Malaria parasite detection in matched peripheral and placental blood samples from delivering women in Blue Nile State, Sudan

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Background:

Early diagnosis and treatment of malaria infection are key factors to reduce malaria-related morbidity and mortality particularly during pregnancy which is a unique period of vulnerability to malaria infection. Placental infection presents an enormous diagnostic challenge as it results in maternal morbidity, premature delivery, intrauterine growth retardation, perinatal mortality, anaemia, abortion, low birth weight. Peripheral malaria parasitemia detected by microscopy in pregnant women does not always provide an accurate estimation of the prevalence of placental malaria parasitemia. Despite the huge burden of malaria in pregnancy, tools to diagnose malaria in pregnant women, especially when hidden in the placenta, have not been evaluated exhaustively. This information is needed to guide patient treatment and for the evaluation of alternative preventive strategies, such as intermittent screening and treatment.

The aim of the present study was to determine the performance of PCR assays in the determination of malaria infection at delivery in maternal peripheral blood and placental blood in comparison to microscopy.

Material/methods:

This was cross-sectional study performed at the main hospitals in Blue Nile state, Sudan during Sep.2012-Sep. 2013. Ethical approval was obtained from the ethical committee of the Directorate of Research, Federal Ministry of Health, Khartoum, Sudan. Delivering women aged between 17 and 46 years who provided informed consent were enrolled. Women's information was collected in a pre-designed questionnaire. Immediately following delivery, each pair of maternal and placental blood samples were collected to be analyzed for malaria parasite infection by performing the microscopy of Giemsa-stained thick and thin blood films and nested PCR.

Results:

An over all of 319 women delivering at the study sites were recruited, and a high rate of no or low education (72.1%) was reported. Moreover, two third of the women (66.5%) were anaemic at delivery, and the prevalence of low birth weight was 51.6%.

A total of 92 women (28.4%) had malaria parasite infection diagnosed by peripheral blood microscopy, while 131 (41.1%) had placental infection by microscopy. Using PCR, 164 women (51.1%) were malaria positive in peripheral and 226 (70.8%) were positive in placental blood.
The prevalence of infection was significantly higher in the placenta compared with the peripheral blood in the overall cohort by the two techniques (p< 0.001), and 29.4 % showed submicroscopic infections that was associated with placental malaria. Submicroscopic infections were associated with lower mean hemoglobin irrespective of gravidity ( p < 0.001). Moreover, both microscopic peripheral and placental parasitaemia was significantly associated with the low birth weight of the newborn (p=0.003).

**Conclusions:** Placental malaria is common in parturient women in Blue Nile state, Sudan and a symptomatic submicroscopic *P. falciparum* infection is associated with adverse pregnancy outcome. Sensitive diagnostic tools for detection of sub-microscopic infections are needed.