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Falciparum malaria case acquired by wound exposed to the blood of infected malaria patient

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Abstract

Malaria is a serious Anopheles mosquito-borne disease. It is not endemic in Egypt but continues to be imported by travelers returning from endemic areas. The transmission of malaria in non-endemic areas is an extremely unusual event, but it is possible under certain conditions.

Herein, we report a case of prolonged fever in a patient living in the countryside of Egypt with no reported travel history following accidental blood exposure to a malaria patient. The purpose is to shed light on this rare mode of malaria transmission and also to alert physicians and infectious disease specialists to consider malaria in the differential diagnosis in case of contact history to the blood of a malaria patient.

Keywords Malaria, Post-injury, Trauma, Fever of unknown etiology

Background

Malaria is rare in non-endemic countries (like Egypt), and locally acquired infections particularly with plasmodium falciparum are exceptional events. The diagnosis is, therefore, likely to be delayed or missed in patients without a relevant travel history [1].

Apart from the Anopheles vector, malaria could be transmitted through nosocomial, blood transfusion, or needle-stick injury [2].

We present a 60-year-old female patient who presented with prolonged fever of unknown etiology and was ultimately diagnosed as falciparum malaria transmitted through blood contaminated with malaria parasites from an open wound injury.

She had never been traveled outside her local village and had not exposed to recent or remote operative surgery. She had no history of blood transfusion, but she was in contact with her feverish son who recently came from Nigeria. She had a trivial wound in the palm of her hand that was soaked with her son's blood after falling unconscious to the ground, and he was admitted to the intensive care unit and diagnosed with cerebral malaria. He was treated and recovered, but after 2 weeks, the mother started to suffer from a persistent mysterious fever for 3 weeks. Lastly, diagnosed as falciparum malaria, so the transmission of malaria in the non-endemic area is extremely unusual, but is possible under certain conditions.

Plasmodium falciparum-infected individuals without a relevant travel history are at high risk of a delayed or missed diagnosis and consequently, of developing potentially life-threatening severe falciparum malaria [3].

Case presentation

A 60-year-old female patient presented to the hospital with prolonged fever and rigors for 3 weeks. She had also experienced episodic headaches as well as intermittent abdominal pain. She was initially treated as a case of typhoid fever based on a positive Widal test: titre of typhi (O) 1/160, Paratyphi 1/40) with no response to the medications given. Nevertheless, after 1 week, she was no better but rather deteriorated; the fever persisted and she

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was exhausted, sweating profusely, and had generalized musculoskeletal pain. At that time, she was suspected to have brucellosis but the brucella agglutination titer was negative.

The patient is known to be hypertensive, but not diabetic. With no history of animal contact or bite, she denied any history of recent or remote operative surgery, previous blood transfusion, or travel outside Egypt.

On examination

The patient was pale but not toxic or distressed. She was sweating profusely and her temperature was 39 °C, her pulse was 120/m, her RR was 20/m, and her BP was 140/90 mmHg. She was alert and conscious, GCS: 15/15, she has mild jaundice but no thyroid swelling, or lymphadenopathy, no oral ulcers, the tongue is moist and not coated, and there was no edema of both lower limbs.

Chest: clear with equal air entry on both sides.

Heart: normal S1, and S2 with no murmur or additional sounds.

Abdomen: lax, tender liver, mild soft tender splenomegaly.

Investigations

At the time of admission, complete blood count shows mild thrombocytopenia (Table 1).

The results of biochemical, serological, and metabolic investigations show elevated total bilirubin, blood urea, and C-reactive protein (Table 2).

Chest X-ray: normal.

Abdominal ultrasonography: bright hepatomegaly and splenomegaly (bipolar dimension 15.5 cm).

After 2 days in the ward admission, she was still feverish and her hemoglobin dropped to 11.2 with thrombocytopenia (platelet count: 60,000).

Blood culture for bacteria both aerobic and anaerobic revealed no growth.

Antinuclear antibody (ANA), rheumatoid factor, and Coomb's test (direct and indirect) were negative, and the reticulocyte count was in the normal range.

Table 1 Complete blood count

Test	Result	Unit	Reference range
Hemoglobin	12	g/dl	11–16
Hematocrit	37.5	%	33–44
Red cell count	4.5	u/l	$3.8–5.4 \times 10^3$
MCV	82.6	FL	78–96
MCH	27.8	Pg	26–32
Platelets	110 × 10	U/L	150–450 × 103
Total leucocytic count	4.3 × 103	U/L	4–11 × 103

Table 2 Biochemical, metabolic, and serological investigation

Test	Result	Unit	Reference range
ESR			
First hour	15	mm	0–20
Second hour	30	mm	
C-reactive protein	25.3		< 5
Total bilirubin	2.8	mg/dl	0.2–1
ALT	47	U/L	24–63
AST	38	U/L	15–37
Creatinine	1.06	mg/dl	0.7–1.3
Serum urea	70	mg/dl	20–40
Serum albumin	3.6	g/dl	3.4–5.4
Random blood sugar	143	mg/dl	70–140
T3	126	ng/dl	80–200 ng/dl
T4	8.3	µg/dl	5–12 µg/dl
TSH	1.7		0.5–5 Mu/L
Tuberculin skin test	Negative	mm	< 5 mm
Serum quantiferon test	negative		Negative
HBSag	Negative		Negative
HCVAb	Negative		Negative
HAV IgM	Negative	mg/dl	Negative
Random blood sugar	143		70–140
ANA by IF	< 1/40		< 1/40
Rheumatoid factor	Negative		Negative
Coombs' test			
Direct and indirect	Negative		Negative
Reticulocyte count	2	%	0.5–2.5
Blood culture for bacteria (aerobic and anaerobic)	No growth		No growth

The next day was the worst, she became paler and more icteric with a sense of dizziness and blacking out, hemoglobin dropped to 7.8 g/dl and platelets were 36,000, and ecchymotic patches appeared on her trunk and thighs.

She was transferred to the ICU, received packed RBCs and platelets and properly resuscitated.

After reviewing the history of the patient, she denied any travel outside the country but she admitted that she had a wound on her right hand as she was subjected to injury from a sharp object (a piece of broken glass while she was inclined in her daily home activities, she tried to compress her son's wound to stop bleeding, her hand was soaked with the blood of her son when he fell to the ground after being unconscious, and his head was injured.

We requested a rapid test for malaria which was positive, also the blood film (thick and thin) was positive for falciparum, and both gametocytes and ring forms were present in the film (Figs. 1 and 2). The infectivity index was 5%.

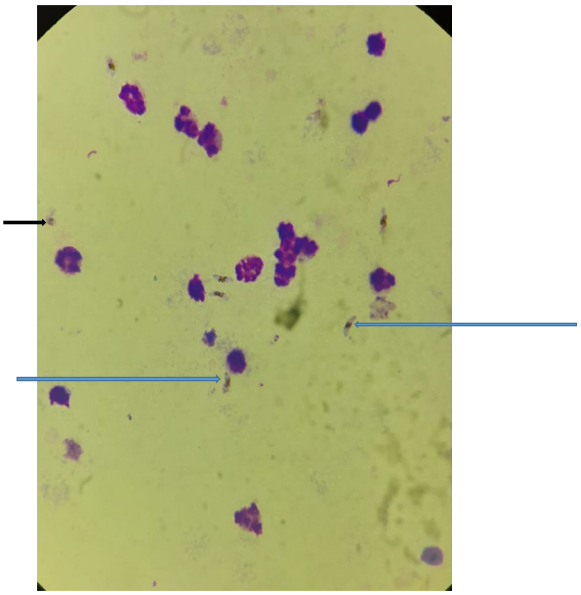

Fig. 1 Blood film showing gametocytes (blue arrows and ring form (black arrow)

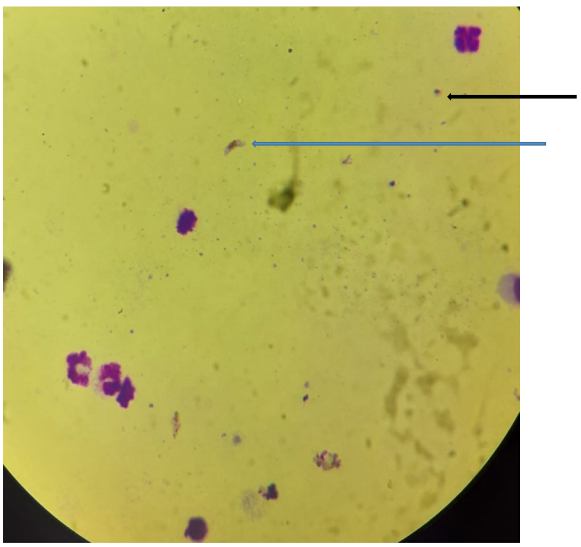

Fig. 2 Blood film showing gametocytes (blue arrows and ring form (black arrow)

Artesunate was started immediately, it was given in a dose of 2.4 mg/kg/by IV injection followed by 2.4 mg/kg after 12 h and 24 h, continued injection once daily, she dramatically improved within days and discharged after 3 negative blood films.

Diagnosis: Falciparum malaria infection.

Discussion

Malaria acquired in non-endemic areas remains an unlikely but possible event for which awareness needs to be maintained [1], because of the high fatality of the undiagnosed falciparum malaria, malaria diagnosed in non-endemic areas has significant public health implications [1].

Egypt successfully eliminated malaria during 2010–2013; however, between May and mid-June 2014, an outbreak was reported in Al-Adwa Village, Aswan Governorate [4], after several years of maintaining zero malaria indigenous cases, treatment of all infected cases was initiated following laboratory confirmation. The MOHP's rapid response and containment of the outbreak demonstrates the institutional capacity for the detection and control of outbreaks that can occur after the elimination [5].

Malaria-confirmed cases were treated, several training sessions for local health workers were conducted, health workers were equipped with the necessary information on malaria to deliver to communities during field surveys, use of indoor residual spraying for vector control and availability of free diagnosis and free treatment services, vector control plan included identification of the anopheles vector species, their distribution and densities as well as their breeding sites in Edfu District [5]. Application of chemical methods for vector control which included larviciding and adulticiding indoor residual spraying conformed to WHO guidelines [6].

Local transmission leading to isolated malaria cases in non-endemic regions has occurred under various circumstances including airport, port, and baggage [7].

In addition to vector-borne transmission, there are other important routes of transmission such as blood transfusion and organ or tissue transplantation; this is due to asymptomatic infections in donors with low-level parasitemia [8].

Nosocomial plasmodium falciparum infection, in which blood or parasite-containing fluids from a parasitemic patient enter the blood of a secondary patient is well-documented, examples include needle stick injuries, the incubation period following blood contact or needle stick injuries ranging from 4 to 17 days (medium 12 days) [1]. Transmission of the malaria parasite through blood transfusion is important as only a small number of infected red cells from the donor can lead to malaria in the recipient [9].

Federal Drug Administration (FDA) [10] and the American Association of Blood Bank (AABB) [11] had set the following criteria for donors who have traveled to or lived in an endemic area:

(1) Travellers may donate blood 6 months after returning from endemic areas provided they are free of symptoms and have not taken antimalarial drugs.
(2) Persons with a history of malaria should be deferred for 3 years after becoming asymptomatic.
(3) People who had been on chemoprophylaxis can donate after 3 years of stopping their therapy.
(4) Immigrants or visitors from endemic areas can be accepted as donors 3 years after departure if they are asymptomatic.
(5) Proven carriers of malaria or persons who had malaria due to plasmodium malariae are excluded permanently from donating blood.

The 3-year limit has been established because infection with the relapsing form of malaria (plasmodium vivax and plasmodium ovale) rarely persists for more than 3 years after naturally acquired infection, infection with plasmodium falciparum usually has clinical malaria within 3 months but may show asymptomatic infection for a year or more, plasmodium malariae may remain undetected in blood for several years.

Enteric fever was excluded by negative blood culture and persistence of fever despite the appropriate antibiotics given. Widal test is a poor diagnostic test since only about half of the patients have elevated titers at the time of established disease, and there are 10–20% frequency of false negatives in patients with untreated infection; on the other hand, false positives are very common in virtually all conditions associated with hyperbilirubinemia such as chronic active hepatitis or collagen disease, and there may be an elevated salmonella agglutination titer, so blood cultures are more diagnostic [12]. The negative brucella agglutination titer, together with poor response to treatment suggested other diagnoses.

The diagnosis of malaria infection with plasmodium falciparum in this patient was based on the identification of the protozoon forms seen on the patient's blood smear (banana-shaped gametocytes seen only in plasmodium falciparum in peripheral blood smear; moreover, the patient's symptoms of intermittent relapsing fever and chills were consistent with the diagnosis, the more surprising though unusual for the disease to be transmitted through a wound injury.

There were no locally acquired cases of malaria reported in the area or cases of febrile illness among the patient's relatives.

Because of the high fatality of the undiagnosed falciparum malaria in non-endemic areas, it has significant public health implications, protecting the population even against a hypothetical threat has the highest priority under such circumstances [6].

Conclusion

Clinicians should consider plasmodium falciparum malaria when faced with a febrile patient who has been exposed to blood-containing parasite-infected erythrocytes with an open wound, we suggest plasmodium falciparum prophylaxis following accidental exposure to a known malaria patient's blood.

Abbreviations

ESR	Erythrocyte sedimentation rate
ALT	Alanine transferase
AST	Aspartate transferase
TSH	Thyroid-stimulating hormone
ANA	Anti-nuclear antibody
ICU	Intensive care unit
MOHP	Ministry of Health and Population

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Authors' contributions

AS collected the patient data and wrote the manuscript. Hamdy Ibrahim was the major contributor to writing the manuscript. All authors read and approved the final manuscript.

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Consent for publication

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Competing interests

The author declares that they have no competing interests.

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