Original Article

Does malaria during pregnancy affect the newborn?

Mohammad Yawar Yakoob[1], Asma Zakaria[1], Saima Naheed Waqar[1], Samiah Zafar[1], Ali Saeed Wahla[1], Sarah Kulsoom Zaidi[1], Arif R. Sarwari[2], Rahat N. Qureshi[3], Amna Rehana Siddiqui[1]

Departments of Community Health Sciences[1], Medicine[2] and Obstetrics and Gynaecology[3], The Aga Khan University, Karachi.

Abstract

Objective: To investigate the effect of malarial infection during pregnancy on the newborn.

Methods: A retrospective cohort study was conducted at The Aga Khan University Hospital (AKUH), Karachi, using in-patient hospital records over an 11-year period from 1988 to 1999. The incidence of preterm delivery, low birth weight (LBW) and intrauterine growth retardation (IUGR) in 29 pregnant women with malaria, was compared with that in 66 selected pregnant women without malaria, who delivered at the AKUH during the same time period.

Results: Pregnant women with malaria had a 3.1 times greater risk of preterm labor (p=0.14). They were more likely to be anaemic compared to women without malaria (RR=2.9, 95% CI=1.6-5.4) and had a significantly lower mean haemoglobin level (p=0.0001). Maternal malaria was significantly associated with LBW babies (p=0.001). The mean birth weight of infants born to pregnant women with malaria was 461 g less (p=0.0005). No significant association was, however, found between malarial infection during pregnancy and IUGR (p=0.33).

Conclusion: Malarial infection during pregnancy is associated with poor maternal and fetal outcome. It is significantly associated with maternal anaemia and LBW infants. Appropriate measures must, therefore, be taken to prevent malaria during pregnancy, especially in endemic areas (JPMA 55;543:2005).

Introduction

Malaria is one of the most important health problems in many parts of the world, 40% of the world population is exposed to this illness.[1] It kills more than one million people a year.[2] The four species of malarial parasite (Plasmodium) affecting man are P. falciparum, P. vivax, P. ovale and P. malariae.[3] P. falciparum causes more fulminant disease and complications like anaemia, black water fever, cerebral malaria, tropical splenomegaly syndrome and systemic shock (algid malaria).[3] P. vivax infects only young erythrocytes and, therefore, causes milder disease.[4] Infection with P. ovale and P. malariae is rare.[3]

Malaria is a major health problem in Pakistan today.[5] It is a leading cause of preventable deaths in the country.[6] The annual incidence of malaria in Pakistan was 62 per 100,000 population in 2001.[6] Transmission of malaria in this country is seasonal, and mostly occurs after the July-August monsoon.[7] Epidemics of malaria have also occurred periodically in Pakistan, major ones being in Punjab in 1975[8] and in N.W.F.P. in 1989-90.[9]

Pregnant women are at a greater risk of acquiring malaria due to depression of cell-mediated immunity.[4,10] Malaria in pregnancy can lead to death of the mother, abortion of the foetus or a still birth.[11] Low birth weight has also been described as one or the effects of malaria on the foetus.[1] The consequences of malaria in pregnancy have been widely evaluated in sub Saharan Africa, which is a stable endemic area for the disease.[12-15] A few studies[16,17] on this topic have, however, been carried out in the Indian subcontinent, which is an unstable area for malarial transmission.[9] This study was conducted to identify the effects of malaria during pregnancy on the mother and the newborn in our region.

Patients and Methods

A retrospective cohort study was conducted at AKUH, a 654-bed tertiary care referral centre in Karachi. The in-patient hospital records drawn over an 11-year period (from 1988 to 1999) identified 70 women admitted with the primary diagnosis of malaria during pregnancy. Thirty-five of these women delivered elsewhere and their delivery records were not accessible. Records of two more women were not found at the time of data collection. Four women with malaria had an abortion (termination of pregnancy before 20 weeks of gestation) and were also excluded from the study. The final number of women in the malaria exposed group was, therefore, 29. All women had malaria diagnosed on the basis of peripheral thick blood smear and delivered singleton live infants. Sixty-six women who had uneventful deliveries at AKUH during the same time period were selected to serve as the unexposed group.

Data was collected through a structured questionnaire which documented age of the mother, gravida status and haemoglobin level at delivery. Maternal records were also used to note the gestational age at delivery and the birth weight of the newborn.

Anaemia was defined as haemoglobin (Hb) of less

than 10 g/dL. Women who had Hb less than 7 g/dL were considered severely anaemic.

Delivery occurring before 37 completed weeks of gestation was considered preterm.

Low birth weight was defined as weight less than 2500 g at birth. Babies who had birth weight less than 10th percentile of expected weight at that particular gestational age were considered IUGR (intrauterine growth retardation).

Statistical Analysis was done by using Epi Info version 6.0. Student's t-test was used to compare means. Proportions were compared using Chi-square test (Yates corrected value was used where applicable). A p-value less than 0.05 was considered statistically significant.

Results

Maternal Characteristics

The exposed group consisted of 29 women who had malaria during pregnancy and delivered at the AKUH. Twenty-one women (72.4%) had infection with P.falciparum, while 8 (27.6%) had P.vivax on peripheral blood smear. The mean age of women in the exposed (25.9±5.1 years, range = 17-42) and the unexposed group (25.6±4.6 yrs, range = 17-39) was similar (p=0.91). Fifteen women (51.7%) in the malaria exposed group were primigravida, compared to 28 (42.4%) in the unexposed group (p=0.54). Women with malaria were 2.7 times more likely to have preterm delivery than women without malaria (RR=2.7, 95% CI = 0.9-8.2, p= 0.14) (Figure 1).

Malaria infected mothers were significantly more likely to be anaemic than uninfected mothers (RR = 2.9, 95% CI = 1.6-5.4, p=0.0015) (Figure 2). The mean Hb level at delivery in the exposed group (9.5±1.8 g/dL, range = 5.7-12.6) was significantly lower than in the unexposed

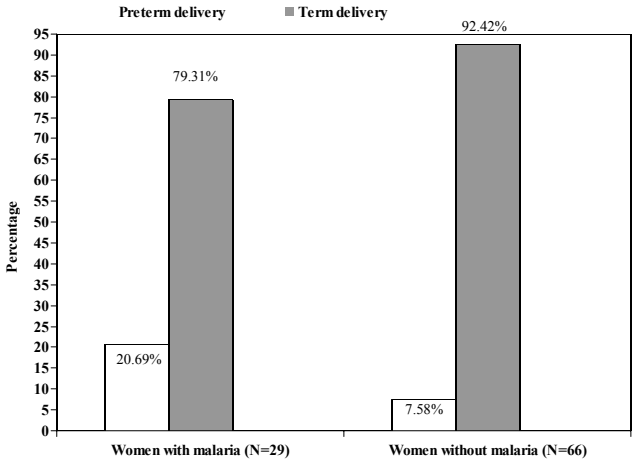

Figure 1. Percentage of term and preterm deliveries in pregnant women with and without malaria.

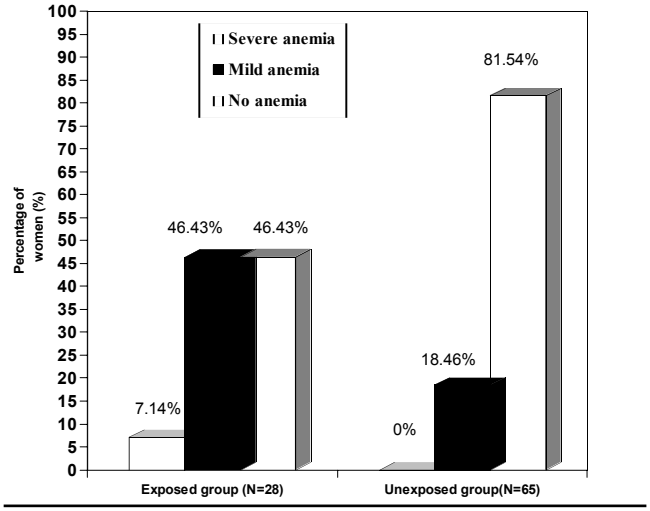

Figure 2. The percentage of women with severe (Hb<7 g/dL), mild (7≤Hb<10 g/dL) and no anaemia (Hb≥10 g/dL) in the two groups.

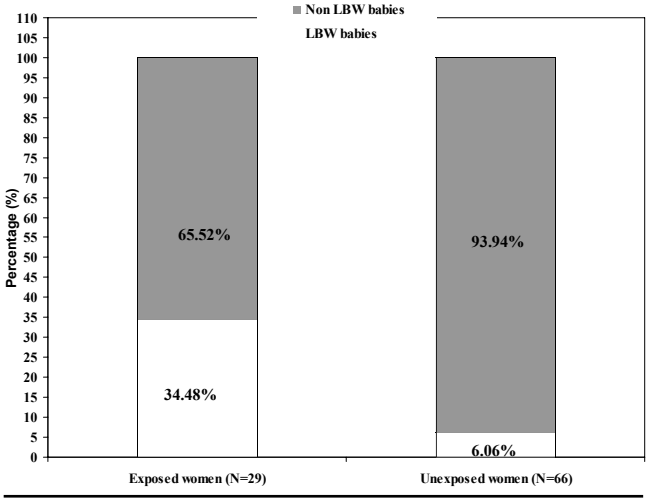

Figure 3. Percentage of low birth weight babies in the exposed and unexposed women.

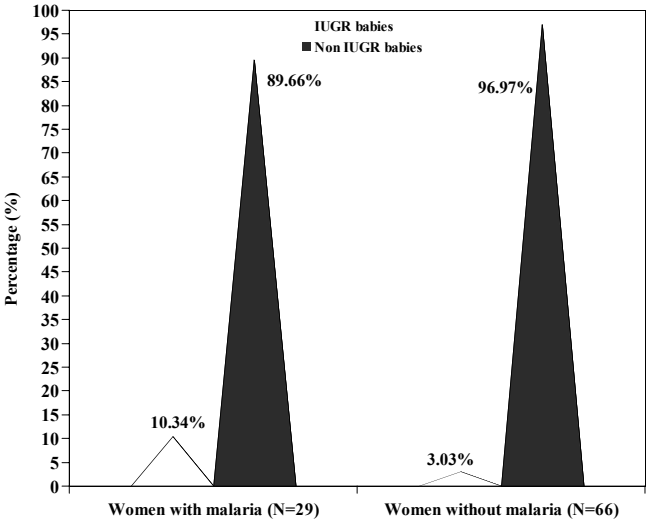

Figure 4. Proportion of babies with IUGR born to women with and without malaria.

(11.2±1.2 g/dL, range = 9.1-14.0) (p=0.0001). The Hb level was not available for one woman each in both groups.

Newborn Characteristics

Low birth weight was significantly more common in women with malaria (RR = 5.7, 95% CI = 1.9-16.7, p=0.001) (Figure 3). The mean birth weight of infants born to exposed mothers was 2611.9 g (SD = 605.5, range = 1500-3800), compared to 3072.8 g (SD = 423.8, range = 2100-3900) in infants of unexposed mothers. The difference in means was statistically significant (p=0.0005). Infected mothers were 3.4 times more likely to have IUGR babies than uninfected mothers (RR = 3.4, 95% CI = 0.6-19.4) (Figure 4). This association, however, did not achieve statistical significance (p=0.33).

Discussion

This study yielded some important information regarding the effect of malaria on the mother and the baby. Women with malaria during pregnancy were more likely to have preterm delivery (PTD). This association, however, was not statistically significant. This is similar to results of a study from Malawi in which maternal parasitemia and/or clinical malaria antenatally was not significantly associated with PTD.[13]

In our study, anaemia was significantly more common in infected compared to uninfected mothers. This is in agreement with results of some studies from sub-Saharan Africa[14] and India.[16,17] Other studies have reported significant association of malaria with anaemia only in primigravid mothers.[18] Our data, however, was not analyzed for primi- and multigravida separately.

Malaria may cause anaemia by haemolysis of parasitized red blood cells and suppression of haematopoiesis.[19] Anaemia in pregnancy, however, has multiple causes like iron deficiency, folate deficiency, poor nutrition and haemoglobinopathies.[20,21] In our study, these factors were not controlled for and so it is difficult to evaluate the contribution of malarial infection to anaemia in our exposed women.

The difference in mean Hb level (1.63 g/dL) in the two groups in our study was significant. A study on pregnant women with and without malaria in Lao PDR found a significant difference in mean Hb level of 1.84g/dL.[22] Other investigators have failed to find any significant difference in mean Hb levels of the two groups.[23]

Our study showed a significant association between malaria during pregnancy and the birth weight. This is in agreement with other studies on this topic.[15,17,24-27] Although, the difference in mean birth weight of 461 grams in our study is higher than other studies. The deficits in mean birth weight of singleton neonates of malaria infected mothers from Sierra Leone[24] and India[17] were 123 g, 264.7 g and 350g respectively.

Different hypotheses have been proposed for low birth weight in infected mothers. The malarial parasite can infest the placenta, leading to placental thickening and fibrin deposition, which impairs the transport of oxygen and nutrients to the foetus.[4] Maternal anaemia, age and pre-pregnancy nutritional status can also result in low birth weight babies.[1] In our study, we were unable to control these factors. Our findings are, therefore, limited by potential confounding.

We did not find a significant association between malarial infection and IUGR. This is in contrast to a study which reported a significant association between parasitemia and/or clinical malaria antenatally and IUGR (OR = 5.13, 95% CI = 1.4-19.4).[13] We had a small number of IUGR babies in both the groups, which may have decreased the power of our study to detect an association.

Maternal anaemia and low birth weight are leading contributors to maternal and newborn mortality respectively.[11] Our study shows a significant relationship between malaria during pregnancy and maternal anaemia as well as low birth weight in neonates. Efforts need to be made to prevent malaria during pregnancy either by chemoprophylaxis or use of bed nets. This is likely to have a favourable effect on child and mother survival in areas highly endemic for malaria.

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