital, Eastern Sudan, where malaria transmission is unstable.

Methods: Pregnant (or in the puerperium) women presented with symptoms of falciparum malaria to the hospital during the period of November 2002 to March 2003 were enrolled to the study. Their socio-demographic characters, physical examinations, especially manifestations of severe falciparum malaria were performed and data were recorded. Blood films for malaria, urine, hemoglobin and blood glucose were tested.

Results: Fifty-nine pregnant (or in the puerperium) women with falciparum malaria were presented in this study. The mean ± SD gravidity was 3.3 ± 2.1. Fourteen (23.7%) out of 59 patients presented with one or more manifestations of severe malaria according to the World Health Organization criteria. Severe anemia (5), pulmonary edema (4), jaundice (3), hypoglycemia (3) and hypotension (1) were the manifestations of the severe illness. In comparison to non-severe group, patients with severe illness have significantly higher temperature and significantly lower hemoglobin level. The other parameters were not significantly different between the 2 groups of patients. In the severe cases, one patient was presented with missed second trimester abortion and the 6/59 (10.2%) patients delivered prematurely 4 were in the severe form. There were 4 perinatal deaths all in the severe group and there was one maternal death due to pulmonary edema.

Conclusion: In this locality not only primigravidae but all parities were infected with falciparum malaria and different manifestations of severity were detected. Higher perinatal mortalities were documented.

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Approximately 50 million pregnancies occur in malaria endemic areas every year, of which approximately half will occur in sub-Saharan Africa.[1] The presentation of malaria during pregnancy varies according to the pre-existing immunity of the mother. Among women without prior exposure to the malaria, or those living in areas of low transmission who have little immunity, pregnancy increases the likelihood that malaria will cause severe syndromes, such as cerebral malaria and pulmonary edema. In addition, a pregnant woman who develops severe malaria syndrome is more likely to die than non-pregnant counterpart. Women who live in areas of stable malaria transmission enjoy considerable systemic immunity. These women experience few symptoms during episodes of malaria, although they commonly develop severe anemia as consequence of the infection.[2-6]

In Sudan, falciparum malaria has been reported to cause different maternal and fetal adverse outcomes such as maternal anemia, low birth weight, perinatal mortality, and it is the main cause of maternal mortality.[7-9] In Eastern Sudan we have recently

From the Department of Obstetrics and Gynecology (Adam), Department of Medicine (Ali), New Halfa Teaching Hospital, New Halfa, and the Faculty of Medicine (Elbashir), University of Khartoum, Khartoum, *Suda*n.

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Address correspondence and reprint request to: Dr. Ishag Adam, Head, Department of Obstetrics and Gynecology, New Halfa Teaching Hospital, PO Box 61, New Halfa, *Sudan*. Tel. +249 421822101/421821880. Fax. +249 4218 22070. E-mail: ishagadam@hotmail.com

observed that falciparum malaria affects all parities and leads to reduction of maternal hemoglobin and the birth weight even after effective treatment.[10] While the epidemiology of malaria during pregnancy has been extensively studied in highly endemic areas, few data are available from areas with seasonal and unstable malaria.[11,12] The present study was conducted to investigate the morbidity pattern of malaria during pregnancy in Eastern Sudan, where malaria is mesoendemic and *Plasmodium falciparum* is predominant species.[13,14]

Methods. The study was carried out in New Halfa Teaching Hospital, Eastern Sudan during the period November 2002 to March 2003. After well-informed written consent, pregnant - or in the puerperium (delivery-42 days) - women with symptoms of falciparum malaria were enrolled in this study. Full history (history of malaria, its treatment and obstetrical history), physical examinations, especially manifestations of severe illness[15] were performed and data were recorded. Peripheral blood smears were prepared, stained with Giemsa and examined under oil immersion for parasite. Parasites and leucocytes were counted in the same fields until 200 leucocytes were counted; parasites densities were estimated using an assumed leucocyte count of 6000 leucocytes/mm^3 of blood. Urine analysis was carried out (including presence of hemoglobin) and blood was examined for hemoglobin level. Blood glucose level was determined on presentation and repeated 2 hours following quinine infusion or if hypoglycemia was suspected clinically. Ultrasound examination to estimate the gestational age and viability of the fetus was performed. Chest x-rays were performed, after the necessary protective precautions, if pulmonary edema was suspected and the pregnancy was more than 28 weeks. Then patients were allocated in different quinine regimens and they were kept in hospital for 7 days, the details of these has been mentioned previously.[16]

Abortion was defined as expulsion of fetus before 28 weeks. Premature labor means labor before completing 37 weeks. Anemia was defined as hemoglobin with <9.5 gm/dl and severe anemia as hemoglobin with <5 g/dl. Perinatal death means death from 28 weeks in-utero until the age of one week.

Data obtained were entered into a computer database. Statistical Package for Social Science software was used for statistical analysis. Simple frequencies and mean were calculated. Students' t-test, x^2 and Fisher's exact test were used to compare the data of severe and non-severe cases. A p value of < 0.05 was regarded as significant.

Results. Fifty-nine women presented to New Halfa Teaching Hospital with falciparum malaria, during the period of the study. Thirty out of 59 (50.8%) were in the third trimester, 21/59 (35.5%) in the second trimester, 4/59 (6.7%) in the first trimester and 4/59 (6.7%) in the puerperium. Patients' gravidity range were 1-8, the median was 3 and parity range from 0-8, the median was 2. The hemoglobin range from 5.5-10.5 g/dl, the median was 9 g/dl. **Table 1** shows the patients' different variables on presentation.

Fourteen out of 59 (23.7%) patients presented with one or more manifestations of severe illness. Severe anemia (5), pulmonary edema (4), Jaundice (3), hypoglycemia (3) and hypotension (1) were the presentations of patients with severe falciparum malaria and some patients presented with more than one manifestation.

The mean ± SD temperature was significantly higher in the patients with severe illness than in those with non-severe illness, (38.8 ± 1.2^{0}C versus 37.97 ± 0.88^{0}C, p<0.05). Patients with severe illness have significantly lower mean ± SD hemoglobin (8.4 ± 1.6 g/dl versus 8.7 ± 0.81 g/dl). There was no significant difference between the severe and non-severe in the age, parity, gestational age, weight, blood glucose and the parasite count.

Six (10.2%) out of 59 patients delivered prematurely, 4 out of these were severe cases and 2 were non-severe, p=0.009. Patients who delivered prematurely were not significantly different from those who delivered at term in different variables. There were 4 perinatal deaths due to pre-maturity and were all in the severe group. One patient from

Table 1 - Variables of patients presenting with falciparum malaria.

Variables	Mean ± SD
Age (years)	25.8 ± 6.5
Gravidity	3.3 ± 2.1
Parity	2.7 ± 2.06
Gestational age (weeks)	26.3 ± 9.4
Weight (kg)	55.9 ± 11.7
Temperature	38.1± 1.03
Hemoglobin (g/dl)	8.6 ± 1.05
Parasite count (rings /µl)*	1754.58 ± 10298.2
Blood glucose (mg/dl)	114.4 ± 28.3

*geometric mean

the severe form group presented with second trimester missed abortion and there was one maternal death due to pulmonary edema.

Discussion. The study was conducted to investigate the morbidity pattern of falciparum malaria in an area with unstable transmission in Eastern Sudan. The mean gravidity was 3.3 and the median was 3 and one patient was in her 8th pregnancy. We have previously observed that, pregnant women in Central Sudan with severe falciparum malaria present with the mean gravidity of 3.2 as well as the parity range 0-8 among the patients treated with artemether in New Halfa Teaching Hospital.[17,18] We have also recently reported that all parities were infected equally and there was no difference in the infection rates between primigravidae and porous women.[10] This is different from the morbidity pattern of falciparum malaria reported from areas with unstable transmission in Thailand, and from areas of intense malaria transmission in India and Gabon where primigravidae and secundigravidae were the most sufferer of the disease.[11,19, 20]

Over 80% of the patients presented in the second and third trimesters, and only 6.7% in the first trimester and 6.7% in the puerperium. As has been reported earlier, the prevalence of parasitemia is greatest in the second and third trimesters, and the susceptibility to clinical malaria appears higher in the second and third trimesters as well.[2,21] Moreover, the susceptibility to malaria may extend even to the postpartum.[21] We have recently observed that more than 40% of postoperative febrile morbidities following cesarean section were due to malaria.[22]

Fourteen out of 59 (23.7%) patients presented with severe form of malaria according to World Health Organization criteria.[15] This relatively high percentage of severe illness could be explained by the fact that many women in the area use to get treatment for falciparum malaria elsewhere but all patients with severe malaria present to hospital. However, severe falciparum malaria was three times higher in pregnant than in non-pregnant women living in area of unstable transmission in Thailand.[23] Anemia, pulmonary edema and jaundice were the leading presentations of severe illness in this study, none of these patients presented with hemoglobinuria. These manifestations were different from that which we have reported among pregnant Sudanese women in Central Sudan, where hemoglobinuria was one of the main presentations.[17] Nevertheless, we did not report hemoglobinuria among children presenting to New Halfa teaching hospital with severe falciparum malaria.[24] Nearly, all patients presented with fever and their mean temperature was 38.1^{0}C. The presenting temperature was significantly higher in the patients with severe illness; 38.8 ± 1.2^{0}C versus 37.97 ± 0.88^{0}C. Six (10.2%) out of 59 patients delivered prematurely and their parameters including the temperature were not different from those delivered at term. However, in a previous report from Central Sudan we have shown that 3/33 (9%) pregnant women with severe falciparum delivered prematurely and their presenting temperature was significantly higher than in those who delivered at term.[17] In neighboring Ethiopia an association was found between malaria and premature delivery.[12] Another study was carried out in an area of unstable transmission in Asia demonstrated association between febrile illness in the week before delivery and premature birth as well as an increased neonatal mortality.[25]

The study showed that 81.3% of the patients were anemic and the mean hemoglobin was 8.6 gm/dl. We have recently observed that women who were infected with falciparum malaria had significantly lower hemoglobin than those who were not infected.[10] This goes with the study conducted in Thailand, where malaria transmission is unstable.[11] Nevertheless, regardless of pre-pregnancy level of immunity against malaria, the most frequent consequence of malaria during pregnancy is anemia.[4]

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