Indian Academy of Pediatrics (IAP)

STANDARD TREATMENT GUIDELINES 2022

Malaria

Lead Author

Digant D Shastri

Co-Authors

Kheya Ghosh Uttam, Vijaykumar G

Under the Auspices of the IAP Action Plan 2022

Remesh Kumar R
IAP President 2022

Upendra Kinjawadekar
IAP President-Elect 2022

Piyush Gupta
IAP President 2021

Vineet Saxena
IAP HSG 2022–2023

IAP Standard Treatment Guidelines Committee

Chairperson

Remesh Kumar R

IAP Coordinator

Vineet Saxena

National Coordinators

SS Kamath, Vinod H Ratageri

Member Secretaries

Krishna Mohan R, Vishnu Mohan PT

Members

Santanu Deb, Surender Singh Bisht, Prashant Kariya, Narmada Ashok, Pawan Kalyan

Malaria

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Diagnosis of Malaria

In all cases of suspected malaria, before starting antimalarial drugs all efforts should be made to have a parasitological diagnosis.

☑ *Microscopy*:

- Microscopic examination of peripheral smear (both thick and thin films) by a skilled microscopist is the gold standard.
- Apart from diagnosis, it is useful in deciding prognosis as well as assessing response of the treatment by getting information of parasitic density.
- Thick film is more sensitive for diagnosis of malaria while the thin film is more useful in species identification.
- Should be done as soon as malaria is suspected and definitely before administration of antimalarials.
- If negative in a case with strong suspicion, examine for 3 consecutive days.
- False negative may be due to prior administration of antimalarials, incorrectly prepared smears, sequestration, or an unskilled microscopist.

☑ *Rapid diagnostic test (RDT):*

- RDTs are simple, cheap, and quick point of care test, which can be performed even by unskilled health worker and even in remote areas.
- Currently available RDTs detect different *Plasmodium*-specific antigens such as histidine-rich protein 2 of *Plasmodium falciparum (PfHRP2),* a pan malarial *parasite-specific lactate dehydrogenase* (pLDH), and *Plasmodium aldolase* (PMA).
- *PfHRP2* can persist in the blood for 28 days, so RDTs detecting *PfHRP2* can remain positive even after clinical cure.

Diagnosis of Malaria

- Sensitivity of RDTs is determined by quality of the kit, species, number, storage condition of the kit (temperature and humidity of environment), technique, and care used in performing the test.

Points to Remember

1. The National Drug Policy for Malaria (2013) has advocated that all fever cases clinically suspected of malaria should be investigated for confirmation of malaria either by microscopy or RDT
2. A negative RDT result in a case with strong suspicion should be confirmed by microscopy.
3. If both RDT and microscopy are available they can complement each other; RDT used as screening test in suspected case, while microscopy is reserved for confirmation of doubtful cases or for confirmation of negative result in RDT when there is high clinical suspicion of malaria.
4. RDT cannot distinguish new infection from recent and effectively treated infection.
5. None of the RDTs are useful in monitoring response to treatment. Therefore for monitoring response to treatment, microscopy is the investigation of choice.

Treatment of Uncomplicated Malaria

Uncomplicated *Plasmodium Vivax* Malaria (Table 1)

TABLE 1: Treatment of uncomplicated *Plasmodium vivax* malaria.

		0 hour	***6 hours***	***24 hours***	***48 hours***	***Total base***
Chloroquine base	Regimen 1	10 mg/kg	5 mg/kg	5 mg/kg	5 mg/kg	25 mg/kg
	Regimen 2	10 mg/kg	–	10 mg/kg	5 mg/kg	25 mg/kg
Plus						
Primaquine	0.25 mg/kg once daily for 14 days to prevent relapse					

Chloroquine should not be given in empty stomach or when there is a high fever. Control fever first. If there is vomiting within 45 minutes, dose should be repeated after ondansetron or domperidone is given.

Uncomplicated *Plasmodium Falciparum* Malaria (Table 2)

i. Artesunate 4 mg/kg orally once daily for 3 days + sulfadoxine + pyrimethamine (ASP) (S 25 mg/kg and P 1.25 mg/kg) on day 1
Or

ii. Artemether 20 mg + lumefantrine 120 mg (AL) combination is available as tablet and liquid preparation. Artemether 20 mg + lumefantrine 120 mg combination as twice daily, six doses, 3 days treatment

TABLE 2: Treatment of uncomplicated *Plasmodium falciparum* malaria.

Body weight	***Start dose***	***8–12 hours***	***Day 2***	***Day 3***
5–14 kg	1 tablet	1 tablet	1 tablet twice	1 tablet twice
15–24 kg	2 tablets	2 tablets	2 tablets twice	2 tablets twice
25–34 kg	3 tablets	3 tablets	3 tablets twice	3 tablets twice
35 kg and above	4 tablets	4 tablets	4 tablets twice	4 tablets twice

And primaquine 0.75 mg/kg single dose. Should not be given to <5 kg children.
Or

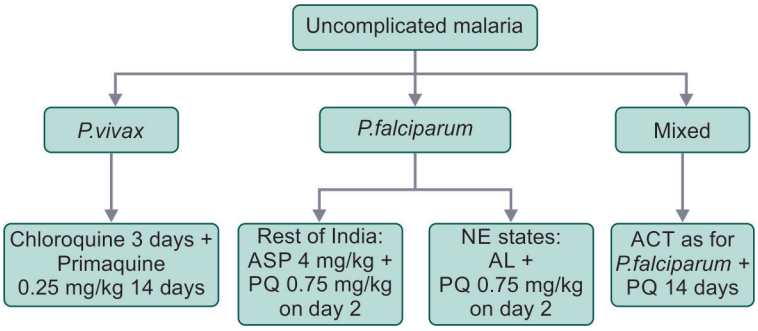
iii. Artesunate 4 mg/kg orally once daily for 3 days + mefloquine 25 mg/kg in two divided doses on day 1 followed by 15 mg /kg on day 2 and 10 mg/kg on day 3.
   a. Safety profile data of mefloquine at dose of 25 mg/kg in children is not available.
   b. As quinine and mefloquine share cross resistance, evidence of easy drug resistance when used as monotherapy, lack of safety profile data with large stat dose in children and neuropsychiatric symptoms as adverse effect—use of mefloquine regimens is better avoided when quinine is also being administered in countries like India.
   c. In North Eastern states of India, regimen with sulfadoxine–pyrimethamine (SP) is not advised. (ii) and (iii) are recommended.

Treatment of Uncomplicated Malaria

Uncomplicated Mixed Infection (*Plasmodium Vivax* and *Falciparum*) (Flowchart 1)

- ☑ Artemisinin-based combination therapy (ACT) regimen as above plus primaquine for 14 days as for vivax malaria.
- ☑ Glucose-6-phosphate dehydrogenase (G6PD) screening is highly recommended. In G6PD deficient children, dose of primaquine is 0.6–0.8 mg/kg once a week for 6 weeks.

Flowchart 1: Treatment of uncomplicated malaria.



P. vivax: *Plasmodium vivax*; *P. falciparum*: *Plasmodium falciparum*

Treatment of Complicated Malaria

- ☑ Patient should always be hospitalized.
- ☑ Always treat at the highest possible level facility.
- ☑ Before transferring the patient to higher center, always offer at least one dose of antimalarial. It will help in reducing the mortality.
- ☑ Rapid clinical assessment and stabilization of airway, breathing, and circulation.
- ☑ Collect blood for complete blood count (CBC), parasitological diagnosis, Glucostrip and other related tests [blood culture, cerebrospinal fluid (CSF) study, and electrolytes)
- ☑ Correction of dehydration and hypoglycemia.
- ☑ Parenteral antimalarials for a minimum of 24 hours **(Table 3)**.

Supportive care: Supplemental oxygen, intravenous fluids, proper positioning in unconscious, care of eyes, mucosa, skin, nasogastric feeding, and depending on close monitoring of vitals are as important as specific treatment.

Treatment of Complicated Malaria

TABLE 3: Antimalarials for severe malaria.

Drug	*Dosage*
Artesunate	☑ 2.4 mg/kg intravenous (IV) stat then at 12 hours and 24 hours and then once a day ☑ Once the patient is able to swallow, complete the course of 7 days by: – Artesunate plus sulfadoxine—pyrimethamine in all states other than Northeast – Artemether plus lumefantrine in North-Eastern state
	Or
Artemether	3.2 mg/kg (loading dose) followed by 1.6 mg/kg daily once the patient is able to swallow, complete the course by: ☑ Artesunate plus sulfadoxine—pyrimethamine in all states other than Northeast ☑ Artemether plus lumefantrine in North-Eastern state
	Or
Quinine salt	☑ Quinine salt; loading dose—20 mg salt/kg by infusion over 4 hours ☑ Maintenance dose—10 mg salt/kg every 8 hours for 7 days ☑ Tetracycline or doxycycline or clindamycin is added to quinine as soon as the patient is able to swallow and continued for 7 days

Treatment of Complications

☑ *Cerebral malaria*:

- Convulsions—lorazepam/midazolam as local intensive care unit (ICU) protocol
- Steroids are contraindicated.
- Mannitol and other anticerebral edema treatment is not required as raised intracranial pressure (ICP) is not a feature of cerebral malaria and it can be harmful.
- Phenobarbitone is avoided.
- Mefloquine is contraindicated.

☑ *Severe anemia/lactic acidosis/hypoglycemia/hyperpyrexia/altered sensorium:*

- These complications occur in combination usually.
- Packed red cell transfusion (5 mL/kg) is indicated when packed cell volume (PCV) is <12% or hemoglobin (Hb) <4 g%, acidosis, acute respiratory distress syndrome (ARDS), cerebral malaria, altered sensorium, and hyperparasitemia. In sick children, from endemic areas packed red blood cell (RBC) infusion is indicated when Hb <7 g%, PCV <20%, or there is evidence of hemolysis.

Treatment of Complications

- Monitoring arterial blood gas (ABG), blood sugar every 4 hours, serum electrolytes once daily or more often, and interventions to be done accordingly.
- Bolus of 25% dextrose, 2 mL/kg followed by appropriate glucose infusion rate (GIR) with hourly glucose monitoring to maintain blood glucose >70 mg/dL.

☑ *Hyperpyrexia*: Common in children and at times may lead to convulsions. Tepid sponging, fanning, and paracetamol 15 mg/kg can be used.

☑ *Acute renal failure* is rare but often serious complication with high mortality. Requires slow fluid infusion, hemodialysis, or renal replacement therapy (RRT).

☑ *Disseminated intravascular coagulation (DIC)*: Spontaneous gastrointestinal (GI) bleeding and subcutaneous bleeding—fresh frozen plasma is administered. Subcutaneous low molecular weight heparin is reserved for cases with clinical and laboratory evidence of DIC.

Recurrence and Treatment Failure

☑ *Vivax malaria*:

- Recurrence within 28 days is due to inadequate treatment or drug resistance.
- Retreatment with different class/regimen is indicated.
- Recurrence after 28 days is due to relapse or re-infection. Weekly suppressive therapy with 10 mg/kg of primaquine for 3–6 months is indicated.

☑ *Falciparum malaria*:

- Recurrence within 28 days is due to recrudescence. It is treated with alternate regimen. If the original regimen was ACT regimen, that patient should be treated with quinine plus doxycycline/clindamycin regimen.
- Recurrence after 28 days is due to reinfection and same initial regimen may be restarted.

Incidence of congenital malaria in newborns of pregnant women with placental malaria can be reduced by offering intermittent preventive therapy (≥2 doses) with sulfadoxine-pyrimethamine (IPT-SP).

Chemoprophylaxis

- ☑ *Short-term chemoprophylaxis*: It is indicated in people who plan to stay up to 6 weeks in high endemic areas of falciparum malaria. Doxycycline 1.5 mg/kg, once daily, maximum dose 100 mg in children above 8 years. To start 2 days before arrival and continue 4 weeks after leaving endemic area.
- ☑ *Long-term chemoprophylaxis*: It is indicated in people who plan to stay for >6 weeks in high-endemic areas of falciparum malaria. Mefloquine 5 mg/kg, maximum dose 250 mg, weekly. Started 2 weeks before and continue 4 weeks after leaving endemic areas.

Further Reading

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