MEDICINE

432 Team

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Malaria and Travel Medicine

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COLOR GUIDE: • Females' Notes • Males' Notes • Important • Additional

Objectives

1. Epidemiology and Etiology of Malaria
2. Clinical Presentation
3. Risk to Travellers
4. Malaria and Pregnancy
5. Diagnostic Work up
6. Treatment and Prophylaxis

Epidemiology and Etiology of Malaria

Epidemiology and Etiology [1][2]:

Malaria in humans is caused by ***Plasmodium falciparum, P.vivax, P.ovale, and P.malariae,*** by the bite of female **anopheline mosquitoes, which occurs mainly between dusk and dawn.** It occurs in tropics and subtropics at altitudes below **1500 meters**. ***P.falciparum* causes the largest burden of disease**, followed by *P. vivax*.

P.falciparum predominates in Africa, while *P.vivax* is more common in the Americas and the western Pacific. *P.malariae* is uncommon and is found in most endemic areas, especially in sub-Saharan Africa. *P.ovale*, even less common, is relatively unusual outside of Africa. **(It is an endemic disease & the most important parasitic disease of humans).**

Pathogenesis:

YouTube Video "Highly recommended": Malaria-Plasmodium

- ***Plasmodium falciparum*** invades RBC at **all ages**.
- ***P. ovale*** and ***P. vivax*** invade **young** RBC's.
- ***P. malariae*** only invades **old** RBC's.

The adherence of non-deformable parasitized RBC to the endothelium → Secondary Ischemia (Microvascular pathology).

Clinical Presentation & IP of Malaria

Sporozoites reach the liver within 1-2 hours following female Anopheles bite. The patients remain asymptomatic for **12-35 days** until RBCs stage of parasite life cycle. The clinical features are non-specific and the **diagnosis should be suspected in anyone returning from an endemic area who has features of illness** [1].

The presence of symptoms depends on the patient's general health and immunity. Sometimes the parasite stays in the liver for years, **that's why we should ask about the family history.** The patient is **symptom-free between attacks**. The disease relapses with recurrent fever.

Sever P. *falciparum* (> 10 parasite/mcl)

Symptoms [1][3]:

- Headache, malaise, and vomiting
- Cough and diarrhea
- **Fever and chills**
- Tachycardia and tachypnea

Note(s):

Headache → tachypnea, hot skin, delirium → fever → extreme fatigue → REMISSION

Signs [1][3]:

- Anemia
- Enlarged and tender liver and spleen
- Mild jaundice

Complications [3]: majority associated with ***P.falciparum:***

- Cerebral malaria
- **Hypoglycemia & Lactic acidosis**
- Renal failure
- Thrombocytopenia
- Noncardiogenic pulmonary edema
- Liver dysfunction
- Haemoglobinuria and Black water fever

High risk includes:

- Children
- Pregnant women
- Non-immune travelers to malarious areas

Diagnosis of Malaria (1)(4)

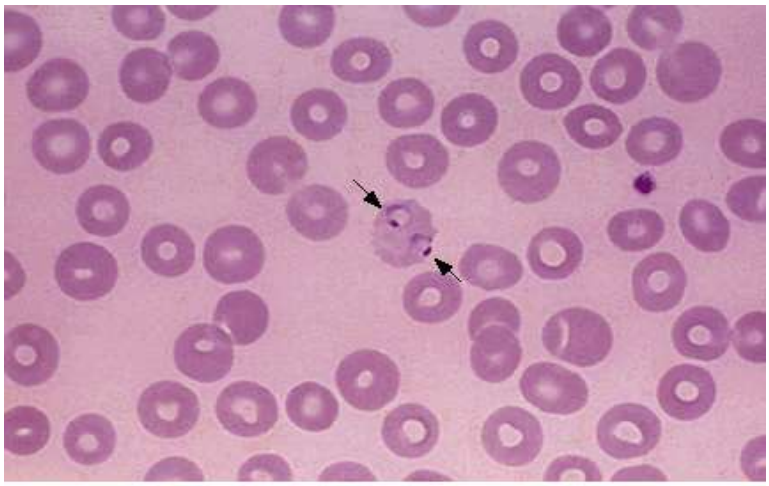
1. **Travel history and physical examination with High Index of suspicion.**
2. **Light microscopy:** Detection of parasites on **Giemsa-stained blood smears** by light microscopy (Cytoplasm: light blue, Nucleus: dark blue) is the standard tool for diagnosis of malaria (Correct identification of malarial Spp. is essential for treatment).
3. **Thin and thick blood smears** "thin smears allow identification of the malaria species". "Band-form appearance of the RBCs"
4. **Immnuochromatographic tests for malaria antigens:** detects the *Plasmodium* lactate dehydrogenase of several species.
5. **PCR "DNA detection":** to determine of the patient has recurrent infection by the same parasite or re-infected by a new parasite.

NOTE **In P. Falciparum:**

(a) Only ring stage a sexual parasite and gametocytes seen **in peripheral blood.**

(b) While RBC with Trophozoites or Schixonts stage – sequestered in peripheral, Microvasculature, and **NOT** circulating in peripheral blood.

All asexual erythrocytic stages of P. Vivax, Ovale and Malariae **circulate in peripheral blood**, thus seen on blood smear.



Malaria Peripheral smear from a patient with malaria shows intraerythrocytic ring forms (trophozoites) (arrows). Courtesy of Carola von Kapff, SH (ASCP).

Risk factors of poor prognosis in cerebral malaria

"Admission criteria":

Elevated level of Creatinine, Bilirubin, and Lactates (because they are signs of microvascular disease).

Malaria and Pregnancy (5)

Pregnant women are more susceptible than the general population to malaria: they are more likely to become infected, suffer a recurrence, develop severe complications and to die from the disease. Restricting treatment to symptomatic pregnant women is an inadequate strategy to reduce the morbidity and mortality associated with malaria.

Common presentation: anemia, hypoglycemia, and pulmonary edema.

Fetal complications: spontaneous abortion, premature delivery, low birth weight, stillbirth, and intrauterine growth restriction.

Congenital malaria may occur by **transplacental spread**, it is more common in offspring of non-immune mothers with malaria. Treatment of the mother may not eradicate parasites from the fetus, due to lower drug levels. Congenital malaria tends to present with **fever, irritability, feeding difficulties, hepatosplenomegaly, jaundice or anemia.** It is most commonly due to infection with *Plasmodium malariae* and can be diagnosed by blood films within a week after birth.

Always consider congenital malaria in the differential diagnosis of a **febrile infant in the first three months of life of mothers who have travelled to or emigrated from malarial areas.**

Malaria and hemoglobinopathies:

Patients with **heterozygous sickle cell anemia, thalassemia, or G6PD** are somehow protected from malaria.

Treatment of Malaria

- ✓ If treatment must be initiated before the species is known treat as *P. falciparum.*
- ✓ *P. falciparum* should be presumed to be **Chloroquine resistant**, except in a few areas of Central America and the Middle East.
- ✓ **Primaquine** should be given if *Plasmodium vivax* or *Plasmodium ovale* is likely.
- ✓ **Never give steroids.**

Pharmacological therapies:

1. *P.falciparum:* Quinine based therapy or quinidine, or artemether-lumefantrine, or atovaquone-proguanil.
2. *P.malariae or Chloroquine sensitive P.falciparum:* Chloroquine phosphate, or hydroxychloroquine.
3. *P.vivax or P.ovale expected to be Chloroquine susceptible:* Chloroquine phosphate, or hydroxychloroquine.
4. *P.vivax expected to be Chloroquine resistant:* Quinine, or atovaquone-proguanil, or mefloquine, or amodiaquine.

Chemoprophylaxis:

Atovaquone-proguanil
Or Chloroquine phosphate
Or Doxycycline
Or Mefloquine
Or Primaquine.

SUMMARY

1. Malaria is an endemic disease and the most important parasitic disease of humans.
   - Plasmodium falciparum invades RBC at all ages.
   - P. ovale and P. vivax invade young RBC's.
   - P. malariae only invades old RBC's.
2. Parastisized RBC's causes microvascular pathology.
3. It takes 12-35 days until RBCs stage of parasite life cycle.
4. Patient often symptoms free between paroxysms!
5. The diagnosis should be suspected in anyone returning from an endemic area who has features of illness.
6. Chemoprophylaxis and Malaria Vaccine are important preventive measures for unimmunized travelers to endemic areas even if this didn't protect from getting the disease it will help reduce the severity of the disease.
7. Majority of the complications are associated with P. falciparum!
8. P. falciparum in Trophozoites or Schixonts stage will **NOT** be found in peripheral blood.
9. Untreated Pts may die from hypoglycemia, dehydration, cerebral malaria or renal failure.
10. Never give steroids!

IMPORTANT NOTES FROM EXTERNAL RESOURCES

	Notes
(1)	Davidson's Principles and Practice of Medicine, 22nd Edition, Infectious Disease chapter
(2)	http://www.uptodate.com/contents/epidemiology-prevention-and-control-of-malaria-in-endemic-areas
(3)	http://www.uptodate.com/contents/clinical-manifestations-of-malaria
(4)	http://www.uptodate.com/contents/diagnosis-of-malaria
(5)	http://www.patient.co.uk/doctor/malaria-in-pregnancy

Questions

1) In a Giemsa-stained blood smear for a patient with malaria, you will see under light microscope which of the following?
   a. Dark red cytoplasm and light enlarge red nucleus.
   b. Light red cytoplasm and dark red nucleus.
   c. Light blue cytoplasm and dark blue nucleus.
   d. Dark blue cytoplasm and destructed red nucleus.

2) Which of the following will **NOT** be found in peripheral blood?
   a. P. Malariae in Trophozoites stage.
   b. P. Falciparum in Schixonts stage.
   c. P. Falciparum in ring stage.
   d. P. Vivax in asexual erythrocytic stages.

432 Medicine Team Leaders

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Answers:

1st Questions: C

2nd Questions: B