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Case Report OMICS International

High Schizontaemia and Pigment-Containing Leukocytes in a Child Living Urban Area of Malaria Low Transmission Setting

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Abstract

Background: Presence of *Plasmodium falciparum's* schizontes in peripheral blood is usually associated with severe malaria. However, presence of schizontes and pigment containing leucocytes is usually not recorded on the laboratory reports in clinical settings and yet theses stages findings may be helpful to manage the patient in context of low transmission of malaria. An uncomplicated form of falciparum malaria contrasting with high schizontaemia, in a child living urban area of Dakar is discussed.

Case presentation: A six-year-old boy presented to the health clinic of Pikine (Dakar) with fever, headache and abdominal pain. There was neither vomiting nor diarrhea. All physical examination was normal. HRP2 based rapid diagnostic test was intensively positive. Blood smear showed malaria parasites identified as Plasmodium falciparum with 3.6% parasitaemia. There was also high proportion of schizontaemia (0.4%) and malaria pigment-containing neutrophils and monocytes. Merozoite cluster and haemozoin pigment were observed into a monocyte, as a phagocytosis outcome.

There was no anaemia and all others laboratory tests were normal. Treatment consisted of classical artemisinin-based combination treatment. Recovery was noted at day 3, confirmed by negative microcopy. No further symptoms were noted.

Conclusion: Schizontes of Plasmodium falciparum usually sequester in microvascular so these stage is not seen in peripheral blood. In low transmission areas or in non-immune person the presence of schizontes in the peripheral circulation is associated with worse prognosis. This case, unexpected in view of the relatively moderate symptoms of the disease, was likely to be expression of good immune response against the blood stages of *P. falciparum*. Patients with a high parasite count (>4%) or presence of schizontaemia in a low transmission area but none of the clinical or laboratory indicators of severe malaria should be monitored closely.

Keywords: Plasmodium falciparum; Schizontaemia; Severe malaria; Uncomplicated malaria

Background

Sequestration of infected erythrocytes (RBCs) in the microvasculature is one of the main pathological features of severe Plasmodium falciparum infection [1]. RBCs infected with very young *P. falciparum* trophozoites (rings stages) circulate in the peripheral blood, but nearly all RBCs containing mature trophozoites and schizonts are sequestered in capillary vessels of different organs and are therefore often absent in collected peripheral blood samples [1-7]. However, the appearance of schizonts in peripheral blood smears is thought to reflect a high sequestered parasite burden and was recognized as a sign of severe disease already in early field studies on malaria. Presence of schizonts on admission was associated with a high positive predictive value for severe malaria [1]. Also the presence of pigment in the neutrophils are good indicators of more severe infection and warrant the clinician's attention as these patients may rapidly deteriorate [3]. This case highlights the need to report a detailed reporting when providing a thick/thin smear.

The following case demonstrates contrast between clinically uncomplicated falciparum malaria and high parasitaemia, high schizontaemia and pigment-containing leucocytes. Also, those biological parameters are not recorded.

Case Presentation

A six-year-old boy living in Pikine (suburbs of Dakar, Senegal) enrolled in Koranic school visited the malaria health post in the same area. He was from Guinea Bissau (high transmission area in south of Senegal) and came to Dakar one year ago. His main complaints were headaches, chills and abdominal pain. He denied ever having took malaria drug in the past and there was no particular previous medical or surgical history. He was fully conscious and had an axillary temperature of 40.5°C. Spleen and liver was not palpable and there was no sign of clinical anemia and even less jaundice. All others physical examinations were normal without any sign of severe malaria.

A rapid diagnostic test was taken for suspected malaria. Once the test was positive, thick and thin blood smear was made and stained with 10% Giemsa solution. Microscopy showed infected red blood cells (IRBC) by trophozoites of *P. falciparum* with 3.6% of parasitaemia

(140,400/µL). *P. falciparum's* schizontes were also noted at 0.4% of parasitaemia (15,600/µL) (Figures 1 and 2).

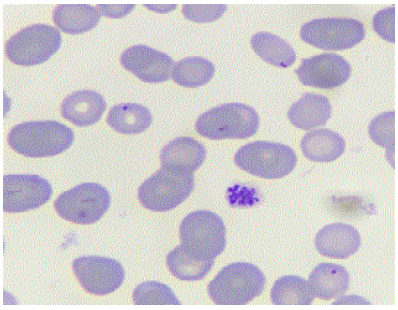

Figure 1: Thin smear showing IRBC by schizont (red arrow) and young trophozoites (black arrow) (Giemsa staining x 100).

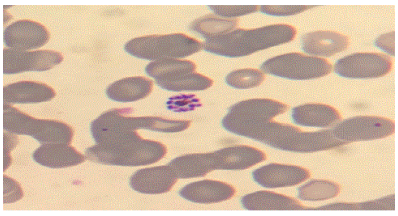

Figure 2: Thin smear showing mature schizont with central malaria pigment (Giemsa staining x 100).

Biological tests showed normal glycaemia (0.98 g/l), no anemia (Hemoglobin 8.6 g/dl), mild thrombocytopenia (Platelet 110,000/µL). The total white blood cell count was normal (6,400/µL). The differential leucocytes showed presence of bands and degranulated in the majority of neutrophils. In some of the peripheral blood smears examined, monocytes and neutrophils contained malaria pigment (Figures 3 and 4). Less than 1% of leukocytes contained pigment. There was also a monocyte containing in its cytoplasm a cluster of merozoites resulting as a phenomenon of phagocytosis (Figure 5).

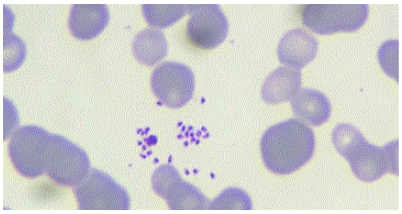

Figure 3: Thin smear showing ruptured schizont with 28 free merozoites and concentrated hemozoin (Giemsa staining x100).

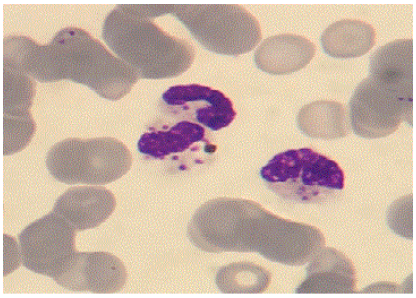

Figure 4: Thin smear showing malaria pigment contained in neutrophil (red borrow) and merozoites inside leucocytes (black arrow) (Giemsa staining x100).

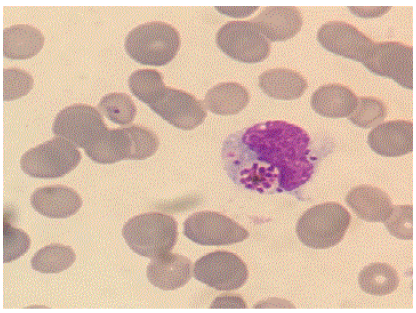

Figure 5: Thin smear showing a monocyte phagocytosis of schizont (Giemsa staining x100).

Patient was immediately treated according to the national treatment guideline for uncomplicated falciparum malaria since WHO criteria for severe malaria was not met. Treatment consisted of oral artemisinin-based combination treatment: Artemether 20 mg Lumefantrin 120 mg in twice daily administration.

Then patient was closely under surveillance because of microscopic features described above. At day 3 of treatment, the patient recovered with no further symptoms.

Discussion

Malaria danger signs are clinical indicators of severity and are useful to predict complications or death. In the malaria patient, clinical or parasitological signs can be easily recognized during the acute phase of the illness that indicate serious complications. Danger signs include neurological change, abnormal breathing pattern, persistent vomiting and diarrhea, jaundice, bleeding, dark urine, delayed capillary refill, intense pallor, hyperpyrexia, hyperparasitemia and schizontaemia [5]. In children in areas of unstable endemicity, a peripheral parasitaemia of 4% or more (≥ 4% of circulating red cells contain parasites) carried an increased risk of death [8,9]. In this case, the parasitaemia was slightly below the WHO Malaria Treatment Guidelines 2006 cut-off for hyperparasitaemia (4% IRBC in a low transmission area). However, the relation of parasitaemia to severity of illness is different in different populations and age groups, and there has been considerable debate whether it should be included at all in definitions of severity. Thus, a 4% parasitaemia in non-immune children or adults should be

considered an indicator of high risk requiring supervised management but not by itself a criterion of severe malaria [8].

Beside the absolute parasite density, the presence of schizonts on the blood film and pigment in the neutrophils are good indicators of more severe infection and warrant the clinician's attention as these patients may rapidly deteriorate [3]. In a study, schizontaemia was found to be significantly correlated with parasite density, severe malaria, impaired consciousness, pulmonary edema, hypoglycemia, jaundice and hemoglobinuria and schizontaemia was considered as an indicator of severe malaria [6]. In this clinical presentation there were no signs that would guide the physician towards classifying this patient as having severe malaria [9]. Some authors report that despite this, such a patient should be treated according to the WHO severe malaria on the basis of the high schizont count and the presence of pigment [3]. This protocol was not followed in this case and patient was treated as uncomplicated falciparum malaria as none of the WHO severe malaria criteria was strictly met. However, the patient was closely under surveillance for possible deterioration. As day 3 of treatment, fever disappeared and negative microscopy confirmed the effectiveness of treatment.

This report comes from an urban area of Dakar where malaria transmission is very low. In such areas where immunity remains poor across all age groups, even a low schizont count is an indicator for close patient observation [3]. That rises the question of how a child with supposed poor immunity could tolerate such a high count of schizont. Maybe, there are strains of Plasmodium falciparum which more nearly follow the pattern of asexual distribution of other species; or maybe this child has an overworked and partly blocked reticulo-endothelial system which allows schizonts to overflow into the peripheral blood more freely than is usual [2]; or most likely he acquired strong immunity during his five first years in Guinea Bissau and that immunity was still protecting him.

Also, the quantity of malaria pigment liberated into the circulation at schizogony reflects the pathogenic sequestered parasite burden in Plasmodium falciparum malaria, and may therefore be a measure of disease severity. In a study, among adult patients with severe falciparum malaria, the most of who died had significantly higher proportions of malaria pigment-containing neutrophils on admission and pigment-containing monocytes [4]. Thus, more than 5% of peripheral blood neutrophils containing malaria pigment is associated with a poor prognosis [3]; although a study of 26,296 children admitted to six hospitals in Africa concluded, after multivariate analysis, that 'associations between pigment-containing cells (neutrophils, mononuclear cells and erythrocytes) and mortality were moderate to nonexistent in most sites [8].

Conclusion

Reliable examination of the peripheral blood slide by considering all the details may be helpful when deciding a protocol of treatment or surveillance. Patients with a high parasite count (>4%) or presence of schizontaemia or high proportions of pigment-containing leukocytes in a low transmission setting but none of the clinical or laboratory indicators of severe malaria should be monitored closely, preferably in hospital for the first day of treatment and if in doubt, treated as severe malaria.

Competing Interests

The authors declare that they have no competing interests.

Author's Contribution

All authors made substantial contributions to the investigations presented in this manuscript. MAD wrote the article. TN and MSY collected the sample and performed Rapid Diagnsotic Test and helped in the acquisition of clinical data. YDN carried out thick and smear. KD and MAD estimated parasitaemia. MAD drafted the manuscript with contributions of ASB, MN, ON, DN. All authors read and approved the final manuscript.

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