

Infantile Malaria in A Non-Endemic Region Associated With Transfusion Transmission in A Preterm Neonate

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Abstract

Malaria is a parasitic infection primarily transmitted through the bite of infected *Anopheles* mosquitoes and remains endemic in many tropical and subtropical regions. However, sporadic cases continue to be reported in non-endemic regions, particularly among vulnerable populations such as neonates, where transmission routes may be atypical. In such settings, two important non-vector transmission routes include congenital malaria and transfusion transmitted malaria. Congenital malaria occurs via transplacental transmission or exposure to maternal blood during delivery, whereas transfusion transmitted malaria results from infected donor blood. Congenital malaria typically presents within the first few weeks of life with nonspecific symptoms such as fever, anemia, hepatosplenomegaly, and thrombocytopenia. Transfusion transmitted malaria, although rare in non-endemic regions, remains a concern due to asymptomatic parasitemia in donors. Delayed diagnosis is common due to low clinical suspicion, making awareness of these alternative transmission routes critical. This report aims to highlight diagnostic challenges and emphasize the importance of considering transfusion related malaria in neonates in non-endemic regions.

Keywords: Neonatal malaria, *Plasmodium vivax*, Transfusion-transmitted infection, Preterm infant, non-endemic region, Congenital malaria differential.

Introduction

Malaria is a parasitic infection primarily transmitted through the bite of infected *Anopheles* mosquitoes and is endemic in many tropical and subtropical regions. However, sporadic cases of malaria continue to emerge even in non-endemic areas, particularly among vulnerable populations such as infants, where the route of transmission can be atypical [1]. In infants residing in non-endemic zones, two rare but clinically important transmission pathways are congenital malaria—transplacental transmission from mother to fetus—and transfusion-transmitted malaria resulting from infected donor blood [2,3]. Congenital malaria, although rare, has been increasingly recognized due to improved diagnostic techniques and clinical awareness. It typically presents within the first few weeks of life, often without maternal history of recent symptoms, owing to partially treated or subclinical infections during pregnancy [4]. The disease manifests as fever, hepatosplenomegaly, anemia, and thrombocytopenia in neonates and may be mistaken for other neonatal infections if not promptly identified [5]. Transfusion-related malaria is another significant concern in non-endemic regions where blood donors may be asymptomatic carriers, especially those from or with recent travel history to endemic zones. The lack of routine screening for malaria in blood banks in some non-endemic areas poses a risk for this mode of transmission [6,7]. *Plasmodium* species, particularly *P. falciparum* and *P. vivax*, have been implicated in such transmissions, with varying degrees of severity [8]. The diagnosis of malaria in infants in non-endemic regions often faces delays due to low clinical suspicion. Awareness of alternative transmission routes becomes critical, especially when there is no history of mosquito exposure [9]. Early identification and treatment are vital to prevent complications, including severe anemia, metabolic derangements, and mortality [10]. This paper explores the unusual presentation of infantile malaria in non-endemic settings, with a focus on distinguishing congenital from transfusion-related malaria, highlighting diagnostic challenges, clinical manifestations, and implications for public health policies in such regions.

Case Report

One of the triplets was born to 32 years old primi mother. The mother had conceived spontaneously and had regular antenatal follow-up. Pregnancy was complicated by PPROM for more than 24 hrs and Gestational diabetes which was well controlled with diet. The baby was born at 27 weeks by Cesarean section with good Apgar score. After birth she was intubated in view of poor respiratory effort. Baby had normal growth

parameters (Appropriate for gestational age). The baby was connected to invasive respiratory support with moderate parameters and received Two doses of surfactant based on chest X ray findings (Bilateral diffuse haziness suggestive of RDS), need of high FiO₂, ventilator parameters and clinical picture. The baby gradually weaned noninvasive respiratory support by day 24 of life. Cardiovascular wise the baby had soft systolic murmur. ECHO showed Moderate size PDA and was hemodynamically significant. The baby received two courses of Paracetamol. The baby started on IV antibiotics after septic screening, and it was given for 7 days based on lab reports and clinical grounds. Brain Scan was done on regular intervals which was normal. Trophic feeding started by day 2 and gradually increased based on tolerance. On and off the baby had feed intolerance which was managed conservatively. Baby received Packed RBC transfusion based on laboratory parameters and clinical findings. Packed RBC given on: DOL-11, DOL-15. On day 39 of life, the baby was on Neoblend with full feeds by NG tube and was noted to have frequent apnoea, temperature instability, desaturations with associated bradycardia. Baby was electively intubated and connected to ventilator with low parameters. Chest X rays showed para hilar and right upper zone haziness. In the next couple of days the respiratory support gradually weaned to noninvasive respiratory support. IV antibiotics were started and given for 10 days as Septic markers was positive but blood culture was sterile. In view of persistent anemia Blood film was sent which was positive for malaria parasite (P. Vivax ring form, gametocyte, schizonts and trophozoites). After discussion with the Infection team, Oral chloroquine and Primaquine were started. Repeat Blood film and malarial test were done after 7 days of therapy and it was negative for malaria parasite.

Baby received blood products (Packed RBC, Platelets transfusion) multiple times post diagnosis of neonatal malaria.

- Packed RBC: DOL-39, DOL-40, DOL-42
- Platelet rich concentrate: DOL-39(twice), DOL- 40(twice), DOL-41(twice)

Retrospectively maternal detailed history was reviewed:

1. Mother is from a non-endemic region.
2. No past history of fever or malaria or visit to endemic region.
3. No history of blood product transfusion till delivery

In the meantime, the blood bank was informed of the diagnosis of malaria in the neonates. All the donors' blood samples results were checked. Both the donors were tested for malaria in the pretransfusion screening, and both were negative for malaria antigen. Both the donors were called for a repeat blood test, but both were unavailable. The baby was discharged home on room air and full oral feeds. His vitals were normal and he was gaining weight.

Discussion

Malaria is a protozoal disease with significant global health impact in endemic countries. In humans it is caused by one of the five Plasmodium species with distinct vector, lifecycle and disease pattern. It is one of the major causes of preventable still births globally, only to be followed by Syphilis [11]. In endemic region malaria is transmitted by infected Mosquitoes bites depending on the type of malaria parasite (Falciparum, ovale, vivax, malariae or Knowlesi).

The incidence of infantile malaria in non-endemic regions is extremely rare [12] and most of the studies have reported an incidence rate of <1%. It can infect either by

- Contaminated Blood transfusion
- Congenital malaria or
- Bite by infected mosquitoes (Airport malaria)

Congenital malaria is defined as presence of malarial parasite in cord blood or peripheral blood film from birth till 7 days of life . The mechanism of transmission of malarial parasite is not clear whether it is transplacental or from direct contact with maternal blood during delivery [13]. The clinical signs and symptoms generally appear between day 10 to 30 of life depending on prematurity/ low birth weight status and immune status of the baby [14,15]. The clinical signs and symptoms are nonspecific including fever, anemia, respiratory distress, diarrhoea, splenomegaly etc. A high index of suspicion is required for diagnosis especially in non-endemic region. Most of the Preterms (especially extreme Preterms) admitted to NICU receive blood based on Lab or clinical conditions. Due to blood transfusion the infants are vulnerable candidates for post transfusion blood borne infection (HIV, HBV, Malaria etc). Blood transfusion associated malaria was 1st reported in 1911 (woolsey, 1911). The risk of malaria transmission is very low in non-endemic countries (1 per 4 million donor units) whereas in endemic

countries is high (>50 cases per million donor units) [16]. Among the Blood product transfusion, the transmission rate of malaria is maximum with fresh whole blood transfusion (<5 days Vs >12 days) as compared to other blood products [17].

Following characteristics the malarial parasite should have to spread by blood transfusion: (i) viable in the blood for long periods (ii) stable at low temperature (iii) long incubation period, and (iv) asymptomatic phase or only mild symptoms in the blood donors, hence not identifiable during the blood donor selection process [18].

For detection of malaria several test are in place like microscopic evaluation of thick and thin peripheral film, Rapid diagnostic test, PCR based test etc. The sensitivity and specificity of the test varies depending on parasite load. In non-endemic regions universal serological screening is not cost effective and screening of all donors at risk by travel based questionnaire can reduce wastage of resources.

In high income countries whole blood are rarely used for transfusion, the blood components are segregated. The blood products are treated by various means like photochemical treatment (with amotosalen and long wavelength ultra violet light) and pathogen reduction technologies [19,20].

Conclusion

Diagnosis of transfusion-associated malaria demands a high index of clinical suspicion. In any blood transfusion recipient presenting with non-specific symptoms unresponsive to antibiotics, antifungals, and with no evidence of viral infections, prompt evaluation for malaria should be considered.

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Declarations

Ethics approval and consent to participate: Ethical approval was obtained from the Institutional Ethics Committee of Latifa Women and Children Hospital, Dubai, UAE. All methods were carried out in accordance with the ethical standards of the Institutional Ethics Committee and in compliance with the Declaration of Helsinki (2013 revision) and CARE (CAsE REport) guidelines for reporting case reports. Written informed consent was obtained from the parents for participation and publication.

Consent for publication: Written informed consent for publication of this case report and accompanying clinical information was obtained from the parents of the patient. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Availability of data and materials: All data generated or analyzed during this study are included in this published article.

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Abbreviations

NICU – Neonatal Intensive Care Unit

PPROM – Preterm Premature Rupture of Membranes

PDA – Patent Ductus Arteriosus

RDS – Respiratory Distress Syndrome

PRBC – Packed Red Blood Cells

DOL – Day of Life

NG – Nasogastric

PCR – Polymerase Chain Reaction

UAE – United Arab Emirates

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