

# Guidelines for Diagnosis and Treatment of Malaria in India

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सत्यमेव जयते

Government of India



National Institute of Malaria Research  
New Delhi



National Vector Borne  
Disease Control Programme  
Delhi

# Preface

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**M**alaria is a major public health problem in India, accounting for sizeable morbidity, mortality and economic loss. Apart from preventive measures, early diagnosis and complete treatment are the important modalities that have been adopted to contain the disease. In view of widespread chloroquine resistance in *Plasmodium falciparum* infection, and other recent developments, the national policy has been revised to meet these challenges.

The guidelines for 'Diagnosis and Treatment of Malaria in India (2009)' were developed during the brainstorming meeting organized by the National Institute of Malaria Research (NIMR) and sponsored by WHO Country Office in India. The same have now been revised in light of changed national drug policy in 2010. These guidelines are the collaborative effort of National Vector Borne Disease Control Programme, National Institute of Malaria Research and experts from different parts of the country. The aim of this endeavour is to guide the medical professionals on the current methods of diagnosis and treatment based on the national drug policy. This manual deals with the treatment of uncomplicated malaria and specific antimalarials for severe disease. The general management should be carried out according to the clinical condition of the patient and judgement of the treating physician. The warning signs of severe malaria have been listed so as to recognize the condition and give the initial treatment correctly before referring them to a higher facility.

It is hoped that these guidelines will be useful for health care personnel involved in the treatment of malaria.

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## 1. Introduction

Malaria is one of the major public health problems of the country. Around 1.5 million confirmed cases are reported annually by the National Vector Borne Disease Control Programme (NVBDCP), of which about 50% are due to *Plasmodium falciparum*. Malaria is curable if effective treatment is started early. Delay in treatment may lead to serious consequences including death. Prompt and effective treatment is also important for controlling the transmission of malaria.

In the past, chloroquine was effective for treating nearly all cases of malaria. In recent studies, chloroquine-resistant *P. falciparum* malaria has been observed with increasing frequency across the country. The continued treatment of such cases with chloroquine is probably one of the factors responsible for increased proportion of *P. falciparum* relative to *P. vivax*.

A revised *National Drug Policy on Malaria* has been adopted by the Ministry of Health and Family Welfare, Govt. of India in 2010 and these guidelines have been prepared for healthcare personnel including clinicians involved in the treatment of malaria.

## 2. Clinical features

Fever is the cardinal symptom of malaria. It can be intermittent with or without periodicity or continuous. Many cases have chills and rigors. The fever is often accompanied by headache, myalgia, arthralgia, anorexia, nausea and vomiting. The symptoms of malaria can be non-specific and mimic other diseases like viral infections, enteric fever etc.

Malaria should be suspected in patients residing in endemic areas and presenting with above symptoms. It should also be suspected in those patients who have recently visited an endemic area. Although malaria is known to mimic the signs and symptoms of many common infectious diseases, the other causes should also be suspected and investigated in the presence of following manifestations:

- Running nose, cough and other signs of respiratory infection
- Diarrhoea/dysentery
- Burning micturition and/or lower abdominal pain
- Skin rash/infections
- Abscess
- Painful swelling of joints
- Ear discharge
- Lymphadenopathy

All clinically suspected malaria cases should be investigated immediately by microscopy and/or Rapid Diagnostic Test (RDT).

### **3. Diagnosis**

#### **3.1 Microscopy**

Microscopy of stained thick and thin blood smears remains the gold standard for confirmation of diagnosis of malaria. The advantages of microscopy are:

- The sensitivity is high. It is possible to detect malaria parasites at low densities. It also helps to quantify the parasite load.
- It is possible to distinguish the various species of malaria parasite and their different stages.

#### **3.2 Rapid Diagnostic Test**

Rapid Diagnostic Tests are based on the detection of circulating parasite antigens. Several types of RDTs are available (<http://www.wpro.who.int/sites/rdt>). Some of them can only detect *P. falciparum*, while others can detect other parasite species also. The latter kits are expensive and temperature sensitive. Presently, NVBDCP supplies RDT kits for detection of *P. falciparum* at locations where microscopy results are not obtainable within 24 hours of sample collection.

RDTs are produced by different companies, so there may be differences in the contents and in the manner in which the test is

done. The user's manual should always be read properly and instructions followed meticulously. The results should be read at the specified time. It is the responsibility of the health care personnel doing a rapid test for malaria to ensure that the kit is within its expiry date and has been transported and stored under recommended conditions. Failure to observe these criteria can lead to false/negative results. It should be noted that *Pf* HRP-2 based kits may show positive result up to three weeks after successful treatment.

**Early diagnosis and treatment of cases of malaria aims at:**

- Complete cure
- Prevention of progression of uncomplicated malaria to severe disease
- Prevention of deaths
- Interruption of transmission
- Minimizing risk of selection and spread of drug resistant parasites

#### **4. Treatment of uncomplicated malaria**

All fever cases diagnosed as malaria by RDT or microscopy should promptly be given effective treatment.

##### **4.1 Treatment of *P. vivax* malaria**

Confirmed *P. vivax* cases should be treated with chloroquine in full therapeutic dose of 25 mg/kg divided over three days. In some patients, *P. vivax* may cause relapse (A form of *P. vivax* or *P. ovale* parasites called as hypnozoites remain dormant in the liver cells. These hypnozoites can later cause a relapse). For its prevention, primaquine should be given at a dose of 0.25 mg/kg body weight daily for 14 days under supervision. Primaquine is contraindicated in known G6PD deficient patients, infants and pregnant women. Caution should be exercised before administering primaquine in areas known



to have high prevalence of G6PD deficiency, therefore, it should be tested if facilities are available. Primaquine can lead to hemolysis in G6PD deficiency. Patient should be advised to stop primaquine immediately if he/she develops symptoms like dark coloured urine, yellow conjunctiva, bluish discolouration of lips, abdominal pain, nausea, vomiting etc. and should report to the doctor immediately.

## 4.2 Treatment of *P. falciparum* malaria

Artemisinin Combination Therapy (ACT) should be given to all confirmed *P. falciparum* cases found positive by microscopy or RDT. This is to be accompanied by single dose primaquine (0.75 mg/kg body weight) on Day 2.

ACT consists of an artemisinin derivative combined with a long acting antimalarial (amodiaquine, lumefantrine, mefloquine or sulfadoxine-pyrimethamine). The ACT recommended in the National Programme of India is artesunate (4 mg/kg body weight) daily for 3 days and sulfadoxine (25 mg/kg body weight) -pyrimethamine (1.25 mg/kg body weight) on Day 0. Presently, fixed dose combinations of artemether+ lumefantrine, artesunate + amodiaquine and blister pack of artesunate + mefloquine are registered for marketing in India and are available for use. Other ACTs which will be registered and authorized for marketing in India may also be used as alternatives.

## 4.3 Treatment of malaria in pregnancy

ACT should be given for treatment of *P. falciparum* malaria in second and third trimesters of pregnancy, while quinine is recommended in the first trimester. *P. vivax* malaria can be treated with chloroquine.

### **Oral artemisinin monotherapy is banned in India**

Artemisinin derivatives must never be administered as monotherapy for uncomplicated malaria. These rapidly acting drugs, if used alone, can lead to development of drug resistance.

#### **4.4 Treatment of mixed infections**

Mixed infections with *P. falciparum* should be treated as falciparum malaria. However, antirelapse treatment with primaquine can be given for 14 days, if indicated.

#### **4.5 Treatment based on clinical criteria without laboratory confirmation**

All efforts should be made to diagnose malaria either by microscopy or RDT. However, special circumstances should be addressed as mentioned below:

- If RDT for only *P. falciparum* is used, negative cases showing signs and symptoms of malaria without any other obvious cause for fever should be considered as 'clinical malaria' and treated with chloroquine in full therapeutic dose of 25 mg/kg body weight over three days. If a slide result is obtained later, the treatment should be completed according to species.
- Suspected malaria cases not confirmed by RDT or microscopy should be treated with chloroquine in full therapeutic dose.

#### **4.6 General recommendations for the management of uncomplicated malaria**

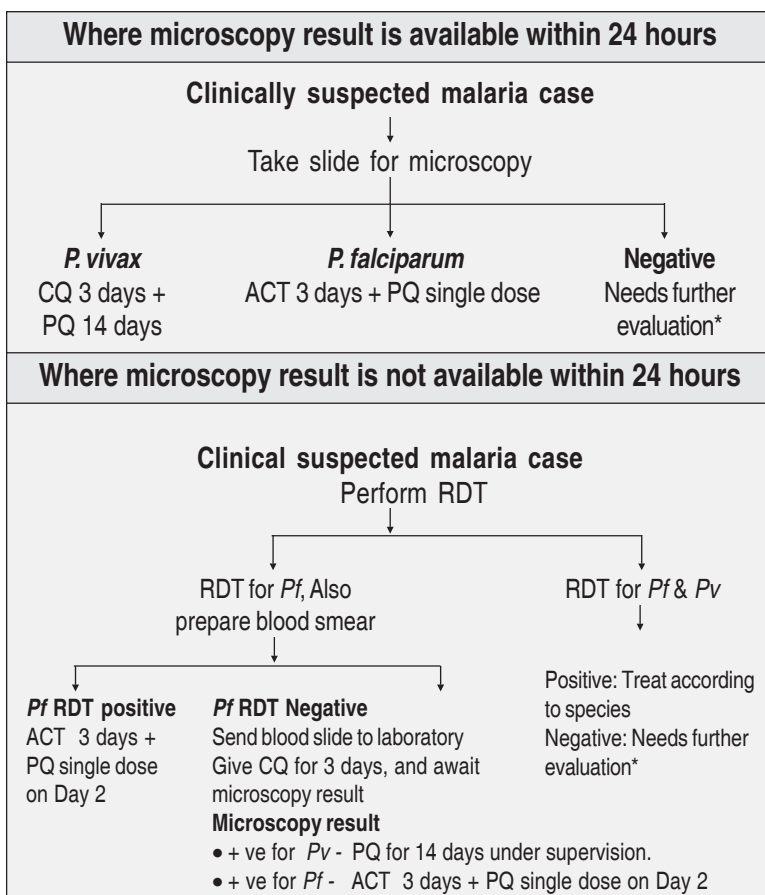
- Avoid starting treatment on an empty stomach. The first dose should be given under observation.
- Dose should be repeated if vomiting occurs within 30 minutes.
- The patient should be asked to report back, if there is no improvement after 48 hours or if the situation deteriorates.
- The patient should also be examined for concomitant illnesses.

The algorithm for diagnosis and treatment is shown in Chart 1.

### **5. Treatment failure/Drug resistance**

After treatment patient is considered cured if he/she does not have fever or parasitaemia till Day 28. Some patients may not respond

**Chart 1: Algorithm for diagnosis and treatment of malaria**



\*Look for other causes of fever; repeat blood slide examination after an appropriate interval

**Table 1. Chloroquine for *P. vivax***

<b>Age in years</b>	<b>Number of tablets</b>		
	<b>Day 1 (10 mg/Kg)</b>	<b>Day 2 (10 mg/Kg)</b>	<b>Day 3 (5 mg/Kg)</b>
<1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$
1 – 4	1	1	$\frac{1}{2}$
5 – 8	2	2	1
9 – 14	3	3	$1\frac{1}{2}$
15 & above	4	4	2

**Table 2. Primaquine for *P. vivax* (Daily Dosage for 14 days)**

Age in years	Daily dosage (in mg base)	No. of tablets (2.5 mg base)
< 1	Nil	Nil
1 – 4	2.5	1
5 – 8	5.0	2
9 – 14	10.0	4
15 & above	15.0	6

**Note:** Primaquine should be given for 14 days under supervision.

Do not give Primaquine to pregnant women and infants and G6PD deficiency cases.

**Table 3. ACT (Artesunate + SP) dosage schedule for *P. falciparum***

Age in years*		Number of tablets		
		1 <sup>st</sup> Day	2 <sup>nd</sup> Day	3 <sup>rd</sup> Day
< 1	AS	½	½	½
	SP	¼	Nil	Nil
1 – 4	AS	1	1	1
	SP	1	Nil	Nil
5 – 8	AS	2	2	2
	SP	1½	Nil	Nil
9 – 14	AS	3	3	3
	SP	2	Nil	Nil
15 and above	AS	4	4	4
	SP	3	Nil	Nil

AS – Artesunate 50 mg, SP – Sulfadoxine 500 mg + Pyrimethamine 25 mg; \*Recently, blister packs for different age groups have also been formulated. Details of the same are given in Annexure 1.

**Table 4. Primaquine for *P. falciparum* (Single dose on Day 2)**

Age in years	Dosage (in mg base)	No. of tablets (7.5 mg base)
< 1	Nil	0
1 – 4	7.5	1
5 – 8	15	2
9 – 14	30	4
15 & above	45	6

**Note:** Do not give Primaquine to pregnant women, infants and G6PD deficiency cases.

to treatment which may be due to drug resistance or treatment failure, specially in falciparum malaria. If patient does not respond and presents with following, he/she should be given alternative treatment.

**Early treatment failure (ETF):** Development of danger signs or severe malaria on Day 1, 2 or 3, in the presence of parasitaemia; parasitaemia on Day 2 higher than on Day 0, irrespective of axillary temperature; parasitaemia on Day 3 with axillary temperature  $>37.5^{\circ}\text{C}$ ; and parasitaemia on Day 3,  $>25\%$  of count on Day 0.

**Late clinical failure (LCF):** Development of danger signs or severe malaria in the presence of parasitaemia on any day between Day 4 and Day 28 (Day 42) in patients who did not previously meet any of the criteria of early treatment failure; and presence of parasitaemia on any day between Day 4 and Day 28 (Day 42) with axillary temperature  $>37.5^{\circ}\text{C}$  in patients who did not previously meet any of the criteria of early treatment failure.

**Late parasitological failure (LPF):** Presence of parasitaemia on any day between Day 7 and Day 28 with axillary temperature  $<37.5^{\circ}\text{C}$  in patients who did not previously meet any of the criteria of early treatment failure or late clinical failure.

Such cases of falciparum malaria should be given alternative ACT or quinine with Doxycycline. Doxycycline is contraindicated in pregnancy, lactation and in children up to 8 years. Treatment failure with chloroquine in *P. vivax* malaria is rare in India.

## 6. Treatment of severe malaria

### 6.1 Clinical features

Severe manifestations can develop in *P. falciparum* infection over a span of time as short as 12 – 24 hours and may lead to death, if not treated promptly and adequately. Severe malaria is characterized by one or more of the following features:

- Impaired consciousness/coma
- Repeated generalized convulsions
- Renal failure (Serum Creatinine  $>3$  mg/dl)
- Jaundice (Serum Bilirubin  $>3$  mg/dl)

- Severe anaemia (Hb <5 g/dl)
- Pulmonary oedema/acute respiratory distress syndrome
- Hypoglycaemia (Plasma Glucose <40 mg/dl)
- Metabolic acidosis
- Circulatory collapse/shock (Systolic BP <80 mm Hg, <50 mm Hg in children)
- Abnormal bleeding and Disseminated intravascular coagulation (DIC)
- Haemoglobinuria
- Hyperpyrexia (Temperature >106° F or >42° C)
- Hyperparasitaemia (>5% parasitized RBCs )

Foetal and maternal complications are more common in pregnancy with severe malaria; therefore, they need prompt attention.

## **6.2 Diagnosis of severe malaria cases negative on microscopy**

Microscopic evidence may be negative for asexual parasites in patients with severe infections due to sequestration and partial treatment. Efforts should be made to confirm these cases by RDT or repeat microscopy. However, if clinical presentation indicates severe malaria and there is no alternative explanation these patients should be treated accordingly.

## **6.3 Requirements for management of complications**

For management of severe malaria, health facilities should be equipped with the following:

- Parenteral antimalarials, antipyretics, antibiotics, anticonvulsants
- Intravenous infusion facilities
- Special nursing for patients in coma
- Blood transfusion
- Well-equipped laboratory
- Oxygen

If these items are not available, the patient must be referred without delay to a facility, where they are available.

#### **6.4 Specific antimalarial treatment of severe malaria**

Severe malaria is an emergency and treatment should be given promptly. **Parenteral artemisinin derivatives or quinine should be used irrespective of chloroquine sensitivity.**

- **Artesunate:** 2.4 mg/kg body weight i.v. or i.m. given on admission (time=0), then at 12 hours and 24 hours, then once a day (Care should be taken to dilute artesunate powder in 5% Sodium bi-carbonate provided in the pack).
- **Quinine:** 20 mg quinine salt/kg body weight on admission (i.v. infusion in 5% dextrose/dextrose saline over a period of 4 hours) followed by maintenance dose of 10 mg/kg body weight 8 hourly; infusion rate should not exceed 5 mg/kg body weight per hour. Loading dose of 20 mg/kg body weight should not be given, if the patient has already received quinine. NEVER GIVE BOLUS INJECTION OF QUININE. If parenteral quinine therapy needs to be continued beyond 48 hours, dose should be reduced to 7 mg/kg body weight 8 hourly.
- **Artemether:** 3.2 mg/kg body weight i.m. given on admission then 1.6 mg/kg body weight per day.
- $\alpha$ - $\beta$  **Arteether:** 150 mg daily i.m. for 3 days in adults only (not recommended for children).

#### **Note:**

- Once the patient can take oral therapy, further follow-up treatment should be as below:
- Patients receiving parenteral quinine should be treated with oral quinine 10 mg/kg body weight three times a day to complete a course of 7 days, along with doxycycline 3 mg/kg body weight per day for 7 days. (Doxycycline is contraindicated in pregnant women and children under 8 years of

age; instead, clindamycin 10 mg/kg body weight 12 hourly for 7 days should be used).

- Patients receiving artemisinin derivatives should get full course of oral ACT. However, ACT containing mefloquine should be avoided in cerebral malaria due to neuropsychiatric complications.
- **Intravenous preparations should be preferred over intramuscular preparations. Parenteral treatment should be given for minimum of 24 hours once started.**
- **In first trimester of pregnancy, parenteral quinine is the drug of choice.** However, if quinine is not available, artemisinin derivatives may be given to save the life of mother. In second and third trimester, parenteral artemisinin derivatives are preferred.

## 6.5 Severe malaria due to *P. vivax*

In recent years, increased attention has been drawn to severe malaria caused by *P. vivax*. Some cases have been reported in India, and there is reason to fear that this problem may become more common in the coming years. Severe malaria caused by *P. vivax* should be treated like severe *P. falciparum* malaria.

## 7. Chemoprophylaxis

Chemoprophylaxis is recommended for travellers, migrant labourers and military personnel exposed to malaria in highly endemic areas. Use of personal protection measures like insecticide-treated bednets should be encouraged for pregnant women and other vulnerable populations.

### 7.1 Short-term chemoprophylaxis (less than 6 weeks)

**Doxycycline:** 100 mg daily in adults and 1.5 mg/kg body weight for children more than 8 years old. The drug should be started 2 days before travel and continued for 4 weeks after leaving the malarious area.

**Note:** Doxycycline is contraindicated in pregnant and lactating women and children less than 8 years.



## 7.2 Long-term chemoprophylaxis (more than 6 weeks)

**Mefloquine:** 5 mg/kg body weight (up to 250 mg) weekly and should be administered two weeks before, during and four weeks after leaving the area.

**Note:** Mefloquine is contraindicated in cases with history of convulsions, neuropsychiatric problems and cardiac conditions.

## 8. Recommended reading

1. Malaria in India. Guidelines for its control. National Vector Borne Disease Control Programme. <http://www.nvbdc.gov.in/malaria-new.html>
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**Annexure 1**  
**Drug schedule of ACT for different age groups**  
**as per blister pack**

Age group (years)	1st Day		2nd Day		3rd Day
	AS	SP	AS	PQ	AS
0-1	1 (25 mg)	1 (125 + 6.25 mg)	1 (25 mg)	Nil	1 (25 mg)
1-4	1 (50 mg)	1 (500 + 25 mg)	1 (50 mg)	1 (7.5 mg base)	1 (50 mg)
5-8	1 (100 mg)	1 (750+ 37.5 mg)	1 (100 mg)	2 (7.5 mg base each)	1 (100 mg)
9-14	1 (150 mg)	2 (500 + 25 mg)	1* (150 mg)	4 (7.5 mg base each)	1* (150 mg)
15 & above	1 (200 mg)	2 (750 + 37.5 mg each)	1 (200 mg)	6 (7.5 mg base each)	1 (200 mg)

\* Previous supply in some places, blister packs for age group 9-14 contains two tablets of artesunate with 100 mg and 50 mg strength.





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