1st Quarter 2022

LANCET LABORATORIES Tanzania

Newsletter

Update on Malaria Part 1
Epidemiology, Pathogenesis, Diagnosis

Compiled by Dr Trisha Moodley

Key facts about Malaria

- Malaria is a **CATEGORY 1 NOTIFIABLE CONDITION** according to the National Department of Health's (NDOH) Notifiable Medical Conditions (NMC) list.
    - o This is a medical condition that requires reporting by the most rapid means available upon diagnosis, followed by a written or electronic notification to the Department of Health within 24 hours of diagnosis by healthcare providers, private health laboratories or public health laboratories.
- Malaria is seasonal in South Africa, where the highest risk of malaria transmission occurs in the wet summer months (September to May).
- Malaria vector mosquitoes generally bite between dusk and dawn.
- Only female mosquitoes are associated with malaria transmission.
- Male mosquitoes DO NOT blood feed and play no role in the malaria transmission cycle.
- Three Plasmodium falciparum Anopheles vectors are associated with human transmission of malaria:
    - o Anopheles gambiae
    - o An. funestus
    - o An. arabiensis
- Sub-Saharan Africa and India carry -85% of the global malaria burden.
- Plasmodium falciparum is the most prevalent parasitic infection in the WHO Africa region.
- One child dies every minute from malaria in Africa.
- Malaria immunity is rapidly lost in the absence of exposure to malaria.
- Non-immune travellers are at higher risk for severe malaria.
- Emergence of antimalarial drug and insecticide resistance threatens control and elimination efforts.

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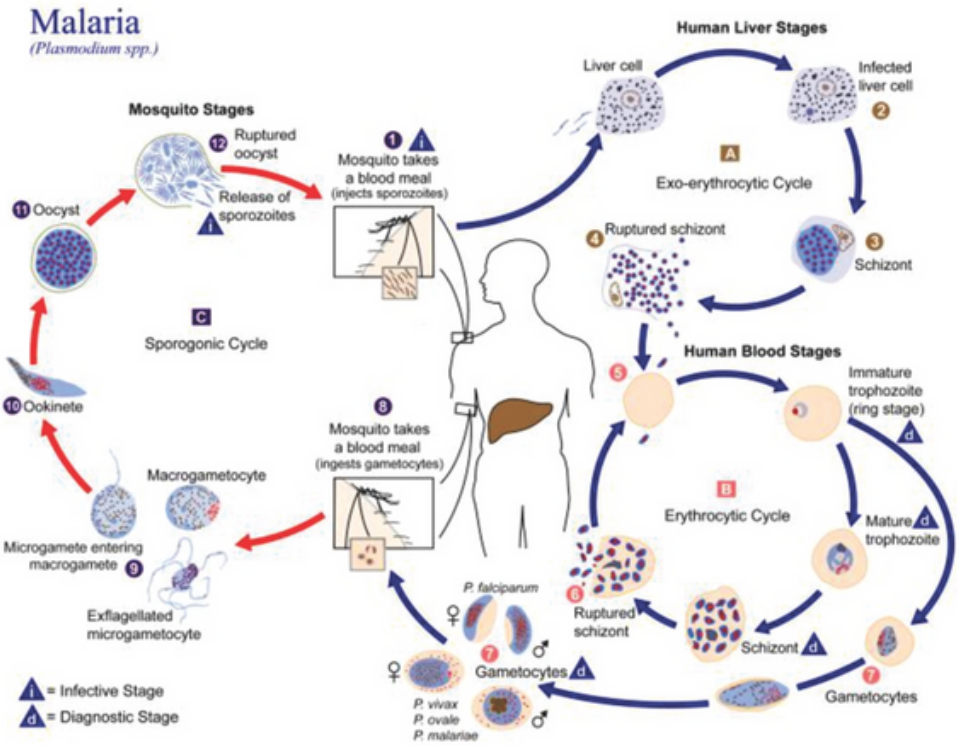
Lancet Laboratories Limited
Conservation House - 2nd Floor
Along Ali Hassan Mwinyi Road
Tel: +255 752 816 904
Email: info@lancet.co.tz
www.cerbalancetafrica.co.tz.

P.O Box 105894
Dar es Salaam, Tanzania
www.cerbalancetafrica.co.tz.
customer service.tanzania@lancet.co.tz

Malaria life cycle



Plasmodium species comparison

	Plasmodium falciparum	Plasmodium malariae	Plasmodium ovale	Plasmodium vivax	Plasmodium knowlesi
Incubation period (days)	12	28	17	15	11
Erythrocytic cycle (hours)	48	72	50	48	24
Parasite load/µL	20 - 500 x 10^3	6 x 10^3	9 x 10^3	20 x 10^3	. 10 x 10^3
Febrile paroxysm	16 - 36 hrs	8 - 10 hrs	8 - 12 hrs	8 - 12 hrs	5 days
Relapses	No	No	Yes	Yes	No
Primary attack	Severe infection in non-immune individuals	Mild	Mild	Mild to severe	Mild to severe
Untreated infection duration	1 - 2 years	3 - 50 years	1,5 - 5 years	1,5 - 5 years	

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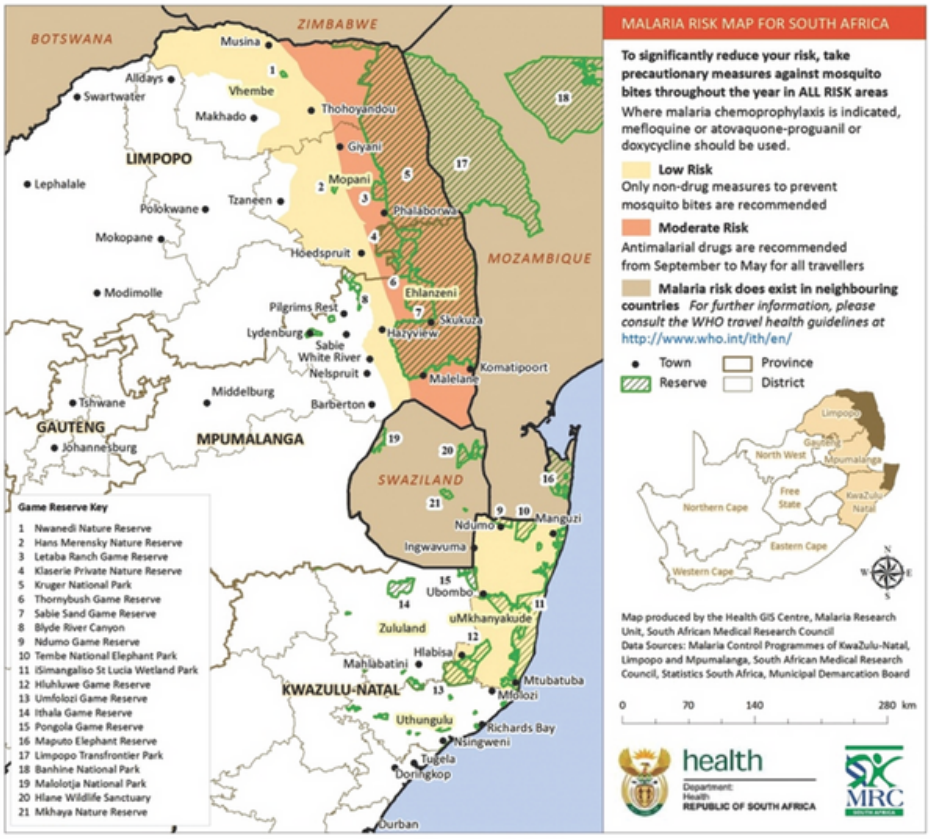
What is Plasmodium knowlesi?

- It was first isolated & studied at the Kolkata School of Tropical Medicine in India in the early 1930s and named after the scientist Robert Knowles.
- First human case was detected 34 years after it was isolated, in a US army surveyor who acquired the infection while working in a forest in Malaysia.
- It is a natural pathogen of macaque monkeys, and humans are incidental hosts.
- Indistinguishable from P. malariae on blood smear.
- Responsible for significant morbidity & mortality in Malaysia.
- It is associated with metabolic acidosis, hepato-renal dysfunction, respiratory distress, severe anaemia, and refractory hypotension.

Which are the malaria areas in South Africa?



What is Odyssean malaria?

- Odysseus was the Greek hero, who, on his way home from the Trojan wars, wandered the Mediterranean region, experiencing many adventures and narrow escapes.
- The term "Odyssean malaria" was coined to describe the various modes of transport used by malaria vectors, e.g. suitcase/luggage/airport malaria; harbour container malaria; minibus taxi malaria.
- Malaria transmission outside of endemic areas is unexpected, therefore this delays diagnosis and treatment, and may result in a more severe illness or fatal outcome.

High risk groups for acquiring malaria

- Children under the age of 5 years
- People older than 65 years of age
- Pregnant and postpartum women
- Immunocompromised patients (e.g. patients receiving chemotherapy & HIV-infected patients)
- Splenectomised individuals
- People with co-morbid conditions

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Malaria pathogenesis

Mature trophozoites & schizonts sequester in deep venous microvasculature

Sequestration is promoted by:

- Adherence of infected erythrocytes to endothelial cells.
- Rosetting — the binding of infected erythrocytes to uninfected erythrocytes.
- Reduced erythrocyte deformability.
- Platelet-mediated clumping of infected erythrocytes.

Sequestration in microvessels prevents filtration & subsequent destruction by the spleen

The low oxygen tension environment in the post-capillary venules enhances the survival & propagation of malaria parasites

Infected erythrocytes have dense protrusions ("knobs") on the surface - Plasmodium falciparum erythrocyte membrane protein 1 [PfEMP-1] These "knobs" enable attachment to the endothelium & support cytoadherence & sequestration

Differential diagnosis

The differential diagnosis for a patient presenting with fever, malaise, headache, and prostration include:

- Influenza
- Viral hepatitis
- Meningitis
- Gastroenteritis
- HIV seroconversion illness
- Urinary tract infection
- Enteric fever (Salmonella serotype Typhi, Salmonella serotype Paratyphi)
- Bacteraemia/sepsis
- Dengue fever
- Acute schistosomiasis
- Leptospirosis (Leptospira interrogans)
- African tick bite fever (Rickettsia africae)
- Yellow fever

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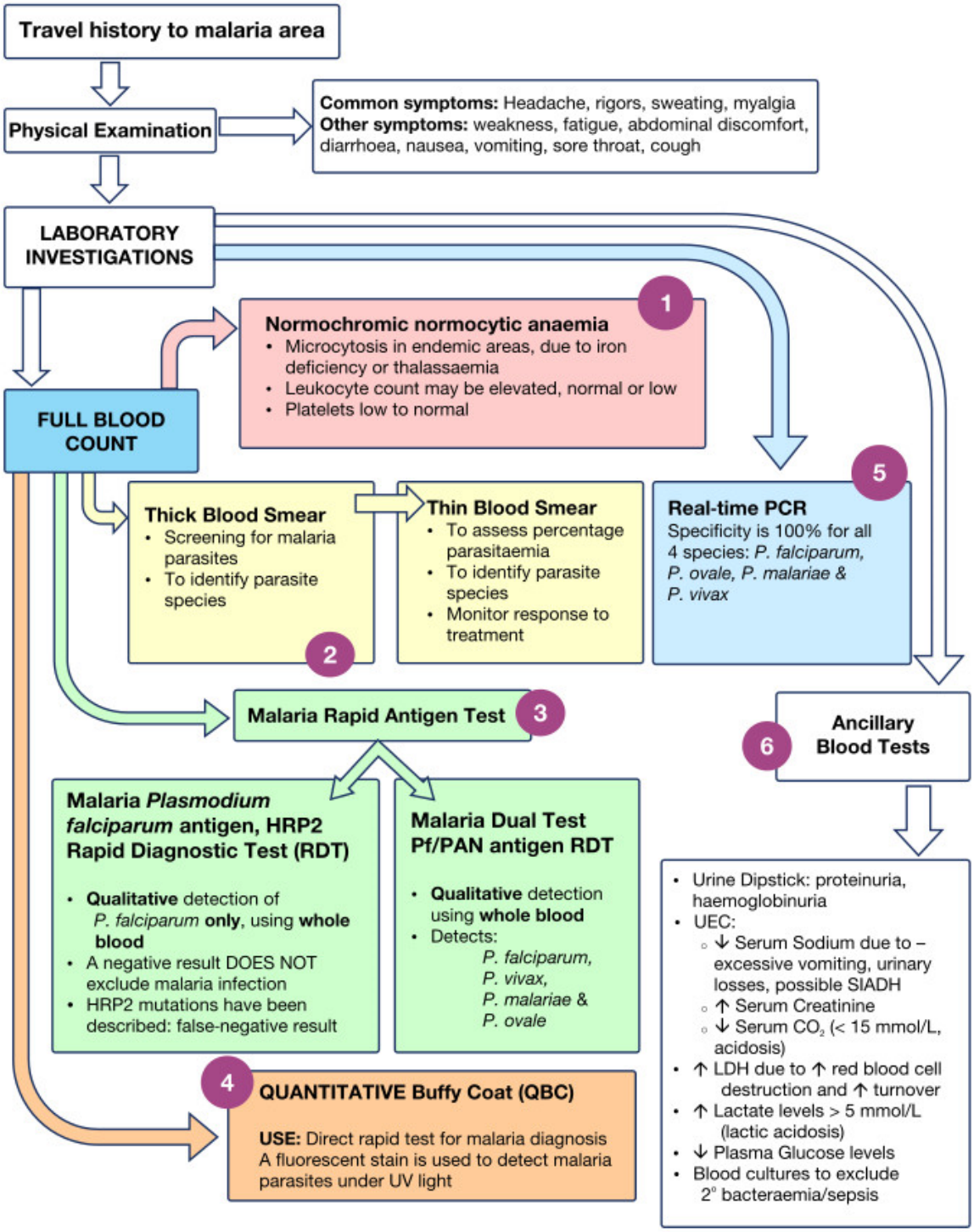
LABORATORY DIAGNOSIS of malaria at LANCET LABORATORIES



References available on request

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