Malaria: Signs, Symptoms and Treatment

Malaria is a life-threatening disease caused by protozoan parasites of the *Plasmodium* genus, transmitted to humans through the bite of infected female *Anopheles* mosquitoes.

Causative Agents

Five *Plasmodium* species cause malaria in humans:

- **Plasmodium falciparum** (most virulent; causes severe malaria)
- **P. vivax** (can cause relapsing malaria)
- **P. ovale** (relapsing, less common)
- **P. malariae** (associated with nephrotic syndrome)
- **P. knowlesi** (zoonotic, rapidly replicating)

Epidemiology

- Endemic in tropical and subtropical regions (Sub-Saharan Africa, South Asia, parts of Latin America).
- Children <5 years, pregnant women, immunocompromised individuals, and travelers to endemic areas are at highest risk.
- P. falciparum is predominant in Africa; P. vivax in Asia and Latin America.

Transmission

- By the bite of an infected female *Anopheles* mosquito during blood feeding.
- Transfusion, congenital, and needle-stick transmissions are rare but possible.

Life Cycle Summary

1. Sporozoites inoculated by mosquito bite.
2. Infect hepatocytes ? asexual replication ? merozoites.
3. Merozoites infect RBCs ? trophozoite and schizont formation.
4. RBC lysis releases merozoites ? febrile episodes.
5. Some parasites form gametocytes (for mosquito transmission).

Clinical Presentation

Uncomplicated Malaria

- Non-specific symptoms: fever, chills, sweats, headache, nausea, vomiting, myalgia, arthralgia.
- **Classical paroxysms** (especially in *P. vivax* , *P. ovale*): occur every 48-72 hours.

Severe (Complicated) Malaria — *P. falciparum* most common

Defined by the presence of *any* of the following:

- **Cerebral malaria** : seizures, coma, confusion.
- **Severe anemia** : Hb <5 g/dL.
- **Hyperparasitemia** : >5% or >200,000 parasites/µL (in high-transmission settings).
- **Hypoglycemia** (<2.2 mmol/L).
- **Renal failure** : oliguria, elevated creatinine.
- **Pulmonary edema / ARDS** .
- **Shock, DIC, metabolic acidosis** .
- **Hemoglobinuria** ("Coca-Cola urine").

Diagnosis

Outpatient

- **Thick and thin peripheral blood smears** : gold standard.
  - *Thick smear* : sensitive for parasite detection.
  - *Thin smear* : species identification and parasite quantification.
- **Rapid Diagnostic Tests (RDTs)** : useful if microscopy unavailable.

Inpatient / Severe Malaria

- Full blood count: anemia, thrombocytopenia.
- Blood glucose: detect hypoglycemia.
- Renal and liver function tests.
- Urinalysis.
- Repeat smears every 12–24 hours if initial test is negative but suspicion is high.

Treatment

Goals

- Eradicate parasites.
- Prevent complications and relapse.
- Interrupt transmission.
- Prevent drug resistance.

Uncomplicated Malaria

First-line (WHO-recommended):

- **Artemisinin-based combination therapy (ACT)**
  - **Artemether-lumefantrine (AL)** : 6-dose regimen over 3 days (adult dose: 4 tablets at 0, 8, 24, 36, 48, 60 hrs).

Alternative regimens:

- **Dihydroartemisinin-piperaquine**
- **Atovaquone-proguanil** , **Mefloquine** , or **Quinine + doxycycline/clindamycin** in

specific cases.

Treatment failure:

- Consider drug resistance or poor absorption.
- Use **quinine** 10 mg/kg q8h × 7 days.

Severe Malaria (Medical Emergency)

First-line agents:

- **IV artesunate** (preferred where available)
- **OR IV quinine** :
  - Loading dose: 20 mg/kg in 5% dextrose over 4 hrs.
  - Maintenance: 10 mg/kg q8h for 7–10 days.
- **OR IM artemether** :
  - 3.2 mg/kg loading dose, then 1.6 mg/kg daily until oral therapy.

Supportive Care:

- Monitor vitals, glucose, urine output.
- Treat hypoglycemia: 50% dextrose 1 mL/kg IV bolus.
- Manage anemia: transfuse if Hb <5 g/dL + signs of cardiorespiratory compromise.
- Seizures: diazepam 0.3 mg/kg IV or rectal.
- Fluid resuscitation + furosemide if oliguria persists.
- Avoid overhydration to prevent pulmonary edema.

Transition to oral therapy (e.g., AL) once tolerated. Complete 7-day course.

Prevention and Chemoprophylaxis

Indications

- Non-immune travelers.
- Patients with SCD, thalassemia, HIV.
- Pregnant women (IPT with sulfadoxine-pyrimethamine).
- Children with impaired immunity or post-splenectomy.

Regimens

- **Mefloquine** : 250 mg weekly, start 2 weeks before travel, continue 4 weeks after return.
- **Atovaquone-proguanil** : daily, start 1–2 days before, continue 7 days post-travel.
- **Doxycycline** : daily, not for children <8 yrs or pregnant women.

Patient Education

- Always seek care for fever, especially after travel to malaria-endemic areas.
- Complete full course of prescribed anti-malarial medication.
- Use mosquito control methods (repellents, bed nets).

- Ensure chemoprophylaxis adherence if indicated.

High-Yield Pearls

- *P. falciparum* is the only species associated with cerebral malaria.
- Negative blood smear does **not** exclude malaria.
- Always consider malaria in febrile patients with recent travel to endemic areas.
- Hypoglycemia is a common complication, especially in children and during quinine therapy.
- Monitor parasite clearance with daily blood smears in severe cases.