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Research Article

Congenital and neonatal malaria in Asian Indian population

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ABSTRACT

Background: Congenital malaria is defined as malarial parasites demonstrated in the peripheral blood smear of the newborn from twenty four hours to seven days of life. Malaria is endemic in India, neonatal disease is considered rare. Routine screening for malaria is essential for all neonates with fever in endemic areas. Early diagnosis and treatment of malaria could effectively prevent infant mortality. The aim of the present observational prospective study is to describe the occurrence and clinical spectrum of congenital *vivax* malaria in admitted neonates in Bikaner, India (low endemic region). Congenital malaria has been predominantly reported for *P. falciparum* from different parts of the world but the reports with *P. vivax* are very scanty.
Methods: This prospective study was conducted on admitted neonate from January 2011 to December 2012. The species diagnosis was done by peripheral blood smear examination and rapid diagnostic test. The possibilities of other disease/infections causing similar illness were investigated thoroughly and stringently. A structured questionnaire was used to collect clinical data on newborn and maternal health during pregnancy.
Results: A total of 1168 new born admitted in first week of life were screened. Out of them 23 (1.97%) had evidence of parasitaemia (*P. vivax* 17 and *P. falciparum* 6). The criteria for admission in these 17 neonates with congenital *vivax* malaria were LBW and prematurity (41.18%), septicemia (35.29%), perinatal asphyxia (17.65%), jaundice (17.65%) and seizures (5.88%).
Conclusions: This study emphasizes the occurrence of *P. vivax* congenital malaria even in neonates in low transmission area and without typical manifestations. The emphasis is also on the relevance even in very low transmission areas of not only maintaining, but even increasing clinical and epidemiological awareness of this preventable and treatable disease in pregnancy and in the neonate.

Keywords: Congenital malaria, *P. vivax*, Peripheral blood smear, Bikaner

INTRODUCTION

Congenital malaria is defined as malarial parasites demonstrated in the peripheral blood smear of the newborn from twenty four hours to seven days of life.[1] The clinical presentation is not always classical, but it may lead to increased morbidity and mortality of the newborn if not accurately diagnosed and treated. The most common clinical features in 80% of cases are fever, anaemia, and splenomegaly. Other signs and symptoms include hepatomegaly, jaundice, regurgitation, loose stools, and poor feeding. Occasionally, drowsiness, restlessness, and cyanosis may be seen. Respiratory distress, loose stools and hepatomegaly may also be present.[1]

Of all malaria cases reported in 2008, the vast majority (85%) were in Africa, followed by south East Asia

(10%). India contributes a large number of cases in the south-East Asia region. Although malariais endemic in India, neonatal disease is considered rare because of the protection provided by the passive acquisition of maternal antibodies and fetal hemoglobin.[2]

Both *Plasmodium falciparum* and *Plasmodium vivax* infections can cause adverse pregnancy outcomes, including maternal anaemia, low birth-weight due to preterm delivery and foetal growth restriction. Pregnant women are more susceptible than non-pregnant women to malaria, especially in first and second pregnancy. On the contrary, congenital malaria remains extremely rare both in endemic and non-endemic areas.[3] Congenital malaria has been predominantly reported for *P. falciparum* from different parts of the world but the reports with *P. vivax* are very scanty. Because no studies have been carried out to establish the magnitude of CM in malaria endemic regions in Bikaner North-Western part of Rajasthan, this study was designed to evaluate the prevalence of CM in a low-transmission region in Bikaner and to describe its clinical characteristics and outcome.

METHODS

This prospective study was conducted on neonate admitted in NICU, Department of peadiatrics, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan, India from January 2011 to December 2012. Bikaner is a part of Thar Desert and is hypo-endemic region for malaria. Informed consent to be obtained from the parents/guardian regarding inclusion of the neonate in the study. The chosen subjects were given a questionnaire to collect data on newborn and maternal health during pregnancy. Diagnostic methods used for detection of malaria parasites were conventional thick and thin PBFs, stained with Giemsa stain and examined under oil immersion. The slide was considered negative when there were no parasites in the 200 high-power field. The RDTs were based on detection of specific *Plasmodium* antigen, Lactate dehydrogenase (OptiMal test; Diamed AG, Cressier sur Morat, Switzerland) and histidine-rich protein-2 (Falcivax test; Zephyr Biomedical System, Goa, India). Other laboratory investigations, which were done in all the patients of severe malaria, included complete blood count, bleeding time, clotting time, blood glucose, renal function test, liver function test, complete urine analysis, electrocardiogram, and appropriate blood test to rule out typhoid fever, leptospirosis, and dengue infection (differential detection of IgG and IgM antibodies) and HIV. Depending upon the clinical situation, other tests included skigram chest, serum electrolytes, and arterial blood gas analysis for ARDS; fundus examination, cerebrospinal fluid (CSF) examination, Computerized Tomography (CT) of the head and electroencephalography (EEG) for Cerebral Malaria (CM); ultrasonography of whole abdomen and specific test for hepatitis B and C in hepatic dysfunction and jaundice; and Glucose-6-Phosphate Dehydrogenase (G6PD) enzyme level (kinetic method: G-SIX Kit, Crest Biosystems, Goa) for hemolysis. Blood culture was taken on brain-heart infusion broth in every patient who was having continuous high grade fever >101°F for more than 24 hours after admission. Parasite density was done in all the patients of severe *vivax* malaria.

The PCR confirmation was done in all the patients having severe manifestations with evidence of malaria on PBF and/or RDT.

Statistical analysis was done by using Chi-square test. Pre-admission drugs included antibiotics and antipyretics. Specific antimalarial treatment was given in the hospital according to WHO guideline.

RESULTS

Out of the 1168 admitted newborn, parasitaemia was detected in 37 (3.17%), of whom 23 (1.97%) [*P. vivax* 17 (1.46%) and *P. falciparum* 6 (0.51%)] were admitted within the first week of life. The criteria for admission in these 17 neonates with congenital *vivax* malaria were LBW and prematurity (7), septicemia (6), perinatal asphyxia (3), jaundice (3) and seizures (1). The clinical malaria was seen in 14 neonates in which spectrum was anemia (13), fever (11), hepatosplenomegaly (10), thrombocytopenia (10) and poor feeding / lethargy / irritability (9).

Although the presence of parasitaemia didn't differ the proportion of neonates having fever (χ^2=0.42; p=0.51) and hypoglycemia (χ^2=2.58; p=0.11) from those without parasitaemia, but was significantly associated with anemia (Hb <10 gm/dl) (χ^2=11.91; p<0.01). The mean Hb level was 8.6 ± 3.2 gm/dl; mean platelet count was 139025.32 ± 86236.56/µl; mean reticulocyte count was 3.2 ± 1.6%; and mean parasite density was 11855.38 ± 4123.21/mm^3. All these neonates were treated according to WHO guidelines and none of them was expired.

Table 1: Parasitemia positive cases.

Total No. cases	Positive cases	Negative cases
1168 (100%)	37 (3.17%)	1131 (96.83%)
	PV positive 17 (1.46%)	
	PF positive 6 (0.51%)	
	Clinical malaria 14 (82.35%)	

Table 2: Clinical presentation of neonate being admitted with *P. vivax* parasitaemia.

Clinical presentations	No. of cases
Prematurity	7 (41.18%)
Septicemia	6 (35.29%)
Perinatal asphyxia	3 (17.65%)
Jaundice	3 (17.65%)
Seizure	1 (5.88%)

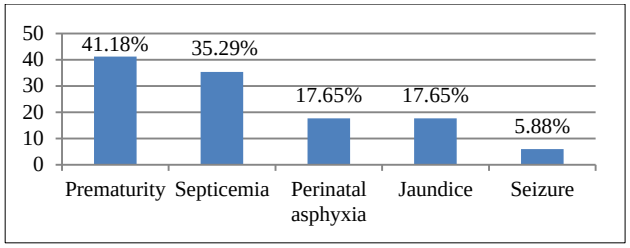

Figure 1: Clinical presentation of neonate being admitted with *P. vivax* parasite.

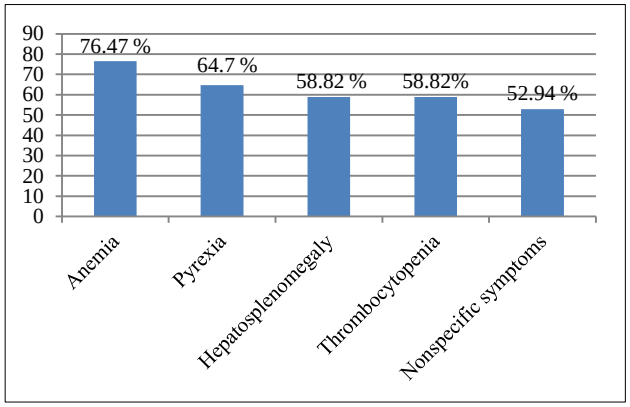

Figure 2: Clinical malarial spectrum of neonates with *P. vivax* parasitaemia.

DISCUSSION

In this study, one of the largest surveillance of neonates in a malaria endemic zone, blood slides for malaria parasites examination were systematically performed for all neonatal admissions. Out of the 1168 admitted newborn, prevalence parasitaemia was found in 37 (3.17%), of whom 23 (1.97%) [*P. vivax* 17 (1.46%) and *P. falciparum* 6 (0.51%)] were admitted within the first week of life. The criteria for admission in these 17 neonates with congenital *vivax* malaria were LBW and prematurity (7), septicemia (6), perinatal asphyxia (3), jaundice (3) and seizures (1). The clinical malaria was seen in 14 neonates in which spectrum was anemia (13), fever (11), hepatosplenomegaly (10), thrombocytopenia (10) and poor feeding/ lethargy/ irritability (9).

All these neonates were treated according to WHO guidelines and none of them was expired and chloroquine is the drug of choice for treatment. Congenital malaria is rare with occurrence rate of 0.3 % in immune mothers and 7.4% in nonimmune mothers.[1] The placenta is involved in most women who acquire malaria during pregnancy. It is not clear whether transmission to the infant is transplacental or from direct contact with maternal blood during labour and/or parturition. Most pregnancies resulting in congenital malaria are associated with a malaria attack during pregnancy, however congenital infection has been described after uncomplicated asymptomatic pregnancies.[1]

In our study prevalence of congenital malaria found to be 3.17%% among newborns. This finding is similar to a study from Uraba, Colombia and Karachi. Where a prevalence of 4.3% and 4.45% was reported respectively.[4,5] Prevention of malaria during pregnancy in non-endemic areas involves the use of chloroquine in the dose of 300 mg base/week. Its use in pregnancy may not be entirely safe as is demonstrated by the occurrence of severe vestibulo-cochlear paresis and posterior column defects in two babies born to a mother suffering from SLE and who was on chloroquine. The dose of chloroquine is four times higher than that recommended for anti-malarial prophylaxis and may be the cause of teratogenecity.[5] *P. vivax* infections during early pregnancy have been shown to result in low birth weight in 7 neonates which emphasizes the need to include early pregnancy in the prevention strategies of pregnancy associated malaria.

Women should be screened for malaria at every antenatal clinic visit, and treated if test results were positive. Although the effects of *P. vivax* infection during pregnancy have become increasingly documented. Efforts should be undertaken to increase staff training to limit the effect of malaria during pregnancy.[6] The prevalence of CM reported here was obtained using thick smear as the diagnostic test; however, a greater pre- valence might have been found if more sensitive techniques, such as PCR.[4] Educational campaigns informing women of childbearing age about the dangers of malaria in pregnancy and the potential benefits available to expectant mothers would help improve the rate of early attendance at the clinic.[7]

CONCLUSIONS

This study emphasizes the occurrence of *P. vivax* congenital malaria even in neonates in low transmission area and without typical manifestations. Congenital malaria is real and it is therefore recommended that babies born to mothers with malaria should be screened for congenital malaria. Furthermore all neonates with unexplained fever should be evaluated for congenital malaria and treated with effective anti-malaria drugs.

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Ethical approval: The study was approved by the institutional ethics committee

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