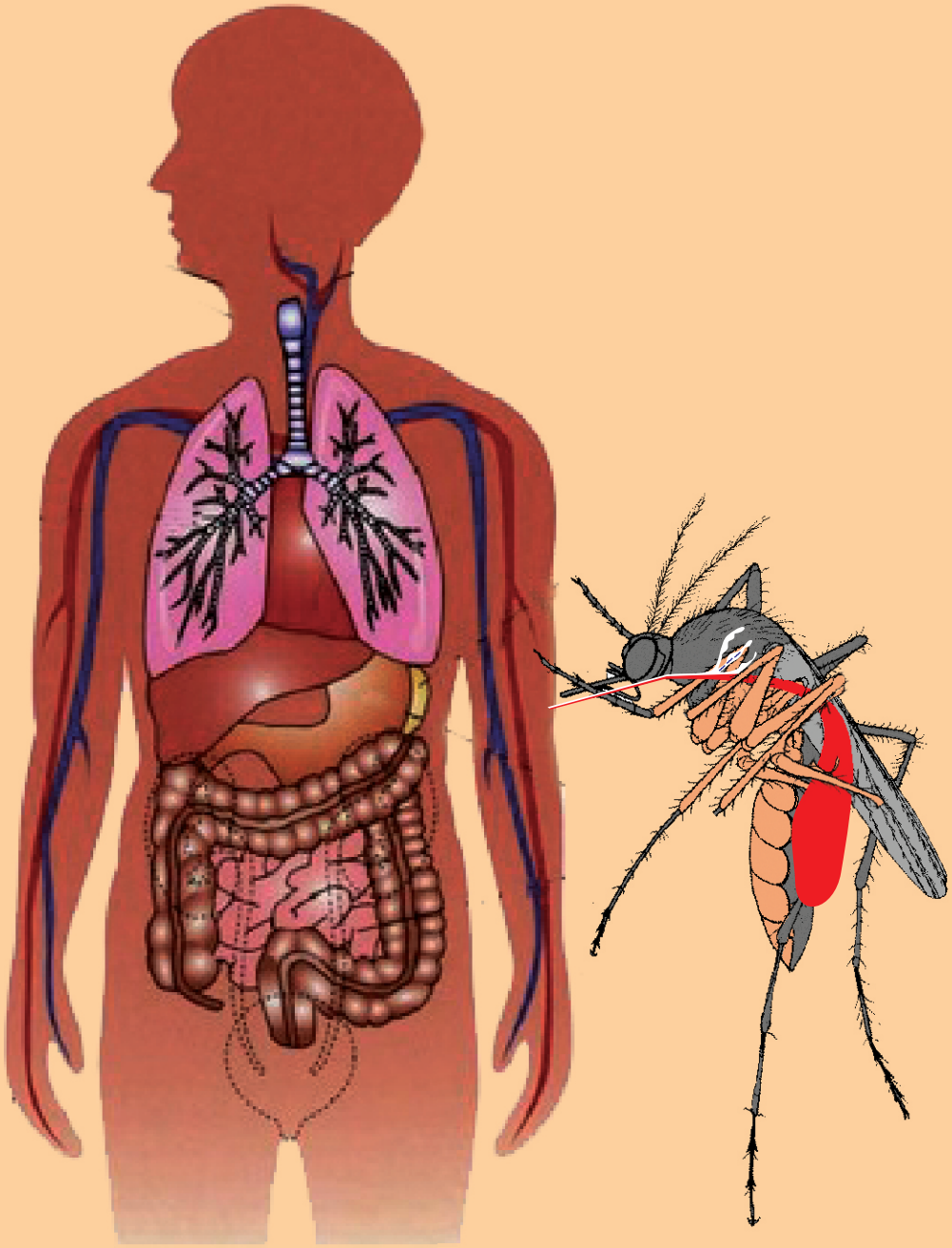
Treatment Guidelines of Malaria for Medical Officers & Specialists 2014



राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम
NVBDCP

Government of Chhattisgarh
Department of Health and Family welfare

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FOREWORD

Department of Health and Family Welfare Chhattisgarh has developed Handbook on the Guidelines for the Treatment of Malaria which is meant to aid physicians in Chhattisgarh to manage Malaria not only in peripheral health facilities such as Primary Health Centers, Community Health Centers but also in District Hospitals and Medical Colleges.

It is encouraging to note that important aspects for management of severe and complicated Malaria are included to enable Medical officers to tackle the disease effectively and with clarity.

I sincerely hope that Medical fraternity will utilize this hand book to provide the best care to the people who are at the risk of Malaria and suffer complications from dreaded disease.

(Dr.Alok Shukla)

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It is my pleasure that Department of Health Services, Department of Medical Education, State Health Resource Centre and Jan Swasthya Sahyog (NGO) together have come forward to share their experiences with their valuable inputs for preparation of Treatment Guidelines of Malaria for Medical Officers/ Specialists. This document has been produced with the efforts of Technical Advisory Committee to frame a clear set of clinical guidelines.

Objective of this Hand book is to train all Medical Officers/Specialist and accomplish them in the management of severe and complicated malaria in the Health facilities.

We do hope to receive your feedback and queries regarding these guidelines.

(Dr. Kamal Preet Singh)

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The Guidelines for the treatment of Malaria has been prepared with united efforts of the members of Technical Advisory Committee, Dr.S.R.Gupta, Retired Proffessor and Head of the Depatrment of Medicine, Pt. J.N.M. Medical College Raipur, Dr.Yogesh Jain, Jan Swasthya Sahyog, Dr. Ravi Tiwari,Specialist Medicine, Dr.Alka Gupta, Specialist Gynic & Obstetric and Dr. V. Jaiprakash ,State Programme Officer, Vector Borne Disease Control Programme, Chhattisgarh and the documents have been reviewed by Dr. R.K.Rajmani, Director ,State Institute of Health & Family Welfare, Dr. Prabir Chatterji, Executive Director, State Health Resource Centre, Dr. Amar Singh Thakur, Joint Director Health Services ,Bilaspur and Dr. S K. Binjhwar, Deputy Director ,Health Services Chhattisgarh.

The Guidelines for the treatment of Malaria for Medical Officer is reproduced as per the NVBDCP Drug Policy 2013 ,simplifying the basic approach of Medical Officers for identification of the Severe/Complicated cases and provide appropriate treatment.

I am very much optimistic that this hand book would serve effective tool for Medical Officers for management of cases with Malaria Disease.

(Dr.Shashank Gupta)

-: Contents :-

What is Malaria?

Malaria is a parasitic infectious disease caused by protozoan parasites of the genus Plasmodium and is transmitted by female anopheles mosquito's bite. Depending on type of Plasmodium the Malaria can be classified as P.vivax, P.falciparum, Mixed Infection (vivax & falciparum) P.ovale and P.malariae. In State of Chhattisgarh two types of Malaria P.vivax & P.falciparum are found where in P.falciparum predominates with 80% cases.

What is Clinical classification of Malaria

In clinical terms, malaria can be classified in two major forms: as follows:

A. Uncomplicated malaria

This is symptomatic malaria with Parasitaemia without signs of severity and with no evidence of vital organ dysfunction. Most cases of malaria in children in the tropics are of this type.

The main manifestations of uncomplicated malaria include fever, chills, rigor, headache, and body pains. Others are malaise (Feeling of being unwell), nausea, vomiting, and joint weakness. Physical examination may reveal pallor and hepato splenomegaly.

B. Complicated/Severe Malaria

Essentially severe malaria is any episode of malaria, in which there is associated dysfunction of any of the vital organs such as brain, lungs, liver, kidneys and blood. It is more common in infection with P.falciparum.

Table 1(page no. 3) mentions the various criteria that allow one to consider the diagnosis of severe/ complicated malaria. Once severe/complicated malaria is diagnosed by any or more criteria, it is important that the treatment now has to be given by an injectable route because we want immediate effect so that death can be prevented.

Why should we bother about whether a person with malaria has severe malaria or not?

- Overall, in all falciparum malaria episodes, out of every 1000 episodes, 1 will die even if good care is made available , i.e. a death rate of 0.1%,
- If early diagnosis and prompt treatment is not available, as many as 30% of simple falciparum malaria may become severe and the minimum mortality among them, even in the best case scenario is 10%.
- Thus the best way forward is Early Diagnosis, Prompt and complicate treatment of all people with Falciparum malaria so that malaria does not become severe/complicated.

All severe malaria arises from undiagnosed or untreated uncomplicated malaria. From a public health point of view severe falciparum malaria is an indicator disease and even a single case from a particular area within the PHC/CHC jurisdiction should lead to an examination of the system for diagnosis and treatment of malaria in that area, and attempts should be made to strengthen them.

Severe malaria of any type should be initially treated with injectable antimalarials even if patient can swallow oral antimalarials.

Plasmodium falciparum causes malaria,
We determine its extent and lethality!

Severe and complicated malaria

Serious complications can arise in *P. falciparum* infection and rarely in *P vivax*. Severe Malaria may lead to multi organ diseases and sometimes develop suddenly 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 clinically characterized by confusion or drowsiness with extreme weakness (prostration). In addition, the following may develop:

- Cerebral malaria with generalized convulsions
- Pulmonary edema(Respiratory Distress)
- Severe anemia
- Renal failure
- Hypoglycemia
- Metabolic acidosis
- Circulatory collapse/shock
- Spontaneous bleeding and laboratory evidence of DIC
- Macroscopic haemoglobinuria or cola colored urine
- Hyperthermia
- Hyperparasitaemia

Always suspect Malaria and Severe Malaria in following conditions/clinical syndromes

- Fever without any obvious cause: Viral fever, Typhoid fever, Sepsis.
- Fever with altered sensorium: Pyogenic meningitis, viral encephalitis, Typhoid fever, Tubercular Meningitis etc.
- Fever with jaundice; Viral hepatitis, Leptospirosis, Sickle cell disease with sepsis
- Fever in pregnancy, or post-partum period. Sepsis, Pyelonephritis
- Fever with renal dysfunction: Pylonephritis,Renal-abcess, typhoid and rarely leptospirosis,
- Fever with severe anemia: Sickle cell crisis, hemolytic anemia, Infective endocarditis

Diagnosis of malaria is done by doing a rapid diagnostic kit test or by reading thick blood smears, whereas diagnosis of severe/ complicated malaria need to be done clinically. One of the commonest mistake made by health professionals is delay in the diagnosis of severe malaria, and thus delay in referral to the appropriate centre.

Clinical manifestations, Recognition and laboratory findings in severe malaria

Table-1: Clinical manifestations, Recognition and laboratory findings in severe malaria

Clinical manifestations	Recognition	Laboratory findings
Impaired consciousness	Assessment by Glasgow scale (10 or less) or Blantyre scale (3 or less) as appropriate[1](Annexure – I & II)	
Severe pallor	Conjunctiva, tongue, lips, palms are pale	Hemoglobin <7 g/dl if there are symptoms of Anaemia or <5 g/dl ifthere are no symptoms of anaemia
Anuria or oliguria	Urine output <30 ml/hour in adults and <0.5 ml/kg/hr in children	Serum creatinine >3 mg/dl in adults and >1.5 mg/dl in children
Jaundice	Yellow discoloration of sclera	Serum bilirubin >3 mg/dl with white & light yellow colored urine/bile salt in Urine
Circulatory collapse cold extremities, weak peripheral pulse,	Cold extremities, weak peripheral pulse and hypotension (systolic BP <90 in adults and <70 mm Hg in children	
Metabolic acidosis	Labored hyperventilation with increased inspiratory effort often termed respiratory distress) and a clear chest on auscultation (Kussmaul's breathing)	Plasma bicarbonate <15 mol/l
Pulmonary oedema or acuterespiratory distress syndrome	Tachypnoea, dyspnoea, and bilateral basal rales, cyanosis	Bilateral infiltrations in the lungs on X ray chest
Repeated or prolonged convulsions	Exclude history of Epilepsy and pregnancy induced hypertention (PIH) in Pregnant Woman	CSF excludes meningitis
Abnormal bleeding	Gums, nose, venepuncture sites, GI tract	Blood tests suggestive ofDisseminated intravascular coagulation (DIC) PT/PTT/Serum fibrinogen/complete blood count (CBC) and Blood smear
Haemoglobinuria	Dark red or cola colored urine	Urine microscopy is positive for haemoglobin
Hypoglycemia	Sweating, palpitation, dilatation of pupils, weakness breathlessness or seizures and alteration of sensorium	Blood sugar <60 mg/dl
Hyperpyrexia	More than 40-41 deg Celsius (104^{o} F -105.8^{o}F)	
Parasitaemia		More than 5% parasitemia, or more than 200,000 parasites per microliter

All health facilities should paste a table of "**criteria to diagnose *severe/ complicated Malaria***

Poster on "Criteria to diagnose severe/Complicated Malaria"

Management of malaria: General Principles

For malaria control, the main thrust of the programme is Early Diagnosis and Prompt, complete and effective Treatment (EDPT). For diagnosis of Malaria gold standard is blood microscopy using thin and thick smears. Mitanin/ANM/male MPW workers prepare blood smears which are tested in designated laboratories for Malaria. Also bivalent Rapid Diagnostic Test (RDT) kits(for falciparum and as well as for vivax malaria) are being provided for diagnosis of Malaria cases so as to provide correct and complete treatment to the confirmed cases. All fever cases suspected for Malaria should be tested with Rapid diagnostic kit and

Blood smear should be taken for Blood microscopy. On the basis of test result and type of Malaria Parasite appropriate complete treatment should be given as per the prescribed protocol.

Presumptive treatment of malaria with a single dose of chloroquine has been stopped.

If the RD test is –ve and you still suspect Malaria, the blood smear already taken should be sent for microscopy and based on the results, Malaria treatment should be initiated as per prescribed protocol.

The malaria case management is very important to prevent simple malaria from becoming severe and complicated malaria, as well as to prevent death due to malaria. All public and private healthcare providers should follow the common National Guidelines for treatment of malaria as per the Drug Policy 2013, which are also elaborated upon, below.

Overall, the aims of the Malaria case management are:

- To provide prompt and complete treatment to all suspected/ confirmed cases of malaria
- To prevent progression of mild cases of malaria in to severe or complicated from of malaria
- To prevent deaths from severe and complicated malaria
- To prevent transmission of malaria
- To minimize risk of spread of drug resistant parasites by use of effective drugs in appropriate dosage by everyone.

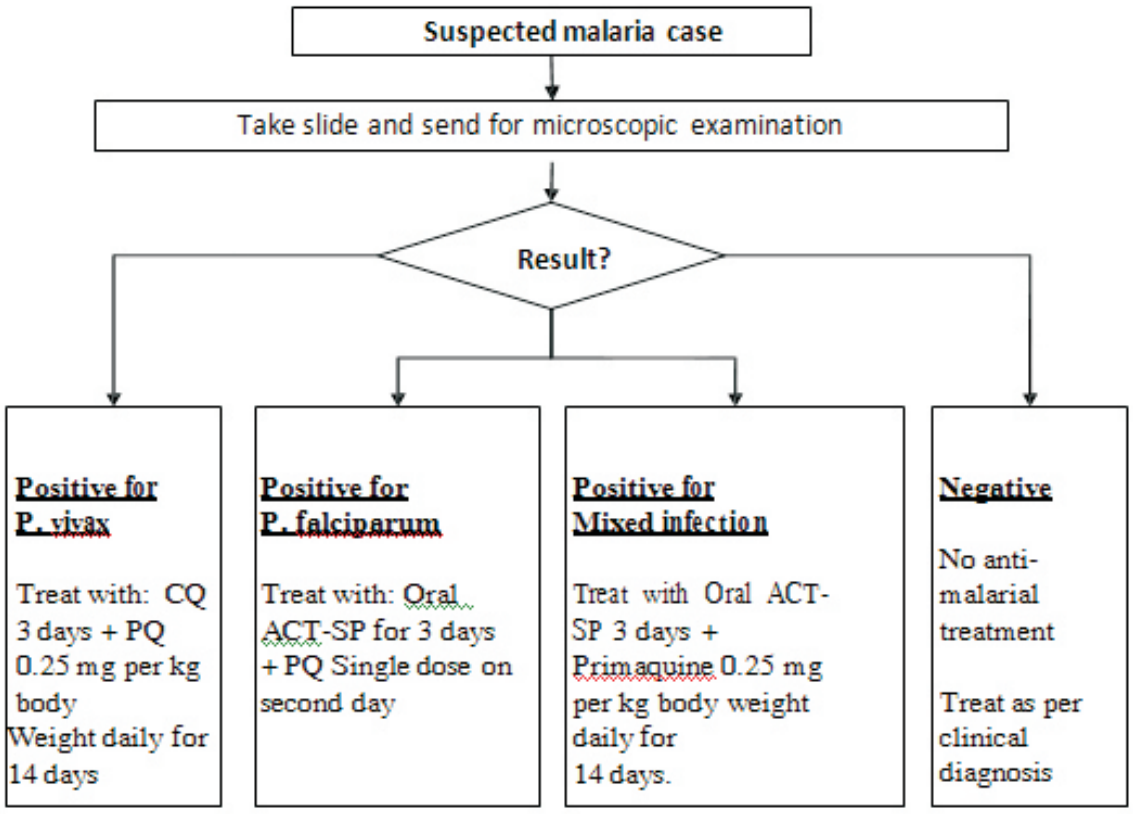
Diagnosis and Treatment for Malaria

Diagnosis &Treatment

All fever cases diagnosed as malaria by either RDT or microscopy should be promptly given complete and effective treatment. The medicine chosen will depend upon whether the patient has vivax malaria or falciparum malaria as diagnosed by the blood test and clinical classification of the disease.

The flow charts in different settings for diagnosis and drug selection for the treatment of uncomplicated malaria are as under:

Where microscopy result is available within 24 hours



Note: PQ is contra-indicated in pregnancy, lactating mothers and in children under 1 year (Infants).

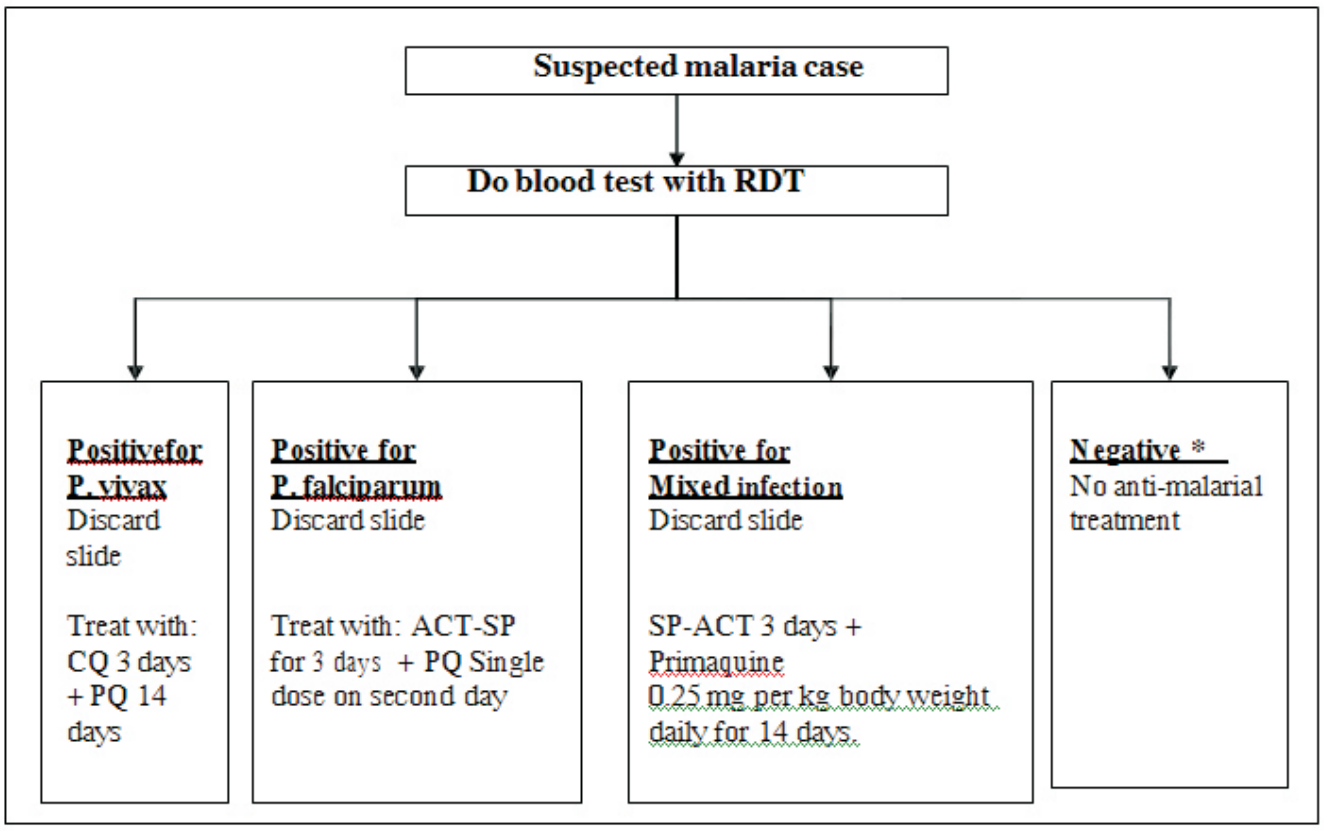
ACT-SP- Artemisinin-based Combination Therapy (Artesunate+ Sulfadoxine-Pyrimethamine)

CQ - Chloroquine

PQ - Primaquine

Malaria Parasite shall be examined by Smear on 1st Day, 5th Day, 14th Day & 28th Day for assessing resistance R1-R4 and to see for parasite clearance. If scizoint of Pf found start immediately inj. Quinine.

Where microscopy result is not available within 24 hours and Bivalent RDT is used



Note: 1) *However, if malaria is strongly suspected, prepare the blood slide & send it for microscopy

2) If a patient has severe symptoms at any stage, then immediately refer to a nearest CHC or other health facility with indoor patient management.

3) PQ is contra-indicated in pregnancy, lactation and in children under 1 year (Infant).

ACT-SP- Artemisinin-based Combination Therapy (Artesunate+Sulfadoxine-Pyrimethamine)

CQ - Chloroquine

PQ - Primaquine

Treatment of Vivax Malaria

Diagnosis of vivax malaria may be made by the use of RDT (Bivalent) or microscopic examination of the blood smear. On confirmation, following treatment is to be given:

Drug schedule for treatment of P vivax malaria:

1. Chloroquine: 25 mg/kg body weight divided over three days i.e.

10 mg/kg on day 1

10 mg/kg at 24 hours and

5 mg / kg at 48 hours.

2. Primaquine: 0.25 mg/kg body weight daily for 14 days.

Primaquine is contraindicated in infants, pregnant women and individuals with G6PD deficiency.

14 day regimen of Primaquine should be given under supervision.

Dosage Chart for Treatment of Vivax Malaria

Table-2

Age	Day 1		Day 2		Day 3		Day 4 to 14
	CQ (150 mg base)	PQ (2.5 mg)	CQ (150 mg base)	PQ (2.5 mg)	CQ (150 mg base)	PQ (2.5 mg)	PQ (2.5 mg)
Less than 1 yr	½	0	½	0	¼	0	0
1-4 years	1	1	1	1	½	1	1
5-8 years	2	2	2	2	1	2	2
9-14 years	3	4	3	4	1½	4	4
15 yrs or more*	4	6	4	6	2	6	6
Pregnancy	4	0	4	0	2	0	0

Note: CQ 250mg tablet is having 150 mg base

Treatment of Uncomplicated Falciparum Malaria

Diagnosis of falciparum malaria may be made by the use of RDT (Monovalent or Bivalent) or microscopic examination of the blood smear. It is imperative to start the treatment for falciparum malaria immediately on diagnosis.

The treatment for falciparum malaria is as follows:

Artemisinin based Combination Therapy (ACT-SP)

Artesunate (AS), available as 50 mg tablets is given for three days, and Sulfadoxine-Pyrimethamine (S-P) tablets, containing 500 mg Sulfadoxine and 25 mg pyrimethamine is given for one day, as shown in the dosage chart as per Table no:3. All tablets for a day should be taken together, swallowed with water. In addition, Primaquine (PQ Large) tablets should be given on the second day. However, Primaquine is not to be given in pregnant/lactating Woman women and in children below 1 year of age. ACT-SP tab is contraindicated in 1st trimester of pregnancy.

Always bring the fever down by giving paracetamol or by doing tepid sponging before you give Artesunate!!! Or else the patient might vomit the precious medicine !!!

Dose schedule for Treatment of uncomplicated P.falciparum cases:

1. Artemisinin based Combination Therapy (ACT-SP) Artesunate 4 mg/kg body weight daily for 3 days Plus Sulfadoxine (25 mg/kg body weight) - Pyrimethamine (1.25 mg/kg body weight) on first day. ACT is not to be given in 1st trimester of pregnancy.
2. Primaquine :0.75 mg/kg body weight on day 2.

Primaquine (PQ) prevents transmission of falciparum malaria to others by its ability to kill gametocytes. PQ tablets should be taken after a meal; not on an empty stomach. With the introduction of different coloured Blister Packs for different age groups, treatment by the field level staff has been made easy. The colour code for different age groups for Packing of Tablet ACT+SP has been given as follows:

Dosage Chart for Treatment of falciparum Malaria with ACT-SP

Table-3

Age Group (Years)	1st day		2nd day		3rd day
	AS	SP	AS	PQ	AS
0-1 Pink Blister	1 (25 mg)	1 (250 +12.5 mg)	1 (25 mg)	Nil	1 (25 mg)
1-4 Yellow Blister	1 (50 mg)	1 (500+25 mg each)	1 (50 mg)	1 (7.5 mg base)	1 (50 mg)
5-8 Green Blister	1 (100 mg)	1 (750+37.5 mg each)	1 (100 mg)	2 (7.5 mg base each)	1 (100 mg)
9-14 Red Blister	1 (150 mg)	2 (500+25 mg each)	1 (150mg)	4 (7.5 mg base each)	1 (150 mg)
15 & Above White Blister	1 (200 mg)	3 (500+25 mg each)	1 (200 mg)	6 (7.5 mg base each)	1 (200 mg)

Treatment of mixed infections (P.vivax + P.falciparum) cases:

All mixed infections should be treated with full course of ACT and Primaquine 0.25 mg per kg body weight daily for 14 days.

SP-ACT 3 days + Primaquine 0.25 mg per kg body wt. daily for 14 days.

Dosage Chart for Treatment of mixed (vivax and falciparum) Malaria with ACT-SP

Table-4

Age	Day 1			Day 2		Day 3		Days 4-14
	AS tablet (50 mg)	SP Tablet (500/25 mg)	PQ (2.5 mg)	AS tablet (50 mg)	PQ (2.5 mg)	AS tablet (50 mg)	PQ (2.5 mg)	PQ (2.5 mg)
Less than 1 yr	½	½	0	½	0	½	0	0
1-4 years	1	1	1	1	1	1	1	1
5-8 years	2	1 ½	2	2	2	2	2	2
9-14 years	3	2	4	3	4	3	4	4
15 yrs or more	4	3	6	4	6	4	6	6

Primaquine is not to be given in pregnant/lactating Woman and in children below 1 year of age. ACT-SP tab is contraindicated in 1st trimester of pregnancy.

Table- 5

	Drug / consumable check list for a facility for treatment of severe malaria
1	Tablet Chloroquine 250mg
2	Tablet Primaquine 2.5 mg
3	Tablet Primaquine 7.5 mg
4	ACT Combi Pack (Tab. Artesunate + Tab. Sulphadoxine Pyremethamine)
5	25% dextrose, 50% dextrose ampoules,
6	Injections Quinine dihydrochloride 2ml, 300mg/ml

7	Tablet Quinine sulphate 300mg
8	Bi-Valent Rapid Diagnostic Test Kits for Malaria
9	Inject able ceftriaxone
10	Inject able Diazepam, Lorazepam, phenytoin, Midazolam.
11	IV sets, Pediatric infusion sets, cannulas, nasogastric tubes, indwelling urethral catheters
12	Glucometers, glucose testing sticks
13	Clindamycin for pregnant women and children under 8 yrs of age
14	Inj furosemide
15	Oxygen cylinders, prop up stand, masks, flow catheters, Pulse Oxy meter
16	Auto analyzers/ colorimeter, microscope, centrifuge
17	Routine equipment blood transfusion set, IV fluids 5% dextrose & DNS (Preferred)
18	Inj Artesunate alongwith Inj Soda-bicarb(For reconstitution) and inj Normal saline

Essential Requirements for health facilities So that they can treat Severe malaria:

The management of severe malaria is possible in health facilities which are equipped with the following:

I. Parenteral Antimalarials, antibiotics, anticonvulsants, antipyretics in good Supply,
II. Intra venous drip set adult and pediatric, iv fluids, 50% dextrose
III. Special nursing for patients in coma
IV. Facilities for blood transfusion on an urgent basis
V. Well -equipped and running laboratory that can check for Hemoglobin, Creatinine, blood glucose round the clock 24*7
VI. Oxygen respirator: Ventilator & Monitoring System.
VII. Either a facility to do haemo dialysis or arrangement with some facility that can do dialysis. Keep a list of Dialysis centre nearby display their address & telephone number in your center.
VIII. Available ambulances that can manage inter facility transport.
IX. At least One nurse and one medical officer specially trained to manage severe malaria

If the patient needs blood transfusion or develops convulsions/ unconsciousness, under such circumstances, the Medical Officer, PHC and paramedical staff should be able to administer emergency treatment-1st dose and refer the case without delay to other institutions where such facilities are available. A list of all health care facilities in the district where emergency parenteral antimalarial care for severe malaria is available should be kept in PHCs and with Community Workers like MITANIN/ANM/ MPW(male) worker. MO-PHC will be responsible for liaison with all these institutions. For timely referral of severe cases, transportation arrangements should be made with the use of 108 ambulances.

Treatment of severe Falciparum malaria cases

Severe malaria is an emergency and treatment should be given as per severity and associated complications which can be best decided by the treating physicians. Monitor the temperature, pulse, respiration, blood pressure and level of consciousness using a scale. (Annexure-I &II) These observations should be made at least every 4 hours until the patient is out of danger.Before admitting or referring patients, the attending doctor or health worker, who so ever is able to do it, should do RDT and take blood smear; give a parenteral dose of artemisinin derivative or quinine in suspected cerebral malaria cases and send case sheet, details of treatment history and blood slide with properly filled referral form along with patient. (Annexure-III)

Criteria for immediate referral to Primary Health Centre:

a) Persistence of fever after 24 hours of initial treatment.
b) Continuous vomiting and inability to retain oral drugs.
c) Headache continues to increase
d) Severe dehydration - dry, parched skin, sunken face
e) Too weak to walk in the absence of any other obvious reason
f) Change in sensorium e.g. confusion, drowsiness, blurring of vision, photophobia, Disorientation
g) Convulsions or muscle twitching
h) Bleeding and clotting disorders
i) Suspicion of severe anemia
j) Jaundice.
k) Hypothermia

Do not wait if there is any doubt that the patient is getting worse.

Role of urgent Transportation

Majority of deaths in malaria happen at home or on the way to the hospital. For some people, it can take several hours to reach a health facility. Since time to parenteral treatment is a crucial determinant of outcome, rectal administration of artesunate at home by a peripheral health worker can be life- saving. Unfortunately this is still not available in India. Even when children reach the hospital, more than 50% of deaths from severe childhood illnesses, including malaria, occur within 24 h of hospital admission.

Managing severe and complicated malaria in the health facility: 22 Critical guidelines

The following steps should be applied in all patients with clinically diagnosed or suspected severe malaria.

1. **Make a rapid clinical assessment with special attention to level of consciousness, blood pressure, rate and depth of respiration, Pallor and Urine output.**
2. **Admit patient to an intensive care or special care unit mention all details in admission ticket(Indoor Patient record) .**
3. **If parasitological confirmation of malaria is not readily available, make a blood film and start treatment on the basis of the clinical presentation.**
4. **Give antimalarial chemotherapy intravenously. If intravenous infusion is not possible, an appropriate drug may be given intramuscularly.**

5. The parenteral treatment in severe Malaria cases should be given for minimum of 24 hours once started. Oral treatment should be substituted after 24 hours injectables and confirmation of the patient that he can swallow and retain tablets).
6. Calculate doses as mg/kg of body weight. Therefore, always weigh the patient. This is particularly important for children.
7. Provide good nursing care. This is vital, especially if the patient is unconscious.
8. Pay careful attention to fluid balance, if fluids are being given intravenously, in order to avoid over and under-hydration. Administer IV DNS 30 ml/ kg for adult as baseline and adjust IV fluid accordingly if Renal Failure & ARDS develope.
9. Make a rapid initial check of the blood glucose level, and monitor frequently for hypoglycemia. If this cannot be done, administer glucose 10%, 25 %, 50% as per need.
10. Examine the optic fundi by ophthalmoscope. This may help in differential diagnosis, and rarely will reveal papilledema, which is a contraindication to performing a Lumbar puncture. Retinal hemorrhages may be seen, but these do not influence management.
11. Make sure you look for other treatable causes of coma. Meningitis should be excluded by lumbar puncture or covered by treatment.
12. Look for and manage any other complicating or associated infections.
13. Record urine output and look for the appearance of black urine (haemoglobinuria) or coca cola coloured urine. Oliguria which may indicate acute renal failure.
14. Monitor the core temperature (preferably rectal temperature), temperature of freshly passed urine may be measured it is good indicator of core temperature and does not need special thermometer. Respiratory rate and depth, blood pressure, level of consciousness and other vital signs regularly. These observations regularly done alone will allow you to identify the onset of important complications such as hypoglycemia, metabolic acidosis, pulmonary oedema and shock.
15. Reduce high body temperatures (>102.2? F) by tepid sponging and fanning. Administer paracetamol as an antipyretic if necessary. And stop sponging when temperature comes below 102? F.
16. If the patient goes into shock, take blood cultures, if possible, but start antibiotics immediately without waiting for blood culture results.
17. Monitor the therapeutic response, both clinical and parasitological, by regular observations and blood films. Take film on 1st day, 5th day, 14th Day & 28th day and ask for degree of parasitaemia.
18. Carry out regular checks on packed cell volume (haematocrit) or haemoglobin concentration (at admission and then at 12 hours), glucose (every hour till consciousness appears, or else every 3 hours in the first 24 hrs, urea or creatinine (daily), and electrolytes (not essential).
19. For disseminated intra vascular coagulation -Draw 5ml blood in a plain vial. See the clot formation and clot retraction.
20. Avoid drugs that increase the risk of gastrointestinal bleeding (aspirin, corticosteroids).
21. Remove an indwelling urinary catheter as soon as it is no longer necessary.
22. Clean insertion sites for intravenous lines at least twice daily with iodine and alcohol.

Lifesaving good nursing care of the patient with severe malaria:

For the unconscious patient- Maintain a clear airway.

Nurse the patient in the lateral or semi-prone position to avoid aspiration of fluid. Insert a nasogastric tube and suck out the stomach contents to minimize the risk of aspiration pneumonia. Aspiration pneumonia is a potentially fatal complication that must be dealt with immediately.

- *Turn the patient every 2 hours.*
- *Do not allow the patient to lie in a wet bed.*
- *Pay particular attention to pressure points.*
- *Keep a careful record of fluid intake and output.*
- *Note any appearance of black urine (haemoglobinuria).*
- *Check the speed of infusion of fluids frequently. Too fast or too slow infusion can be dangerous.*
- *Monitor the temperature, pulse, respiration, blood pressure and level of consciousness using a scale.*

(Assess Sensorium in Adult patient using Glasgow Comma Scale - Annexure -I and Assess Comma in Children by using Blantyre Scale Annexure-II)

- *Report changes in the level of consciousness, occurrence of convulsions or changes in behaviour of the patient immediately. All such changes suggest developments that require additional treatment.*
- *If the rectal temperature rises above >102.2? F, remove the patient's clothes and start tepid sponging and fanning.*
- *Give paracetamol oral/IM/IV (rectal route may be used in children)*

The treatment of severe malaria is divided into two parts.

1. **Antimalarial therapy.**
2. **Treatment of complications, which will depend on the type of organ dysfunction.**

The guidelines for specific antimalarial therapy are as follows. Parenteral artemisinin derivatives or quinine should be used irrespective of chloroquine resistance status of the area with one of the following options:

Antimalarial Chemotherapy of severe and complicated malaria

Table-6

Initial parenteral treatment for at least 24 hours: CHOOSE ONE of following options	Follow-up treatment, when patient can take oral medication following parenteral Treatment
Quinine: 20mg quinine salt/kg body weight-1st Dose on admission (IV infusion: e.g. For 60 kg body Wt. 1200 mg Quinine is to be added in 10% Dextrose solution) followed by maintenance dose of 10 mg/kg 8 hourly; infusion rate should not exceed 5 mg/kg per hour. **It should take about 4 hours.** Dissolve Quinine in 10 ml per kg Dextrose normal saline or DNS. (Loading dose of 20mg/kg should not be given , if the patient has already received quinine.) **(For details see Annexure -IV)**	**Quinine** 10 mg/kg three times a day **with:** doxycycline 100 mg once a day in others but use clindamycin in pregnant women and children under 8 years of age,10 mg per kg body weight for 7 days to complete the treatment.
Artesunate: 2.4 mg/kg i.v. or i.m. given on admission (time=0), then at 12 h and 24 h(Use Max of 120 mg in adults), then once a day. For a total of 10 mg per kg (For details see Annexure -V) or Artemether: 3.2 mg/kg bw i.m. given on admission then 1.6 mg/kg per day for a total of 10 mg per kg	Full oral course of ACT: Treat with: ACT-SP for 3 days + PQ Single dose on second day

Note: The parenteral treatment in severe malaria cases should be given for minimum of 24 hours once started (irrespective of the patient's ability to tolerate oral medication earlier than 24 hours).

After parenteral artemisinin therapy, once you switch to oral treatment, patients should receive a full course of oral ACT for 3 days. Those patients who received parenteral Quinine therapy should receive oral Quinine 10 mg/kg body weight three times a day for 7 days (including the days when parenteral Quinine was administered) plus Doxycycline 3 mg/kg

body weight once a day or Clindamycin 10 mg/kg body weight 12-hourly for 7 days (Doxycycline is contraindicated in pregnant women and children under 8 years of age) or ACT as described.

Quick Tips on how to give anti-malarial in severe malaria?

- Ideally, antimalarial drugs should be given initially by intravenous infusion; this should be replaced by oral administration as soon as possible, after 24hrs of Injectable administration.
- Weigh the patient, and calculate the dose of antimalarials according to body weight (mg/kg of body weight).
- Artesunate can be given intravenously by bolus ("push") injection, intramuscularly or by suppository. Artemisinin if available as a suppository may also be given. Artemether can only be administered intramuscularly.
- Do not attempt to give oral medication to unconscious children; if parenteral injection is not possible and referral is likely to be delayed, consider using artesunate, or artemisinin suppositories. Crushed antimalarials may be given by nasogastric tube. However, nasogastric administration may cause vomiting and produce inadequate drug levels in the blood.

Please note:

- Use of mefloquine should be avoided in cerebral malaria due to neuropsychiatric complications associated with it.

Malaria in Pregnancy:

Pregnancy is a immune compromised state and increased levels of hormones cortisol and oestrogen makes pregnant women far more vulnerable to malaria than adults.

1) In comparison to non pregnant women
   a) 10 times higher parasitemia
   b) 3 times more likely to suffer from severe malaria
   c) 2-10 times higher risk of death in Non immune pregnant women
2) Presentation is more atypical, convulsions may be confused with Eclampsia.
3) All the complications of P. Falciparum are more likely to occur.

Treatment of falciparum Malaria Uncomplicated: Pregnancy

- **1st Trimester :** Tab Quinine salt 10mg/kg 3 times daily for 7 days.

Quinine may induce hypoglycemia; pregnant women should not start taking quinine on an empty stomach and should eat regularly, while on quinine treatment.

- 2nd and 3rd trimester: ACT-SP (As given for age more than 15 years except Primaquine)
    a) Day 1: Tab Artesunate 200mg 1 OD+ Tab SP(500mgS+25mgP) 3 OD
    b) Day 2: Tab Artesunate 200mg 1OD
    c) Day 3: Tab Artesunate 200mg 1 OD

Pregnant women should not be given Primaquine on Day 2

Points to ponder for oral anti-malarial therapy

- First dose should be Directly Observed by Mitanin/ANM
- Drugs should be preferably be given after meals.
- Ask the patient to wait for 15 minutes after taking medicine for observation
- If patient vomits within 15 minutes of taking drug , repeat the dose and wait more for 15 min.
- If patient vomits again consider patient as severe malaria and immediately refer to FRU/DH

Treatment of Falciparum Malaria Severe: Pregnant women

1st Trimester

Initial parenteral treatment for 48 hrs:

- Inj. Quinine: Loading dose 20mg quinine salt/kg body weight on admission (IV infusion or divided IM injection) followed by Maintenance dose of 10 mg/kg 8 hourly; infusion rate should not exceed 5 mg/kg per hour.
- Loading dose of 20mg/kg should not be given, if the patient has already received quinine.

Follow up oral treatment

- Oral Quinine 10mg/kg TDS with
- Tab Clindamycine 10mg /kg body wt BD for 7 days

2nd and 3rd Trimester

Initial parenteral treatment for 48 hrs:

Inj Artesunate: 2.4 mg/kg i.v. or i.m. given on admission (time=0), then at 12 h and 24 h, then once a day.

Follow up oral treatment : ACT+SP for three days.

Primaquine on day 2 should not be given to pregnant woman

Some don'ts in severe malaria case management

- Do not use corticosteroids,
- Do not give intravenous mannitol,
- Do not use heparin as anticoagulant,
- Do not administer adrenaline or overhydrate.

Parenteral therapy once started should be continued for at-least 24 hours even if case is able to take oral medicines.

Treatment of complications in severe malaria in adults

1. Cerebral malaria

The adult patient with cerebral malaria is comatose, the depth of consciousness being variable (for assessment of coma, see the Glasgow coma scale) If the cause is in doubt, test for other locally prevalent encephalopathy, e.g. bacterial, fungal or viral meningoencephalitides.

Asexual malaria parasites are usually demonstrable on a peripheral blood smear. Convulsions and retinal hemorrhages are common; papilledema is rare. A variety of transient abnormalities of eye movement, especially disconjugate gaze, have been noted. Fixed jaw closure and tooth grinding (bruxism) are common. Pouting may occur or a pout reflex may be elicited (by stroking the sides of the mouth). Mild neck stiffness occurs but neck rigidity and photophobia are absent. The commonest neurological picture in adults is one of a symmetrical upper motor neuron lesion.

Motor abnormalities such as decerebrate rigidity and decorticate rigidity (arms flexed and legs stretched), occur. Hepatosplenomegaly is common. The abdominal reflexes are

invariably absent; this is a useful sign for distinguishing hysterical adult patients with fevers of other causes in whom these reflexes are usually brisk. The opening pressure at lumbar puncture is usually normal in adults, but may be elevated; cerebrospinal fluid (CSF) is clear, with fewer than 10 white cells per microlitre; the protein is often slightly raised, as is the CSF lactic acid concentration. A variety of nonspecific electroencephalographic abnormalities have been described; computerized tomography scans of the brain are usually normal.

Cerebral malaria in children, the following is seen

Clinical features

- The earliest symptom of cerebral malaria in children is usually fever (99.5? F-105.8? F), followed by failure to eat or drink. Vomiting and cough are common; diarrhea is unusual.
- The history of symptoms preceding coma may be very brief-commonly one or two days.
- A child who loses consciousness after a febrile convulsion should not be classified as having cerebral malaria unless coma persists for more than 1 hour after the convulsion. Antimalarial treatment must not be delayed.
- The depth of coma may be assessed according to the coma scale for children (Annexure III) by observing the response to standard vocal or painful stimuli (rub knuckles on child's sternum; if there is no response, apply firm pressure on thumbnail bed with horizontal pencil).
- Always exclude or treat hypoglycemia.
- Convulsions are common before or after the onset of coma. They are significantly associated with morbidity and squeal. They may present in a very subtle way-important signs include intermittent nystagmus, salivation, minor twitching of a single digit or a corner of the mouth and an irregular breathing pattern.
- Deep breathing with a clear chest is a sensitive and specific sign for the presence of metabolic acidosis.
- A few children have cold, clammy skin, with a core-to-skin temperature difference of 1?C. Some of these patients are in a state of shock with a systolic blood pressure below 50 mmHg.
- In children with profound coma, corneal reflexes and "doll's eye" movements may be abnormal.

- In some children, extreme opisthotonos is seen which may lead to a mistaken diagnosis of tetanus or meningitis.
- CSF opening pressure is usually raised.

Essentially, most cases have one of the following symptom complexes such as

1) Coma with concomitant other severe systemic derangement such as severe anemia, metabolic acidosis, respiratory distress or shock;
2) Coma with protracted or multiple seizures, where unconsciousness might be caused by a long (>1 h) post-ictal state or by subclinical or subtle seizure activity, characterized by conjugate eye deviation, nystagmus, salivation, and hypoventilation or
3) a pure neurological syndrome of coma and abnormal motor posturing, which might be complicated by raised intracranial pressure and recurrent seizures.

In fact, sudden hypoventilation and apnea due to respiratory centre depression is a not infrequent occurrence, and should be anticipated and due preparedness with ventilator support is necessary.

Different Diagnosis of Cerebral Malaria

Table-7

Condition	Features
Heat Stroke	Occurs during summer, on exposure to heat, absence of sweating skin hot and dry
Meningitis	Gradual onset, neck rigidity, CSF changes
Viral encephalitis	Outbreak of many cases with similar history, neck rigidity, typical headache, post-monsoon season.
Cerebro vascular episodes	Sudden onset, higher age group, CSF changes, characteristics history
Hypertensive encephalopathy	History of long standing hypertension, sudden onset
Hypo-or hyper-glycaemia	History of diabetes
Uremic coma	History of chronic kidney disease
Hepatic coma	History of chronic liver disease
Narcotic poisoning /Head Injury & Alcoholic	Circumstantial history, Pupillary changes,Neurology findings

Management:

Principles of management consist of

(1) Care of the unconscious patient

(2) Symptomatic management

(3) Specific antimalarials

(4) Management of associated complications

1. Care of the unconscious patient: (Annexure-VI)

- Airway, breathing and circulation (ABC) care of unconscious patients should be practiced in all patients of cerebral malaria in addition to meticulous nursing care.

2. Symptomatic treatment: Convulsions and body temperature should be controlled

- Control of body temperature: by sponging or fanning, if the fever is not Controlled appropriate antipyretics (paracetamol) may be used. Use vigorous sponging If temperature is above 102 F(squeeze muscles of limb, thigh with wet clothes.) Ice water feeding/bath or enema may be used some times.
- **Control of convulsions:** convulsions can be controlled with intravenous diazepam 5-10 mg injected slowly. If the convulsion persists, the dose can be repeated every 15 minutes, but the total dose should not exceed 20 mg in one hour. This regimen can be repeated once every 2-4 hours up to a maximum dose of 100 mg in 24 hrs. Inj Midazolam 5-10mg slowly over a period of more than 3 minutes this drug is safer than inj diazepam.
- **For repeated and uncontrolled seizures:** phenytoin 15-20mg/kg body weight by slow intravenous injection (not more than 50mg/min) over 15 to 20 minutes can be used. The maintenance dose is 5mg/kg in 24 hours to prevent further seizures.

3. Specific antimalarial drugs:

The antimalarial drug should be administered parenterally for achieving quicker and predictable blood concentrations. Artemisinin compounds or intravenous quinine or can be administered.

4. Management of associated complications: The following conditions (in addition to convulsions and hyperpyrexia mentioned earlier) may also cause impaired consciousness and appropriate management of these conditions will help reduce mortality and to differentiate impaired consciousness due to cerebral malaria from other associated conditions.

- Hypoglycemia
- Severe anemia

- Acidosis
- Use of sedative drugs

The following drugs have been used or suggested for the treatment of cerebral malaria but are now considered of no beneficial effect and should be avoided:

- Corticosteroids
- Other anti-inflammatory agents
- Agents given for cerebral oedema (urea, mannitol)
- Low molecular weight dextran
- Epinephrine (adrenaline)
- Heparin

Mortality is significantly higher in patients of cerebral malaria when associated with other complications such as acute renal failure, acute respiratory distress syndrome, etc. Therefore cerebral malaria patients with multiple complications should be referred to intensive care.

2. Anemia

- Anemia of varying degree is a common accompaniment in severe malaria. Severe anemia is defined as hemoglobin < 5g/dl or hematocrit <15% .In Pregnancy Hb less than 7 g/dl is defined as severe anemia.
- Severe life threatening anemia is less common in adults of low transmission areas, though it may be seen in children.
- Preexistent iron deficiency may be present in many malaria patients.

Clinical features:

- The signs and symptoms of anemia in malaria depend on degree of anemia and rate of decrease of blood hemoglobin concentration.
- Sudden fall in the hemoglobin concentration may lead to cerebral anoxia and may even manifest as cerebral malaria.
- Malaria patients having pre-existent severe iron deficiency anemia may present with manifestations of heart failure.
- Anemia decreases oxygen carrying capacity of the blood and severe anemia may lead to tissue hypoxia and lactic acidosis.
- Hemoglobin level in finger prick samples is lower than venous blood.

Management:

- The blood hemoglobin level is likely to fall after fluid replacement and it should be re-estimated after dehydration is corrected to review the requirement of blood transfusion.

Indications of blood transfusion

Based on blood hemoglobin:

(1) When fall of hemoglobin is by 20% or more per day

(2) Haemoglobin concentration of <7.0 g/dl with symptoms (signs of hypoxia, severe metabolic acidosis with no other apparent cause) or

(3) Haemoglobin concentration of <5.0 g/dl with or without symptoms.

Based on clinical criteria: Anemic patients with

(1) Hyperparasitemia in whom a large drop in hemoglobin is anticipated

(2) Impaired consciousness, which might be exacerbated by reduced oxygen supply secondary to anemia

(3) ARF where haemodialysis is required

(4) Disseminated intravascular coagulation (DIC).Use fresh frozen plasma 200 ml at least per 24 hours.

Transfusion of pathogen free compatible fresh blood, preferably packed cells or settled cells should be given.

- Small intravenous doses of furosemide, 20 mg, may be given during the blood
- Transfusion to avoid circulatory overload, provided that the patient's renal function is adequate.
- In patients with ARF, only packed or settled cells should can be transfused.
- The volume of transfused blood should be included in calculation of fluid balance.
- Iron or iron containing tonics should be prescribed only if the cause of anemia is iron deficiency.
- Anemia due to infection may present in form of mild to moderate anemia.
- In such conditions it is better to estimate blood hemoglobin after 4 weeks or before hospital discharge (and without parasitemia) and if anemia is still present it should be treated with haematinics.

3. Renal failure

- Pre-renal azotemia is the most common form of acute renal failure (ARF) resulting from mild to moderate renal hypo perfusion. It is rapidly reversible upon restoration of renal blood flow. More severe hypo perfusion may lead to ischemic injury of renal parenchyma and intrinsic renal azotemia. Thus, pre-renal azotemia and ischemic ARF are part of a spectrum of manifestations of renal hypo perfusion. ARF as a complication of malaria is more common in adults than children
- Acute renal failure when present alone is less severe than when associated with other complications (cerebral malaria, jaundice, pulmonary oedema/ARDS).

- Malarial ARF is catabolic in type characterized by rapid rise of plasma urea and creatinine. The cause of established ARF is usually due to acute tubular necrosis.

Clinical features

- ARF may presents as oliguric or non-oliguric renal failure and even anuria in severe cases.
- The diagnosis of ARF is suspected when urine output decreases to 400ml or lessin 24 hours, or 20ml/hour, which fails to improve after rehydration. The diagnosis is confirmed when the serum creatinine exceeds 3mg/dl in adults and 1.5 mg/dl in children.
- Oliguric phase usually lasts about a week but may vary from few days to few weeks.
- Pre-renal azotemia usually presents with clinical signs of severe dehydration. However, prolonged anuria or oliguria may lead to inevitable volume overload, because of diminished salt and water excretion.

The distinction between pre-renal and established ARF is important for the correct clinical management, which can be differentiated by the simple measurement of urine specific gravity; while in pre-renal azotemia it is more than 1020. In established ARF it is less than 1010.

Management

- **Fluid replacement:** The patient should be examined for hydration status
- Signs of fluid overload should be monitored closely (raised jugular venous pressure, basal crepitations and reduced urine volume) during transfusion of blood or fluids, because of the vulnerability of ARF patients for post-transfusion volume overload.

Supportive therapy:

- Loop diuretics (furosemide) can convert an oliguric renal failure to a non-oliguric renal failure. Though this does not usually affect progress of the disease process and serum creatinine may continue to rise in spite of adequate urine volume, conversion of oliguric to non-oliguric renal failure reduces the risk of volume overload. Therefore, the use of loop diuretics may be restricted to the following conditions:
- Intravenous furosemide 40 to 250 mg IV should be tritrately given in conditions of volume overload.
- In oliguric patients, increase in urine volume with diuretics may mislead in assessing renal status where the monitoring of renal function is done by urine volume alone. In conditions where a diuretic is administered (or has already been administered before coming to the hospital) renal function should be monitored by serum creatinine and other clinical and biochemical indicators.

- Diuretics are of little help, and may be hazardous in complete anuric patients.
- Nephrotoxic drugs should be avoided where ARF is suspected or anticipated.
- If shock occurs Inj dopamine (10 microgram/ kg body weigh to 70 mcg/KG bw) or inj Noradrenalin can also be used.

The following drugs should be avoided in malaria patients because of their adverse reactions on renal function:

- **ACE inhibitors and cyclooxygenase inhibitors (NSAID) should not be given as they may precipitate pre-renal azotemia to ischemic ARF.**
- **Assessment of renal function using measurement of urine volume should also be done in patients receiving diuretics.**
- **Associated conditions requiring urgent attention:** Hypervolemia, hyperkalemia, severe acidosis, and severe anemia should be treated on priority.

Indications of referral for dialysis

Clinical indicators:

- Uremic symptoms: Nausea, vomiting, hiccough, flapping tremor, muscle twitching, and convulsions.
- Symptomatic volume overload: as shown by examination of jugular venous pressure (JVP), and pulmonary oedema.
- Pericardial rub, cardiac arrhythmia
- Persistence of acidotic breathing even after rehydration.

Laboratory indications:

- Hyperkalemia with no response to drug.
- Uncorrectable (by no dialysis treatment) metabolic acidosis (plasma bicarbonate <15 mmol/L)

4. Hypoglycaemia

Hypoglycemia is an important manifestation of falciparum malaria. It occurs in three different groups of patients which may overlap:

- Patients with severe disease, especially young children
- Patients treated with quinine, as a result of a quinine-induced hyperinsulinaemia;
- Pregnant women, either on admission or following quinine treatment.

In conscious patients, hypoglycemia may present with classical symptoms of sweating, dilatation of the pupils, breathlessness, oliguria, a feeling of coldness, tachycardia and light-headedness and weakness. This clinical picture may develop into deteriorating consciousness, generalized convulsions, extensor posturing, shock and coma.

The diagnosis can be easily missed because all these clinical features also occur in severe malaria itself. Deterioration in the level of consciousness may be the only sign. If possible, confirm by biochemical testing, especially in the high-risk groups mentioned above.

Blood sugars should be checked at admission, and if the patient remains unconscious, then it should be done hourly till consciousness returns. If the patient is conscious, then it should be done every three hours for the first 12 hours and then 6 hourly thereafter.

Management

- If hypoglycemia is detected by blood testing or suspected on clinical grounds, give 50% dextrose, 50 ml (1.0 ml/kg of body weight for children). This should be diluted in an approximately equal volume of any infusion fluid and infused over a period of about 5 minutes.
- Follow with a continuous intravenous infusion of 5% or 10% dextrose.
- Continue to monitor blood glucose levels (using a "stix" method if available, or clinically and biochemically if not) in order to regulate the dextrose infusion. Remember that hypoglycemia may recur even after treatment with intravenous dextrose.

5. Fluid and electrolyte disturbances

- Both hypovolemia and circulatory overload are extremely dangerous and therefore
- Correct assessment of hydration status and management of fluid and electrolyte balance is of enormous importance.

Hypovolemia

- Hypovolemia is a common accompaniment in severe malaria.
- Severe dehydration may be caused due to persistent fever, profuse sweating, inadequate fluid intake and in some cases vomiting and loose motion.
- Untreated hypovolemia may lead to hypotension, shock, and under perfusion of the kidney, brain, and other vulnerable organs.
- Hypovolemia may lead to tissue hypoxia resulting in lactic acidosis.

Clinical features

- The usual manifestations are those of dehydration such as increased thirst, orthostatic dizziness, orthostatic hypotension (blood pressure drop of more than 10 mm of Hg when the patient sits up from supine position), and tachycardia, reduced JVP, decreased skin turgor, dry mucous membranes, reduced axillaries sweating, oliguria with high urine specific gravity, and acidotic breathing with increased rate and depth.

Management

- Correct dehydration should be corrected with 0.9% saline or 5% dextrose saline by IV infusion. Excessive administration of isotonic dextrose (5%) solutions can induce hypoosmolality and hyponatremia. If severe it may lead to cerebral oedema and neurological abnormalities, including seizures.
- Monitor blood pressure, urine volume, and JVP every hour to assess hydration status. **Avoid circulatory overload, which may lead to fatal pulmonary oedema.** Improve oxygenation by clearing airway and oxygen therapy.
- Avoid administration of sodium bicarbonate unless associated with severe life threatening acidosis.

Circulatory overload

- Circulatory overload condition is extremely dangerous as it may rapidly precipitate fatal pulmonary oedema. Expansion of extracellular fluid volume may be associated with oliguric or anuric patients due to diminished salt and water excretion.
- It may be caused by intravenous administration of fluids or blood if hydration status is not monitored. The usual manifestations are weight gain, bilateral basilar lung rales, raised JVP, dependent oedema and features of pulmonary oedema. Fluid intake should be drastically restricted and fluid input output chart maintained.
- Titrated furosemide 40-250 mg IV be given immediately.

Circulatory collapse

Circulatory collapse occurs when associated with severe dehydration, algid malaria, massive gastrointestinal hemorrhage, ruptured spleen, and gram-negative septicemia. Possible sites of infection could be urinary tract (especially if there is an indwelling catheter) intravenous lines, meninges (meningitis), lungs (pneumonia) etc.

Clinical features

Circulatory collapse is diagnosed when one or more of the following features are present: systolic blood pressure less than 70 mm Hg in supine position, cold, clammy, cyanotic skin, sunken eyes, constricted peripheral veins, and rapid and feeble pulse.

Management

- Correct hypovolemia with an appropriate fluid e.g. normal saline or 5% dextrose saline.
- Look for the possible sites of infection (lung, urinary tract, IV injection sites).
- Take a blood culture and start broad-spectrum antibiotics e.g., third generation cephalosporin's.
- IV Dopamine as per need.

Hyponatremia

- Many patients with hyponatremia are dehydrated and salt depleted. Hyponatremia has been attributed to inappropriate secretion of ant diuretic hormone (SIADH). It may be 'depletion' through losses in sweat, vomitus, and diarrhea or 'dilutional' if the patient is drinking large quantities of plain water or by use of intravenous dextrose solution alone.
- Isotonic saline (0.9% "normal' saline) is an appropriate replacement for hyponatremia.
- Tab Tolvaptan 15mg to 30 mg one day(1-2 tab/day).

Hyperkalemia

- Hyperkalemia in malaria is usually associated with impaired renal function requiring urgent attention. These cases should be referred to a dialysis center for further treatment.
- IV Dextrose 25% +inj actrapid insulin (Regular Insulin) 6 unit 6 hourly.
- Potassium binding Resins can also be used.
- Hypokalemia and hypernatremia are less common in severe malaria.

6. Jaundice

- Jaundice is associated in severe falciparum malaria more commonly in adults than in children.
- Tender enlargement of liver and spleen are common in malaria.
- Mild jaundice may be due to haemolysis, but high rise of bilirubin is usually associated with hepatic dysfunction.
- Liver enzymes SGOT and SGPT may be increased but rarely more than 10 times of normal.
- Other causes jaundice should be excluded if the enzyme levels were found to be very high.
- Jaundice on its own may not be fatal in malaria patients, but mortality is increased
- Significantly when high bilirubin values are associated with ARF and cerebral malaria.
- Clinical signs of liver failure with hepatic encephalopathy are rare
- Hepatic dysfunction may lead to altered handling of antimalarial drugs.
- There is no specific treatment for jaundice. However severe haemolysis and rapid fall of hemoglobin need blood transfusion.

7. Metabolic Acidosis

- Metabolic acidosis is a common feature in severe malaria.
- Loss of bicarbonate and increased generation of lactic acid are major contributors.
- Blood lactate level rises due to tissue hypoxia, increased body metabolism, and failure of the hepatic clearance.

Clinical features

- Severe metabolic acidosis may presents with hyperventilation, Kussmaul's breathing, and acidotic breathing, but chest signs are usually absent.
- Presence of chest signs (crepitations and/or rhonchi) is indicative of pulmonary oedema/ARDS or associated pneumonia. Estimation of blood pH and bicarbonate will confirm the diagnosis.

Management

- Rehydrate the patient taking care not to over hydrate
- Treat severe anemia with blood transfusion.
- Refer the patient to a higher center for dialysis if ARF or severe anemia is present.

8. Pulmonary Edema

Pulmonary edema is a grave complication of severe malaria, with a high mortality (over 80%). It may appear several days after chemotherapy has been started and at a time when the patient's general condition is improving and the peripheral parasitaemia is diminishing. In most cases there are features of adult respiratory distress syndrome (ARDS), implying increased pulmonary capillary permeability. Pulmonary edema may also arise iatrogenically from fluid overload. The two conditions are difficult to distinguish clinically and may coexist in the same patient. Pulmonary edema is often associated with other complications of malaria and may also occur in vivax malaria. The first indication of impending pulmonary edema is an increase in the respiratory rate, which precedes the development of other chest signs. Hypoxia may cause convulsions and deterioration in the level of consciousness and the patient may die within a few hours.

Acute pulmonary oedema is also a more common complication of malaria in pregnancy. It may be the presenting feature or can develop suddenly after several days. It is more common in 2nd and 3rd trimesters.

It can develop suddenly in immediate post-partum period. This is due to

- Auto transfusion of placental blood with high proportion of parasitised RBC's
- Sudden increase in peripheral vascular resistance after delivery.

It is aggravated by pre existing anaemia and hemodynamic changes of pregnancy.

Acute pulmonary oedema carries a very high mortality in pregnacy

Management

- Keep the patient upright; raise the head of the bed or lower the foot of the bed.
- Give a high concentration of oxygen by any convenient method available, including mechanical ventilation.
- Give the patient a diuretic, such as furosemide 40 mg, by intravenous injection. If there is no response, increase the dose progressively to a maximum of 200 mg.
- In well-equipped intensive care units, mechanical ventilation with positive end-expiratory pressure (PEEP), a wide range of vasoactive drugs and hemodynamic monitoring will be available.
- If there is pulmonary edema due to over-hydration in addition to the above restrict Fluid Intake to 500-1000ml per day (24 hrs) in adults.

Diagnosis of metabolic acidosis, pulmonary oedema /ARDS, and pneumonia

Table-8

Clinical Feature	Metabolic acidosis	Pulmonary oedema/ARDS	Pneumonia
Respiratory rate	High /Low in late Stages	High	High
Depth	Deep Kussmaul's Breathing	Shallow	Variable
Effort of accessory respiratory muscles	In drawing of lower chest wall, mostly in children	Increase effort of respiratory muscle (sternocleidomastoid)	Variable, mostly seen in gross hypoxia
Bronchial breathing	Absent	May be present towards late stages	Present
Crepitations	Usually absent	Mostly present in bases.	Present on the site of pneumonia
Rhonchi	Absent	Present	Usually Absent
Cyanosis	Mostly absent	Usually present in late stage	May be present in severe hypoxia
Jugular venous Pressure	Not raised	Raised with volume overload; not raised in ARDS	Not raised
Chest X ray	Clear	Bilateral interstitial infiltration, hilar vessels prominent	Consolidation in the affected part of the lung

9. Circulatory collapse ("algid malaria"):

Some patients get admitted in a state of collapse, with a systolic blood pressure less than 80 mmHg in the supine position (less than 50 mmHg in children); a cold, clammy, cyanotic skin; constricted peripheral veins; rapid feeble pulse. In some countries this clinical picture is often associated with a complicating Gram-negative septicemia.

Circulatory collapse is also seen in patients with pulmonary edema or metabolic acidosis, and following massive gastrointestinal hemorrhage or ruptured spleen. Dehydration with hypovolemia may also contribute to hypotension.

Since severe malaria is a multisystem, multi-organ disease, children frequently present with more than one of the classic clinical phenotypes: cerebral malaria, respiratory distress, severe malarial anemia, and hypoglycemia.

Possible sites of associated infection should be sought, e.g. lung, urinary tract (especially if there is an indwelling catheter), meninges (meningitis), intravenous injection sites, intravenous lines.

Management

- Correct hypovolemia with an appropriate plasma expander (fresh blood, plasma or If these are not available, give isotonic saline.
- Take a blood culture if possible and start the patient on broad- spectrum antibiotics immediately, e.g. a cephalosporin such as Ceftraixone or a quinolone like Ciprofloxacin combined with a single dose of amikacin.
- If the facilities for blood culture are available, and the results of blood culture and sensitivity testing are available, give the appropriate antibiotic.
- Monitor central venous pressure.

10. Abnormal Bleeding And Disseminated Intravascular Coagulation (dic)

- Bleeding gums, epistaxis, petechiae, bleeding from injection sites, and subconjuctival hemorrhages may occur in patients of severe malaria.
- DIC may lead to hematemesis or malena. Asymptomatic thrombocytopenia is very common in falciparum malaria, which usually reverts to normal after recovery from the disease.
- Give Fresh frozen plasma 200mlper 24 hours, clotting factors or platelets as required and as available .If fresh frozen plasma is not available then transfuse fresh blood.
- Give vitamin K, 10 mg, by slow intravenous injection.

Management of High fever:

- Monitor frequently rectal temperature or freshly passed urine temperature or oral as the condition of patient permits.
- If rectal temperature is above 102.2?F, remove the patient's clothes, apply tepid sponging and fanning, and give paracetamol, 15 mg/kg of body weight, by mouth, suppository or nasogastric tube or intramuscularly.

Gram-negative septicemia is a common superinfection in children with severe falciparum malaria. These children have a higher case fatality with parasitaemia and invasive bacterial infection.

The following are indications for empiric antibiotic use:

I. fever that persists 48 hours after starting antimalarials, and the smear is negative
II. presence of shock or hypotension
III. presence of respiratory distress or tachypnea even when temperature has been brought down,
IV. And those who are younger than one year and those especially those with severe anemia. Malaria and bacterial co-infection mainly occur with multidrug-resistant gram-negative bacteria, particularly non-typhoid salmonellae and the best choice of antibiotic would therefore be a quinolone or third generation cephalosporin.

The dose of ceftriaxone would be 1 g 12 hourly in adults as a slow IV injection or infusion, and 60 to 70 mg per kg in children; ciprofloxacin would be 10 mg per kg IV 12 hourly given as an infusion over one hour; Amikacin can be added 15 mg per kg as a single daily dose if no renal dysfunction is present

Management of Hyperparasitaemia

- Antimalarial therapy should be initiated immediately, preferably by a parenteral route even if the patient can take medication by mouth.

Management of Malarial hemoglobinuria

- Continue appropriate antimalarial treatment if parasitemia is present.
- Transfuse screened fresh blood if needed i.e. if the Hb is less than 5 g/dl.
- Monitor central venous pressure to avoid fluid overload and hypovolemia.
- If oliguria develops and blood urea and serum creatinine levels rise (i.e. if acute renal failure develops), peritoneal dialysis or hemodialysis may be required. If possible, refer the patient to a dialysis unit or centre.

How does malaria behave in children differently than adults?

In children, febrile convulsions, repeated vomiting and dehhydration are common if the temperature is high due to any cause. Therefore, these symptoms are not necessarily indicative of severe malaria. However, children with such symptoms should be managed as severe malaria in routine program situations, and a diagnosis of malaria should be confirmed at the earliest.

Difference between severe malaria in adults and in children

Sign or symptoms	Adults	Children (<12 years of age)
Anemia	Common	Very common
Convulsions	Common	Very common
Pre-treatment hypoglycemia	Less common	Common
Metabolic acidosis	Less common	Common
History of cough	Uncommon	Common
Cerebral malaria	Common	Common in older children
Jaundice	Very common	Common
Renal failure	Common	*Less common*
Pulmonary edema, Acute Respiratory Distress Syndrome (ARDS)	Not uncommon, particularly in pregnancy	*Rare*
Duration of illness	Longer (5-7 days)	Shorter (1-2 days)
Resolution of coma	Longer (2-4 days)	Shorter (1-2 days)

In pregnancy, malaria, especially P.falciparum is a serious disease because with each bout of malaria, there is a reduction in haemoglobin and profound anemia may develop rapidly. They are also at high risk of abortions or intrauterine growth retardation because sequestration of parasites in placenta restricts oxygen and nutrients flow to the fetus.

Special clinical features of severe malaria and management of common complications in children:

In central Indian children, anemia is a common presenting feature in malaria, with almost 50% of children with severe malaria having Hb less than 5 grams%. Asexual parasitaemia is sometimes low but there is abundant malarial pigment in monocytes and other phagocytic cells, reflecting recent or resolving infection.

The rate of development and degree of anemia depend on the severity and duration of parasitemia. In some children, repeated untreated episodes of otherwise uncomplicated malaria may lead to normochromic anemia in which dyserythropoietic changes in the bone marrow are prominent. Parasitaemia is often scanty, although numerous pigmented monocytes can be seen in the peripheral blood.

On the other hand, children with hyperparasitaemia may develop severe anemia rapidly. In these cases, acute destruction of parasitized red cells is responsible.

Children with severe anemia may present with tachycardia and dyspnoea. Anemia may contribute to cerebral signs - confusion, restlessness, coma and retinal hemorrhages; signs of acidosis - deep, sometimes laboured, breathing; and rarely, cardiopulmonary signs - gallop rhythm, cardiac failure, hepatomegaly and pulmonary edema. Pedal Edema is not seen uncommonly in children in spite of heart failure.

Deep breathing, with in-drawing (recessions) of the bony structures of the lower chest wall, in the absence of localizing chest signs suggests metabolic acidosis frequently lactic acidosis. Frankly, in drawing (recession) of the intercostal spaces is a less useful sign. Deep Respiratory efforts due to acidosis or distress commonly accompany cerebral malaria or anemia but it may develop in a child without impaired consciousness. In either case it is associated with an increased risk of death. A systolic blood pressure below 50 mmHg in children indicates a state of shock.

Hypoglycemia is particularly common in children under 3 years and in those with convulsions or hyperparasitaemia or those who are in a profound coma. It is easily overlooked clinically because the manifestations may be similar to those of cerebral malaria.

Management of severe malaria in children:

The management of severe malaria in children is generally similar to that in adults. Some specific aspects are re-emphasized here.

- The parents or other relatives should be questioned about:
  - (i) history of residence or travel to a known malarious area like a forest village in the last 15 days;
  - (ii) previous treatment with antimalarials or other drugs;
  - (iii) Recent fluid intake and urine output; and
  - (iv) Recent or past history of convulsions.
- If the child is unconscious, insert a nasogastric tube to minimize the risk of aspiration pneumonia. Evacuate the stomach contents (this may reveal evidence of noxious substances given to the child if that is a likely possibility).
- It is a good idea to quickly try and weigh the child so that doses of various medicines can be given correctly. However, if it is really not possible, then decide on doses on basis of an assumed weight.

Presumed weights of rural children in Chhattisgarh could be 6 kg at 6 months, 8 kg at 1 year of age, 10 kg at 3 years, 13 kg at 5 years, 16 kg at 7 years, 25 kg at 10 years, 35 kg at 14 years! But try your best to get the actual weight!!!

- If parasitological confirmation is likely to take more than 1 hour, treatment should be started before the diagnosis is confirmed.
- Treat convulsions with intravenous diazepam, 0.3 mg/kg of body weight as a slow bolus ("push") over 2 minutes or 0.5 mg/kg of body weight intrarectally.
- In general, children with metabolic acidosis who have not previously received parenteral fluids are dehydrated and should be managed accordingly.
- In any child with convulsions, hyperpyrexia and hypoglycemia should be excluded. Whereas prophylactic anticonvulsants have been recommended in the past, use phenytoin 15 mg per kg given over 15 minutes slowly. Avoid Phenobarbitone.

- Paracetamol, 15 mg/kg of body weight 4-hourly, may also be given orally or rectally as an antipyretic.
- Use tepid sponging and fanning to try to keep the rectal temperature below 390C. Relatives are usually happy to do this when instructed.
- Avoid harmful ancillary drugs such as steroids dextran.

Management of Cerebral malaria:

- The management of severe malaria in children is the same as in adults including careful nursing and monitoring of the unconscious patient.
- The child with cerebral malaria may also have anemia, respiratory distress (acidosis) and hypoglycemia and has to be managed accordingly

Management of Anemia:

- The need for blood transfusion must be assessed with great care in each individual child. Not only packed cell volume (haematocrit) or haemoglobin concentration, but also the density of parasitemia and the clinical condition of the patient must be taken into account.
- In general, a packed cell volume (haematocrit) of 12% or less, or a haemoglobin concentration of 5 g/dl or less, is an indication for blood transfusion, whatever the clinical condition of the child. In some children, an initial transfusion is required with the utmost urgency (10 ml of packed cells or 20 ml of whole blood/kg of body weight). In these children if there is evidence of shock or hypotension, one may have to actually push in blood through a syringe or by compressing the blood bag.
- In children with less severe anemia (i.e. packed cell volume 13-18%, Hb 5-7 g/dl), transfusion should be considered for high-risk patients with any one of the following clinical features:
  (i) Respiratory distress (acidosis);
  (ii) Impaired consciousness;
  (iii) Hyper-parasitaemia (>20%).
- Anemic children with respiratory distress are, contrary to usual belief, rarely in congestive cardiac failure. More commonly their dyspnea is due to acidosis, resulting from tissue hypoxia, often associated with hypovolemia. Contrary to what we do when there is evidence of congestive heart failure, the sicker the child more rapidly the transfusion needs to be given!!!
- A diuretic is usually not indicated as many of these children are hypovolemic. However, if there is fluid overload, furosemide, 1-2 mg/kg of body weight up to a maximum of 20 mg, may be given intravenously.

Management of Respiratory distress (acidosis)

- Correct any reversible cause of acidosis, in particular dehydration and severe anemia. Intravenous infusion is best, using the most accessible site, including the femoral vein.

If this is impossible, give an intra-osseous infusion. Take care not to give excessive fluid, as this may precipitate pulmonary edema.

- Because convulsions may contribute to lactic acidosis, prevention of further seizures may be beneficial.
- If the haematocrit is more than 15% or the haemoglobin concentration is more than 5 g/dl, give 20 ml/kg of body weight of isotonic saline, by intravenous infusion over 30 minutes.
- If the haematocrit is less than 15% or the haemoglobin concentration is less than 5 g/dl in a child with signs of metabolic acidosis, give screened whole blood, 10 ml/kg of body weight over 30 minutes and a further 10 ml/kg of body weight over 1-2 hours without diuretics.
- Monitor response by continuous clinical observation supported by repeated measurement of acid-base status, hematocrit or hemoglobin concentration, and glucose, urea and electrolyte levels.

Management of Hypoglycemia:

- Unconscious children should be given dextrose regularly to prevent starvation hypoglycemia. It is most conveniently provided as 5% dextrose in saline infusion, but if this would be likely to lead to fluid overload, smaller volumes of more concentrated dextrose may be given at regular intervals.
- If hypoglycemia occurs, give intravenous 50% dextrose in a dose of 1.0 ml/kg of body weight (0.5 g/kg) diluted in approximately the same volume of IV fluid slowly over several minutes. If only 25% or 10% dextrose is available, give appropriately more to provide the same amount of dextrose (0.5 g/kg), i.e. 2 ml per kg of 25% dextrose, or 5 ml per kg of 10% dextrose fluids. This should be followed by a slow intravenous infusion of 5% or 10% dextrose to prevent recurrence of hypoglycemia. If the intravenous route is impossible, intra-osseous access should be tried. If this fails, 1ml/kg of body weight of 50% dextrose - or of any sugary solution - may be given through a nasogastric tube.
- The duration and amount of dextrose infusion will be dictated by the results of blood glucose monitoring (which should be done in blood taken from the arm opposite to that receiving the infusion), using a glucometer.
- Monitoring of blood glucose levels should continue even after successful correction as hypoglycemia may recur.

Management of Dehydration

- Rehydrate quickly with isotonic saline. Frequently examine the jugular venous pressure, blood pressure, chest, heart and liver size, to make sure the patient is not being given too much fluid.
- Where facilities for monitoring and maintenance of adequate sterility exist, fluid balance may be adjusted in accordance with direct measurement of the central venous pressure through a central venous catheter.

- If, after careful rehydration, urine output in the first 8 hours is less than 4 ml/kg of body weight, furosemide can be given intravenously, initially at 2 mg/ kg of body weight, then doubled at hourly intervals to a maximum of 8 mg/kg of body weight (given over 15 minutes). This is a high dose, but when necessary, then it has to be done.

Complications due to Malaria in Pregnancy

- Associated infections such as pneumonia and urinary tract infections are common.
- Pregnant women with severe malaria should be transferred to intensive care if possible.
- Malaria may lead to threatened premature labour or may result in established labour, despite prompt antimalarial treatment.
- Once labour has started, fetal or maternal distress may indicate the need to intervene, and the second stage may need to be shortened by the use of forceps, vacuum extraction or caesarean section.
- Women with severe anemia in the peak malaria season such as between August and January, especially primigravida, should be given full antimalarial treatment even if peripheral blood films are negative and there are no other features to suggest malaria. Mostly this is due to lodging of Pf in capillaries.

Management of hypoglycemia

- All pregnant women should be investigated for hypoglycemia. Symptoms of hypoglycemia may be subtle such as sweating, anxious look and tachycardia, and may not be florid like seizures and unconsciousness. If the diagnosis is in doubt, a therapeutic trial with 50% dextrose (20-50 ml intravenously) given over 5-10 minutes should be used.
- Recurrent severe hypoglycemia may be a problem in pregnant women with hypoglycemia.
- If injectable dextrose is not available, dextrose or sugary solution can be given to an unconscious patient through a nasogastric tube.
- Blood sugar should be monitored in every 4-6 hours for recurrent hypoglycemia.

Management of Anemia in pregnancy

- Women with a packed cell volume (hematocrit) lower than 20% or a hemoglobin concentration less than 7 g/dl should receive a slow transfusion of screened packed cells over 4 hours and frusemide 20 mg intravenously.
- Folic acid and iron supplements may be required. Iron sucrose may be given after seen of gestation.

Prognostic indicators to predict poor outcomes of severe malaria (in all age groups) : i.e mortality rates of over 10%

Clinical Indicators

- Age under 3 years
- Deep coma (death rates of more than 20%)
- Witnessed or reported convulsions
- Absent corneal reflexes

- Decerebrate/decorticate rigidity or opisthotonus
- Clinical signs of organ dysfunction (e.g. renal failure, pulmonary edema)(death rates of more than 40%
- Respiratory distress (acidosis)
- Circulatory collapse
- Papilledema and/or retinal edema

Laboratory Indicators

- Hyperparasitaemia (>250 000 parasites per microliter as seen on thick smear or >5% of RBC being involved on a thin smear)
- Peripheral schizontemia seen on microscopy
- Peripheral blood polymorph nuclear leukocytosis (>12 000 per microlitre) Mature pigmented parasites (in >20% of parasites)
- Peripheral blood polymorph nuclear leukocytes with visible malaria pigment (>5%)
- Packed cell volume less than 15% or Hemoglobin concentration less than 5 g/dl.
- Blood glucose less than 2.2 mmol/l or less <40 mg/dl)
- Blood urea more than 60 mg/dl or Serum creatinine more than 265 ?mol/l (>3.0 mg/dl)
- High CSF lactic acid (>6 mmol/l) and low CSF glucose (not an easily available test!)
- Raised venous lactic acid (>5 mmol/l) (not an easily available test !)
- More than 3-fold elevation of serum enzymes (aminotransferases)

Chronic malaria and its complications

It is much more common in endemic areas than previously thought.Chronic malaria develops after a person repeatedly suffers from an acute form of malaria. Malaria caused by P.Vivax or P.ovale can be considered chronic when it persists in the patients liver on hypozonite and producing relapses of infection weeks, months or even years after the initial infection. In between malarial attacks these patients show no sign of the malaria parasite in the blood but during the relapse the parasite re-enters the blood from the liver and can be detected .It is this phase when the parasites are in the blood the patient symptoms begin to appear.

Symptoms

The main symptoms of malaria include spleen enlargement, emaciation, depression, yellow complexion, ankle oedema, indigestion and weakness of muscles All of these symptoms may occur when a person has acute malaria but they are persistent and long term if they are due to chronic malaria.

When To Seek Treatment

The treatment for chronic malaria usually involves hospitalization. It is important to monitor and hydrate patient. These Patients should have each relapse treated with area specific anti malaria and then give primaquine which will kill the dormant liver stages and prevent future relapse.

Complication's Of Chronic Malaria

Hyper Reactive Malarial Syndrome

Several Patients from tropical areas have been seen with massive Splenomegaly. After excluding known causes of Splenomegaly, tropical Splenomegaly Syndrome was defined as separate entity. This condition was later defined as hyper reactive malarial syndrome (HMS).

Pathophysiology -

Hyper reactive malarial syndrome (HMS) is prevalent in native residents of regions where malaria is endemic and visitors to those regions. Patients with HMS have high levels of antibody for P falciparum, P Vivax and P ovale. Chronic antigen stimulation may be an important factor in the development of HMS.

Genetic factors, pregnancy and malnutrition may also play a role in the etiology of HMS. Relative protection against HMS is observed in patients with Sickle cell trait, as it is with malaria.

Effective malarial chemoprophylaxis and eradicative measures have been associated with a decrease in the incidence of HMS.

Epidemiology -

HMS is usually restricted to native residents and visitors of the malaria belt which roughly includes South Asia, Southern Asia, Middle East, Africa, equatorial region of South America. HMS is reported in India also.

Age -

HMS is more common in young and middle aged adults although the process probably commences during childhood. HMS is rare in children younger than 8 years but was reported in a 3 yrs old child.

Sex -

HMS is more common in female, especially Lactating mothers than in males.

Symptoms And Sings -

- The most common presenting symptom of HMS is chronic abdominal swelling and pain. Abdominal swelling may wax and wane.
- Many patients do not have any symptoms and are capable of normal daily activity. Patients adapt physiologically to chronic anaemia and are symptomatic only when it is severe. Weakness, loss of energy and headache may signify severe anaemia.
- Almost all patients have weight loss.
- Hernias, leg swelling, acute abdominal pain may be due to pressure on the abdominal content.
- Rarely patients have intermittent fever, persistent, sever fever should raise the possibility of an alternative diagnosis.

- Bleeding complications such as epistaxis are uncommon because thrombocytopenia is usually not severe.
- Susceptibility to skin and respiratory infection is slightly increased.

Signs -

Patients with HMS are usually a febrile at presentation. Anaemia is common. Patient may be malnourished. Jaundice may present.

The hallmark of HMS is moderate to massive Splenomegaly. Few Spleens (around one third) are tender and almost all have a smooth surface, self consistency, Sharp border. The enlarged Spleen may be seen to protrude against the abdominal wall and a spleenic bruit may be audible. Despite the sign of the spleen, spleen rupture is rare.

Hepatomegaly is common, Ascites is uncommon Dilatation of the veins, cardiomegaly, Low blood pressure and flow murmurs reflect hyper volumia.

Lymphadenopathy is absent but bilateral parotid swelling has been described.

The extensive travel history should be taken including travel in the endemic areas in patients who present with massive splenomegaly.

Differential- Diagnosis

Other causes of Splenomegaly

- B Cell Lymph proliferative disorders.
- Felty's syndrome
- Infectious mononucleosis
- Leishmaniasis
- Kala-azar
- Extra Hepatic portal hypertension
- Chronic Myeloid Leukemia.
- Malaria
- Salmonella infection
- Schistosomiasis
- Sickle Cell Anaemia
- Splenic lymphomas
- Thalassemia

Diagnosis Criteria For Hms -

Gross Splenomegaly 10 cm and more below the costal margin in adults for which no other cause can be found.

Elevated serum IgM

Clinical and immunological responses to antimalarial therapy.

Regression of Splenomegaly by 40% by 6 months after start of therapy.

High antibody levels of Plasmodium Species (> 1:80)

Minor criteria include the following -

- Hepatic sinusoidal lymphocytosis
- Normal cellular and humoral response to antigen challenge.
- Hypersplenism
- Lymphocytic proliferation
- Familial occurrence.

Lab Investigation -

Normocytic norm chromic anemia
Leucopenia is common and is sometimes associated with lymphocytosis
Thrombocytopenia is generally mild.

Treatment -

Antimalarial drugs have been the only to be used in HMS and have been shown to be effective in treatment. The specific drug of choice is based on the pattern and prevalence of drug resistance in the patient's geographical area. The Therapy may have to be continued for months to years but the exact duration of end point is not established.
The response to therapy is guided by the size of spleen, a decrease in serum IgM levels, improvement of anaemia and general improvement in the patient well begin.
Splenectomy is contraindicated because of increased risk of infection associated mortality.

Prognosis -

HMS is a chronic disease with mortality rates from 20-57% based on degree of Splenomegaly. Higher mortality rates are associated with treatment non compliance. Bleeding and infections are the most common complications. The exact risk of development of malignancy has not been established.

QUARTAN MALARIA NEPHROPATHY

Chronic or repeated infection usually with P.malariae may cause soluble immune-complex injury to the renal glomeruli. The pattern of renal involvement varies from asymptomatic proteinuria to full-blown nephritic syndrome. Oedema, ascites or pleural effusions are usual presenting features. Anemia and hepatosplenomegaly are common and many patients have fever on admission. The blood pressure is usually normal; the urinary sediment may show granular or hyaline casts in addition to proteinuria, but haematuria or red cell casts are rare. The disease usually progresses inexorably to renal failure over 3-5 years. Spontaneous remission is rare. Antimalarial treatment does not prevent progression and corticosteroids are usually ineffective. Some cases respond to cytotoxic therapy.

BURKITT'S LYMPHOMA AND EPSTEIN BAR VIRUS INFECTION

Malaria related immune suppression may provoke infection with lymphoma virus burkitts lymphoma is strongly associated with Epstein bar virus.
Standard Strategies for prevention of relapse in PV and PF

A malarial fever is considered as cured if after treatment patient does not have fever or parasitemia till day 28.

In some patients of P.vivax may cause relapse. A form of Plasmodium vivax parasite called as Hypnozoite remains dormant in the liver cells. These hypnozoite can later cause a relapse. A relapse may occur in falciparum malaria too.

To achieve a radical cure, relapses must be prevented .The frequency and pattern of relapse varies geographically. In Indian subcontinent it varies between 15-20%

For prevention of relapse the primaquine should be given at doses given below.

Primaquine for vivax malaria (Daily doses for 14 days)

Age in years	Daily dosage (in mg base)	No.of tablets (2.5 mg base)	No.of tablets (7.5 mg base)
<1	Nil	Nil	Nil
1-4	2.5	1	Nil
5-8	5.0	2	Nil
9-14	10.0	4	Nil
15 & above	15.0	6	2

Primaquine for falciparum malaria (Single dose on day 02)

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

Note: Primaquine should be given under supervision. Do not give Primaquine to pregnant, lactating woman and infants and G6PD deficiency cases.

G6PD deficiency and Primaquine:

The inherited sex linked G6PD deficiency is associated with some protection against P.falciparum malaria but there is increased susceptibility to oxidation haemolysis. The severity of haemolytic anemia is related to primaquine dosing and variants of the G6PD enzymes. Fortunately primaquine is eliminated rapidly and so haemolysis is self-limiting provided no further drug is taken.

Screening of G6PD deficiency is not available in the field therefore many patients are unaware of their G6PD status. If a patient is known to be G6PD deficient then primaquine should not be given.

In case of haemolysis in G6PD deficiency patient should be advised to stop primaquine immediately if he/she develops symptoms like -

- Dark coloured urine.
- Yellow discolouration of conjunctiva.
- Bluish discolouration of lips.
- Abdominal pain nausea or vomiting etc.

These cases should be reported to the doctor immediately.

Common errors in diagnosis:

Errors in Diagnosis that we should avoid!!

1. Failure to think of malaria in a patient with either typical or atypical illness
2. Failure to elicit a history of exposure (travel history) to an endemic village or working in a forest area
3. Misjudgment of severity (perhaps the commonest error)
4. Failure to do a thick blood film or a rapid diagnostic kit test.
5. Failure to identify P. falciparum in a dual infection with P. vivax (the latter may be more obvious)
6. Not checking for hypoglycemia
7. Failure to diagnose other associated infections (bacterial, viral, etc.)
8. Misdiagnosis (e.g. Influenza, viral encephalitis, hepatitis, typhoid, scrub typhus, etc.)
9. Failure to recognize respiratory distress (metabolic acidosis)
10. Failure to carry out an ophthalmoscopic examination for the presence of papilloedema, and retinal hemorrhages in adults.

Common errors made while managing severe malaria:

There are so many errors that can be made while treating severe malaria. Mentioned below are those errors that are commonly made. Let us see how can we avoid them !!

1. Inadequate nursing care
2. Delay in starting antimalarial therapy

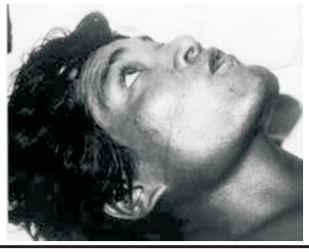
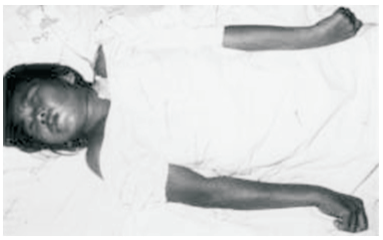
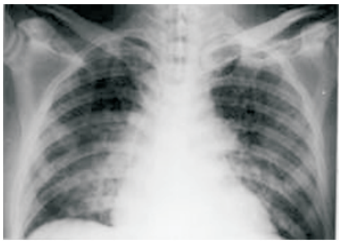
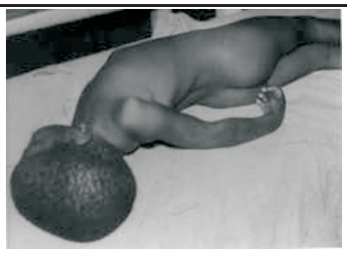
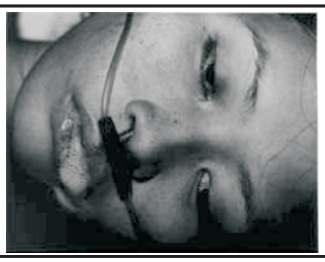
Use of inappropriate therapy:

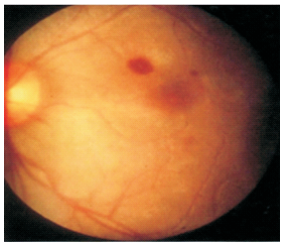
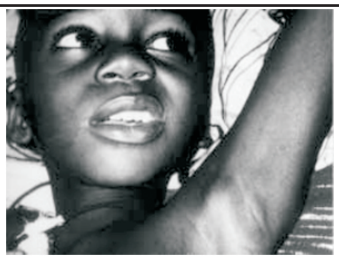
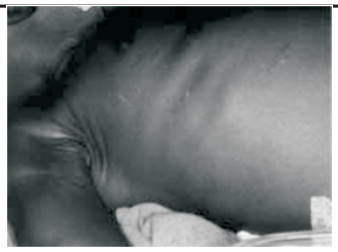
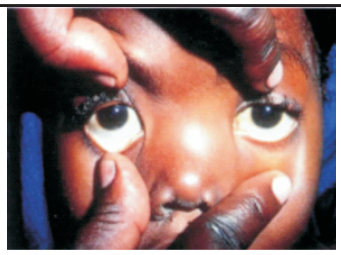
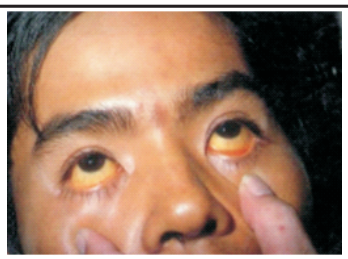
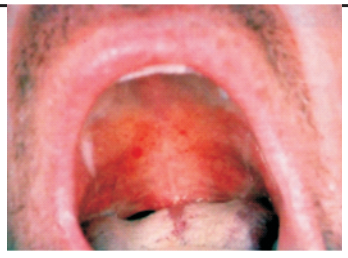
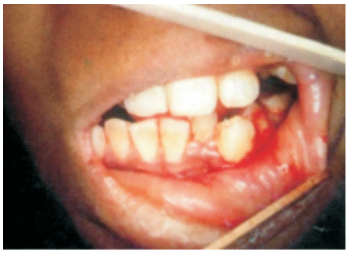
3. Using chloroquine in areas of resistance to it.
4. Unjustified withholding of an antimalarial drug
5. dosage not correctly calculated
6. inappropriate route of administration
7. unjustified cessation of treatment
8. failure to prevent cumulative effects of antimalarial drugsfailure to switch patients from parenteral to oral therapy as soon as they can take oral medication
9. unnecessary continuation of chemotherapy beyond the recommended length of treatment
10. use of unproven and potentially dangerous ancillary treatment
11. failure to review antimalarial treatment in a patient whose condition is deteriorating
12. Errors of fluid and electrolyte replacement
13. failure to control the rate of intravenous infusion
14. Failure to elicit a history of recent chemotherapy
15. Failure to identify or treat metabolic acidosis
16. Unnecessary endotracheal intubation
17. Unduly delayed endotracheal intubation (where this is
18. indicated and possible) Failure to control convulsions
19. Failure to recognize minor ("subtle") convulsions
20. Failure to recognize and treat severe anemia
21. Delay in considering obstetrical intervention in late pregnancy
22. Failure to recognize and manage pulmonary edema
23. Undue delay in starting peritoneal dialysis or hemodialysis
24. Failure to pass a nasogastric tube to prevent aspiration pneumonia
25. Failure to give antibiotics as a covering procedure if the decision is made to delay lumbar puncture.

Notes on antimalarial drugs

Drug name	Note
Quinine	At present, quinine remains the drug of choice for the treatment of severe and complicated malaria in many parts of Chhattisgarh. It should always be given by rate-controlled infusion, never by bolus ("push") intravenous injection. It may also be given intramuscularly diluted to 60-100 mg/ ml, but it is better avoided by this route. Quinine is safe in pregnancy. Mild side-effects are common, notably cinchonism (tinnitus, hearing loss, dizziness, nausea, uneasiness, restlessness and blurring of vision); serious cardiovascular and neurological toxicity is rare. Hypoglycemia is the most serious frequent adverse side-effect. In suspected quinine poisoning, activated charcoal given orally or by nasogastric tube accelerates elimination.
Artemisinin compounds	Artemisinin and its derivatives may be administered intrarectally, though this preparation is still not available in India. Artemisinin derivatives do not induce hypoglycemia in pregnancy although there is still very little information on their use in pregnancy. There is no reason to withhold these drugs from pregnant women with severe malaria.
Artesunate	Artesunate should now becoming is the drug of choice and is available in oral, intramuscular and intravenous formulations. It is rapidly absorbed with an accelerated parasite clearance time when compared with quinine. The drug is well tolerated with no attributable local or systemic adverse effects. As an IV injection, it should be given as a slow push over 2-4 minutes, and if any left- over drug is there, it should be discarded since it degrades vary rapidly.
Artemether	Artemether is available in oral and intramuscular formulations. Its efficacy, side-effects and availability are similar to artesunate except that the parenteral formulation is oil- based and may be inadequately or erratically absorbed following intramuscular injection in severely ill patients.
Sulfadoxine-pyrimethamine (500 mg + 25 mg)	Sulfadoxine-pyrimethamine should preferably not be given in the first trimester of pregnancy. Sulfonamides should not be given directly to neonates because of the risk of kernicterus, but sulfonamide treatment of a lactating woman does not pose a threat to her breastfed neonate unless there is jaundice, prematurity or G6PD deficiency. Theoretically, there might be a risk of kernicterus if sulfonamides were administered in late pregnancy, just before delivery; how- ever, there has been no documented case of this complication. When the contra-indications to the use of this drug are respected, and when this drug combination is used as a single-dose treatment for malaria in the prescribed manner, severe reactions are rare.
Chloroquine	Chloroquine in tablet form is still the most widely pre-scribed antimalarial drug. Despite parasite resistance, it provides symptomatic relief and reduces morbidity and mortality in many endemic areas where resistance is predominantly RI or RII. . It Is only recommended for vivax malaria. Oral therapy should be substituted as soon as possible; crushed chloroquine tablets can be given by nasogastric tube if injection is not possible. Immediate side-effects include nausea, vomiting, headache, uneasiness, restlessness, blurred vision, hypotension and pruritus. Acute chloroquine poisoning is manifested by coma, convulsions, dysrhythmias and hypotension.
Tab Synriam	It is new drug used for both Pv and Pf cases given one Tab daily for 3 days It can be used in uncomplicated and uncomplicated malaria no radical cure is needed.safty in pregnant women and child is not established.

Pictures of various complications of severe malaria

Dysconjugate gaze in a patient with cerebral malaria: optic axes are not parallel in vertical and horizontal planes	
Pouting and sustained upward deviation of the eyes accompanied by laboured and noisy breathing in a patient with cerebral malaria complicated by hypoglycaemia	
Decerebrate rigidity in a patient with cerebral malaria complicated by hypoglycaemia	
Radiographic appearance of acute pulmonary oedema, resembling adult respiratory distress syndrome	
Opisthotonus in an unarousable and comatose child with cerebral malaria.	
Acute pulmonary oedema developing immediately after delivery in a patient	
Urine from a Patient with Blackwater Fever	

Multiple retinal hemorrhages in cerebral malaria	
Subtle convulsions in a child with cerebral malaria. Note deviation of the eyes to the left, raising of the corner of the mouth and stereotyped raising of the left arm	
Deep acidotic breathing with intercostal recession in a child with severe falciparum malaria	
Profound anaemia (haemoglobin 1.2 g/dl) in a young boy with heavy Plasmodium falciparum parasitamia	
Deep jaundice in a man with severe falciparum malaria	
Palatal petechiae in a patient with importet falciparum malaria complicated by severe thrombosypenia	
Bleeding from the gingival sulci in a Patient with cerebral malaria complicated by disseminated intravascular coagulation.	

Annexure-I

Assessing Sensorium in adult patients with cerebral malaria using Glasgow ComaScale

Glasgow Coma Scale

Behaviour	Response	Score
Eye Opening response	Spontaneously To speech To Pain No response	4 3 2 1
Best Verbal response	Oriented to time, place and person Confused Inappropriate words Incomprehensible sounds No response	5 4 3 2 1
Best Motor response	Obeys commands Moves to localized pain Flexion withdrawl from pain Abnormal flexion (decorticate) Abnormal extension (decerebrate) No response	6 5 4 3 2 1
Total score	 Best response Comatose client Totally unresponsive	____ 15 8 or less 3

Annexure-II

Assessing coma in children: use the Blantyre scale

The Blantyre coma scale is modified from the widely used Glasgow coma scale and is applicable to children, including those who have not learnt to speak.

Type of response	Response	Score
Best motor	Localizes painful stimulus Withdraws limb from painb Nonspecific or absent response	2 1 0
Verbal	Appropriate cry Moan or inappropriate cry None	2 1 0
Eye movements	Directed (e.g. follows mother's face) Not directed	1 0
Total		0-5

Response Score

a. Rub knuckles on patient's sternum or above patient's eyebrow.

b. Firm horizontal pressure on thumbnail bed with a pencil

A state of unrousable coma is reached at a score of <3. This scale can be repeatedly to assess improvement or deterioration.

Annexure-III

PATIENT REFERRAL FORMAT

Name of the Patient: Age: Sex:

Address:

Date and time of admission: Date and time of referral:

Name of referring facility : Name of facility to which refered:

Chief complaint:

History:

Physical examination:

Progression:

Events during stay in small hospital (with special reference to):

Witnessed convulsions Yes/No (If yes how many?……..)

Presence of bleeding Yes/No (If yes, site of bleeding……)

Coma score

Oliguria

What antimalarial drug has been given?

Number of doses of antimalarial received?

Time of last dose of antimalarial received/started?

What other supportive therapy given (name of the drug, doses and the time of last dose)?

Anticonvulsants:

Diuretics:

Sedatives:

Antibiotics:

Any other drug:

Intake and output in previous 24 hours.

Blood sugar charting

Report of blood film (if possible the slide may be sent with the patient).

Reason of referral

Signature and name of the treating doctor

Annexure-IV

How to Use Quinine:

Quinine loading dose: Quinine dihydrochloride 20mg salt/ kg body weight diluted in 10ml/kg body weight (2mg/ml) of 5% dextrose or dextrose saline given by IV infusion over a period of 4 hours.

Maintenance dose:

1. IV-Quinine dihydrochloride 10mg salt/ kg body weight diluted in 10ml/kg body weight (1mg/ml) of 5% dextrose or dextrose saline given IV infusion. In adults, the maintenance dose is infused over a period of 4 hours, repeated every 8 hrs and in children infused over a period of 2 hrs, repeated every 12 hours, calculated from the beginning of the previous infusion, until the patient can swallow.
2. **Oral quinine:** Quinine sulphate 10mg salt/kg, 8 hourly to complete a 7 day course of treatment.

A loading dose of quinine should not be given

(1) If the patient has received quinine, quinidine or mefloquine within the preceding 12 hrs, or the previous history of drug intake cannot be ascertained

(2) Facilities for controlled rate of flow of quinine infusion is not available

(3) Facilities to treat complications of quinine therapy if develop do not exist.

- If there is no clinical improvement after 48 hours of parenteral therapy, the maintenance dose of parenteral quinine should be reduced by one-third to one half (i.e., 5-7 mg quinine dihydrochloride).

Total daily dose of quinine in patients requiring parenteral therapy beyond 48 hours is as follows:

Adults: Day 0: (first day of treatment) 30-40 mg salt/kg of body weight

Day 1: 30 mg salt/kg of body weight

Day 2 and subsequent days: 15-21 mg salt/kg of body weight.

Children: Day 0: (first day of treatment) 30-40 mg salt/kg of body weight

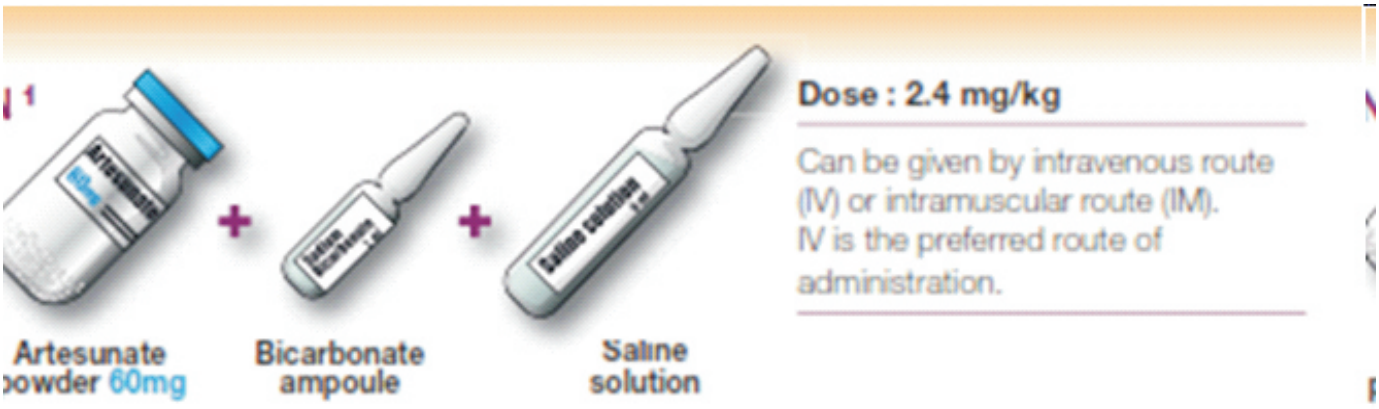
Day 1: 20 mg salt/kg of body weight

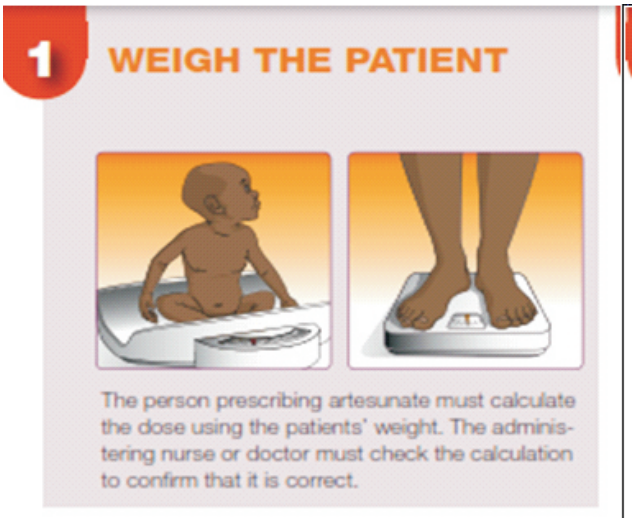
Day 2 and subsequent days: 10-14 mg salt/kg of body weight.

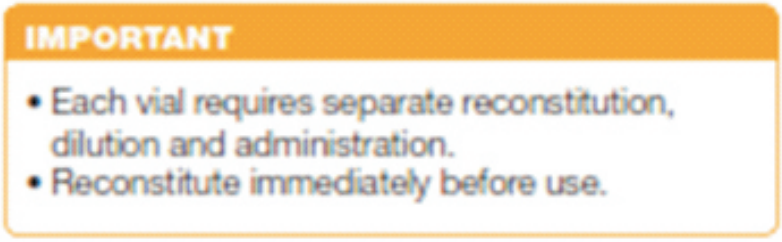
- Intravenous quinine should be administered at recommended dosage for first 48 hrs even if acute renal failure (ARF) or severe jaundice is present, but subsequent dose should be reduced to half if IV infusion is necessary. Quinine is not contraindicated in pregnancy.
- Monitor pulse and blood pressure at least every 6 hrs till the patient is on quinine.
- Avoid erect posture of the acutely sick patient during quinine therapy to prevent severe postural hypotension.
- Volume of infusion fluid for administration of quinine can be reduced to half (Quinine dihydrochloride 10 mg salt/ kg body weight diluted in 5 ml/kg body weight, or 1 mg of quinine salt/ 0.5 ml of fluid) if the condition of volume overload is failure develops, refer the patient to a dialysis.

Annexure-V

- **Procedure of giving Inj artesunate**
- **Product Information:**







Why must artesunate be reconstitued with sodium bicarbonate?

Artesunate is the sodium salt of the hemisuccinate ester of artemisinin. It is soluble in water but has poor stability in aqueous solutions at neutral or acid pH. In the injectable form, artesunic acid is reconstituted in sodium bicarbonate to form sodium artesunate,the active form of the drug. Due to the poor stability of the drug it must be reconstituted or activated immediately before dilution and then administered within 1 hour.

4 DILUTE

■ Reconstituted artesunate + saline solution (or dextrose 5%)

■ Volume for dilution

	IV	IM
Bicarbonate solution	1 ml	1 ml
Saline solution	5 ml	2 ml
Total volume	**6 ml**	**3 ml**
Artesunate 60mg solution concentration	10 mg/ml	20 mg/ml

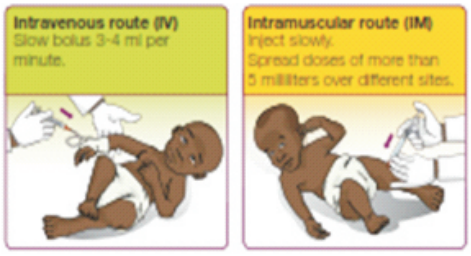
5 CALCULATE THE DOSE

Calculate and withdraw the required dose in ml according to route of administration:

For intravenous route (IV)	For intramuscular route (IM)
2.4 mg x body weight (kg) / IV artesunate solution concentration 10 mg/ml	2.4 mg x body weight (kg) / IM artesunate solution concentration 20 mg/ml
Round up to the next whole number	Round up to the next whole number
Example :	**Example :**
Doses needed (ml) for 6 kg child	Doses needed (ml) for 6 kg child
$\frac{2.4 \times 6}{10} = 1.44$ ml	$\frac{2.4 \times 6}{20} = 0.72$ ml
1.44 rounded up to 2 ml	0.72 rounded up to 1 ml

6 ADMINISTER

Withdraw the required dose (ml) from the prepared vial(s) and inject.



IMPORTANT

- Prepare the correct size syringe.
- Double check dose required (mls) for patient's weight (kg) before injecting.
- Inject immediately after preparation.
- Discard any solution not used within 1 hour.
- Prepare a fresh solution for each administration.

7 DOSING SCHEDULE

Give **3 parenteral doses** for a minimum of 24 hours once started, irrespective of the patient's ability to tolerate oral medications earlier:

- **Day 1**
  Dose 1: on admission (0 Hours)
  Dose 2: 12 hours later
- **Day 2**
  Dose 3: 24 hours after first dose

IMPORTANT

- Water for injection is not an appropriate dilutant

Annexure-VI

ABC of coma management

A: Airway:

Maintain the airway by keeping airway clean, i.e., free from saliva, vomitus, etc.

- Unconscious patients should be nursed on side, preferably left lateral position, on a flat surface
  without a pillow. This reduces incidence ofaspiration of gastric contents.
- Keep changing the side every 2 hours
- Insert a nasogastric tube and aspirate stomach contents.
- Airway should be used to prevent the tongue from falling back and to keep the airway clean.

B: Breathing:

If breathing is smooth, no support is necessary. If tachypnoea, laboured respiration, acidotic breathing is present or develops in the course of the management, patient may need ventilatory support. Hence it should be referred to centers with facilities for intensive care

C: Circulation:

Check for dehydration by examining the pulse rate, blood pressure, skin elasticity, jugular venous pressure.

- If dehydration is present, infuse intravenous fluids.
- Frequently check the rate of infusion.
- Suspected infection must be treated with antibiotics. Keep an accurate record of fluid intake and output. Strict intake and output chart should be maintained. Normal urine output is approximately 1 ml/min.

Annexure-VII

Useful tips for I.V. fluid infusion

While prescribing I.V. fluid therapy one should clearly mentioned that, what type of I.V.fluid is to be given, how much I.V. fluid is to be given, at what rate I.V. fluid should be given, and in how much time it should be given. It is very simple to calculate but in usual practice it is not followed. The guideline to calculate fluid infusion is given below which gives nearly normal rate of infusion.

For Adult I.V. set :

1. 15 drops = 1 ml.
2. Per minute drop rate calculation for I.V. fluid for 24 hours.

   I.V. fluid in litre in 24 hrs. x 10 = Drop rate per minute

   For e.g. :-

   a. To calculate drop rate per minute for 2.0 litres fluid in 24 hrs.

      2.0 x 10 = 20 Drops per minute

   b. To calculate drop rate per minute for 3.5 litres fluid in 24 hrs.

      3.5 x 10 = 35 Drops per minute

3. To calculate drop rate per minute for I.V. fluid to be given in 01 Hrs.

   Volume in ml. per hour 4 = Drop rate per minute

   For e.g. : -

   To calculate drop rate per minute for 60 ml I.V. fluid to be given in 01 Hrs.

   60 4 =15 Drops per minute

   To calculate drop rate per minute for 200 ml. I.V fluid to be given in 01 Hrs.

   200 4 = 50 Drops per minute

For Microdrip I.V. Set :

1. For Microdrip set 01 ml. = 60 Drops per minute

Number of Microdrops per minute = Volume in ml. per hour.

PHC/CHC/ DISTRICT HOSPITAL _____

BED HEAD TICKET FOR MALARIA PATIENTS

INDOOR PATIENT RECORD

Name:_____Age/Sex: _____

Father's/Husband's Name: _____

Occupation: _____ Ward No. /Bed No. : _____

Mark of Identification: _____Caste/Tribe_____

Address: H.No. _____

Gali/Street _____

City _____ District _____

State _____ PINCODE _____

Tel. No. _____ Mob. No. _____

OPD No. /Casualty No. _____IPD No. _____

Brought By: _____

BPL ☐ SMART CARD ☐

Date & Time of Admission: _____

Date & Time of Discharge: _____

Result ☐ DOR ☐ /LAMA/DAMA ☐ /ABSCONDED ☐ /REFERRED ☐ /EXPIRED ☐

Provisional Diagnosis : _____

_____

Final Diagnosis: _____ICD Codmg ☐

_____

IF REFERRED - Place of Referral Transportation Mode

Cause of Referral

DAMA - Discharged Against medical advise (give discharge ticket)

सहमति पत्र

मरीज की जानकारी	रिश्तेदार की जानकारी
मरीज की जानकारी	नाम :
रजि. नं.	पता
बीमारी का नाम	
Procedure	मरीज से रिश्ता

मैं ..... नीचे हस्ताक्षर करने वाला मैं खुद पर / उपरोल्लेखित मरीज पर उपरोक्त जांच पडताल दवाईयां उपचार पद्धति के लिए अपनी सहमति प्रदान करता हूं।

1. इस औषधीपचार, जांच पडताल, उपचार पद्धति की आवश्यकता, न करने से होने वाले परिणाम शल्यक्रिया के अतिरिक्त अन्य उपचारों के खतरे और समस्याओं आदि के बारे में डाक्टर .... ने मुझे पूर्ण रूप से समझा दिया है।
2. मुझे स्पष्ट रूप से यह जानकारी दी गई है कि कोई भी औषधीपचार / जांच पडताल पद्धति पूर्णतः सुरक्षित नहीं होती तथा उनके प्रयोग से सामान्यतः स्वस्थ तंदरूस्त व्यक्ति के जीवन को भी खतरा हो सकता है।
3. औषधिपचार / जांच पडताल उपचार पद्धति के दौरान अत्याधिक रक्त स्त्राव, संप्तर्गजन्यता, हृदय की गति रूकना या फेफडों में रक्त गुठली का अटक जाना इस तरह के या अन्य खतरे भी अकल्पित / आकस्मिक रूप से निर्मित हो सकते है इन संभावनाओं से भी डॉक्टर ने मुझे अवगत करा दिया है।
4. औषधि उपचार / जांच पडताल के उपचार पद्धति के दौरान या उसके पश्चात् अपेक्षित लाभ के बजाय हानि भी हो सकती है, खतरा अन्य तकलीफों से भी पैदा हो सकती है।

ऐसी स्थिति में उन्हें दूर करने के लिए डॉक्टर आवश्यक सावधानी बरतेंगे या अन्य दक्ष डॉक्टरों की सहायता / सलाह लेंगे। इस बात का मुझे पूरा भरोसा है और इसे मेरी सहमति भी है।

उपरोक्त दस्तावेज मैने पढा है ☐ मुझे पढकर समझा दिया गया है ☐

मैं इसके लिए सब जानकारी रखते हुए स्वेच्छा से एवं बिना किसी दवाब के सहमति प्रदान करता हूं।

गवाह **मरीज के रिश्तेदार** **मरीज के हस्ताक्षर**

हस्ताक्षर	हस्ताक्षर	हस्ताक्षर या दायें हाथ का अंगूठा
नाम		
पता		
उम्र : वर्ष ता.	तारीख	तारीख
	समय	समय

*** Presenting complaints:**
(with duration)
History of Presenting illness:(with special reference to:-)

S.No	Complaints/History	Yes	No
1.	Area of residence or travel to malaria endemic zone in past 6 weeks		
2.	Fever		
3.	Headache		
4.	Convulsions/Altered sensorium		
5.	Taken or taking antimalarial drug		
6.	Vomiting		
7.	Urine output in last 8-12 hrs. Adequate in adult (>400 mL) In children 0.5 ml per kg bw per hour.		
8.	Haemoglobinuria (coca cola or dark coloured urine)		
9.	Allergy to any drug		
10.	Pregnancy/ Post natal period		
11.	Antimalarial prophylaxis taken		
12.	Documented Hypoglycemia		
13.	Jaundice		
14.	History of Breathlessness.		

Any other relevant history:

Past History of illness :

S.No.	Disease	Yes	No	If Yes Dura tion
1.	Malaria			
2.	Jaundice			
3.	Hypertension			
4.	Diabetes			
5.	G6PD Deficiency			
6.	Sickle cell			
7.	Blood Transfusion			

Any other history of operation/ Drug allergy/ Injuries & operation Perform

* Adequate space should be given for notes
* Personal History:

(including diet & Nutrition/ bowel bladder habit / sleep/ tobacco, Alcohol, Cigarette habites)

* Family History:
* Menstrual History :
* Obstetric History :
* Treatment History:(Record of previous investigation and drug theraphy along with antimalarials taken at previous hospital as well with duration if referred):

General Examination(ON SEPARATE SHEET) :

Pulse: /min

BP: mm of Hg

Respiration: /min Type:

Temperature:

Pallor:

Icterus :

Cyanosis:

Clubbing:

Weight of patient: Kgs

Urine colour

Systemic examination: (With Special reference to neurological examination as per Table 1. Clinical manifestation, recognition and laboratory finding in Severe Malaria)

* 1. Respiratory System Examination :
* 2. Cardiovascular System Examination :
* 3. PER Abdomen Examination :
* 4. Center Nervous System Examination :
* 5. Obstetric Examination (If woman is pregnant)

Provisional Diagnosis :-

Treatment Advised (ON SEPARATE SHEET) :-

Name & Signature of Doctor

Date : / /20

* Adequate space should be given for notes

Severe Malaria Monitoring Chart

							Date of Admission				
							Time of admission				
							Registration number				
Name				Age (years/ months)			Sex				
Father/ husband name							Caste				
				weight (kg)							
Village											
monitoring chart											
duration		time/ date	sensorium	urine per hour	RR	O2 sat	fluids infused in last 1 hr	Pulse rate	BP	rx given	problem
at admission											
1 hour											
2 hours											
3 hours											
4 hours											
6 hours											
8 hours											
10 hours											
12 hours											
14 hours											
16 hours											
18 hours											
20 hours											
22 hours											
24 hours											
36 hours											
48 hours											
72 hours											
treatment given											
antimalarials											
IV artesunate		_____mg		time							
IV artesunate		_____mg		time							
IV artesunate		_____mg		time		date					
oral artesunate		_____mg		date							
S-P (reziq)		_____mg		date							

primaquine		_____mg		date							
other treatment											
IV ceftriaxone		_____mg every 12 hours			date						
					date						
					date						
blood		IV Blood _____ml over _____hours									
		IV Furosemide_____mg at onset _____time									
		IV Furosemide_____mg at midway _____time									
IV Dextrose											
		25% dextrose/ 50% dextrose _____ml Time_____									
		25% dextrose/ 50% dextrose _____ml Time_____									
		25% dextrose/ 50% dextrose _____ml Time_____									
Lab Monitoring											
date	**time**	**HB**	**sugar**	**creat**	**parasite count**						
admission											
2h											
4h											
6h											
12 h											

DAILY NOTES AND INSTRUCTIONS (4 SHEETS)

Name of Patient : _____ _____ **Age/Sex.**_____

Diagnosis : _____

_____

Notes	Treatment Advised

Lab Testing

S.No.	Investigations Done	Reports			
* 1.	Peripheral Smear (Parasitemia on day 1, 14 & 28)				
*2.	RD Test(Kit)	PF ☐ PV ☐ Mixed ☐			
3.	*HB%				
	• CBC				
*4.	Urine(R/M)				
5.	*Blood sugar(RBS)				
	• PPBS				
	• FBS				
• 6.	Blood Urea				
	S. Creatinine				
• 7.	S. Sodium				
	S. Potassium				
	S.Chloride				
• 8.	T. Bilirubin				
	Direct				
	SGOT				
	SGPT				
	T.Protein				
	Albumin				
• 9.	PT/INR				
• 10.	CXR				
• 11.	Electrocardiogram				
• 12.	USG abdomen				
• 13.	Urine Hb				
• 14.	CSF				
• 15.	Plasma Bicarbonate				
• 16.	G6PD				
• 17.	Sickling /Hb Electrophoresis				

Note : Flow chart of microscopy/Bivalaent RD test (Page no.7 & 8) and Drug Schedule (Table - 2,3,4 & 6) shall be displayed in the wards ,be read and remembered.

Reporting System

Reporting system consists of Field level reporting(M1,M2,M3 &M4),Facility based reporting(Sentinel site report) and death due to Malaria be investigated in the prescribed format.

a) Field Level Reporting (M1,M2,M3 &M4) :-

i) Surveillance Report of Fever Cases by Health facility (M1):-

This is the primary case record for all suspected malaria cases i.e it is actually a line list of all fever cases. This form is to be filled by any health provider/ worker which are directly involved in case detection and treatment. In M1, each row corresponds with one patient record.A copy of M1 will be send from Sub centre to PHC and the 2nd copy will be retained with the health provider/ worker.

ii) Laboratory Request Form for Slide Examination (M2):-

Fever cases are diagnosed using RDT and/ or Blood Slide. M2 is the Laboratory Request Form for Slide Examiantion, is filled in duplicate by MPW whenever blood slides need to be sent to the Lab. The result of microscopy and feed back on smear quality are filled by the LT and send the results back to health provider/ worker. The results obtained are entered into M1 by MPW to provide treatment and follow up the beneficiary.The positive cases shall be entered in M3 Register.

iii) Record of slide Examination in PHC/CHC Laboratory (M3):-

M3 register with regard to village wise positive data shall be maintained at PHC & CHC level. A Village wise positive cases register shall be maintained as per M1 and M2 reports. Each village will be recorded in separate sheet of the register.

iv) Report of Cases Sub centre/ PHC/ District/ State (M4) :-

M4 is a village-wise/ provider-wise/ sub centre wise numerical data recorded from M1 & M2 formats. In the monthly meeting at the Sub Centre MPW male worker collect reports of M1 and Mitanin report and generate M4 report.This M4 report along with M1 report will be forwarded to PHC through Sector Supervisor. A copy of M4 shall be retained with the Sub Centre. The collected data of all Sub centres shall be compiled and forwarded to CHC. The collected data of all PHC shall be compiled and forwarded to District. The final M4 generated in the District level be send to the State level.

b) Facility based reporting(Sentinel Site Report) :-

Sentinel site report includes both OPD and IPD data and this format is filled up by PHC/CHC/District Hospital/Medical college. The final compilation of Sentinel site report is done at District level and forwarded to the State level.

c) Death due to Malaria Investigation format :-

All deaths due to malaria should be investigated in detail by DMO/AMO/VBD consultant with a Medical Officer and recorded in the prescribed format.

राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम, छत्तीसगढ़

Annexure 1
M1

एम–1: बहुद्देशीय स्वास्थ्य कार्यकर्ता का निगरानी प्रतिवेदन

मलेरिया के सभी रोगियों की सूचना अंकित करें। प्रत्येक माह के लिए अलग–अलग प्रपत्र का प्रयोग करें। प्रत्येक माह में रोगी की सं0 1 से प्रारम्भ करें एवं जिस माह में रोगी की सूचना प्राप्त होती है उसका प्रतिवेदन उसी माह में अंकित करे। आवश्यकतानुसार 1 से अधिक शीट का प्रयोग 1 माह में किया जा सकता है। ऐसी स्थिति में शीट नं0 अवश्य अंकित करें। रोगी द्वारा उपचार तिथि के एक माह के अंदर पुनः बुखार की शिकायत करने पर उसे प्रा0 स्वा0 केन्द्र को रेफर कर देना चाहिए और यदि उसे एक माह पष्चात् बुखार आने पर इसे नये रोगी के रूप में प्रपत्र में अंकित करना चाहिए।

प्रा0 स्वा0 केन्द्र **उप स्वा0 केन्द्र** **माहः** **वर्षः**

क्र0सं0	गाँव का नाम	मलेरिया के संभावित रोगी का नाम	परिवार के मुखिया का नाम	सक्रिय/निष्क्रिय (ए/पी)	उम्र (वर्ष/माह)	लिंग (स्त्री/पु0)	अ0जा0 (हाँ/नहीं)	अ0ज0ज0 (हाँ/नहीं)	बुखार की अवधि (दिन)	आर0डी0टी0/रक्त पट्टी संग्रह की तिथि	उपयोगकी गई आर.डी.टी. क्रमांक	आर0डी0टी परिणाम		रक्त पट्टी संग्रह			रक्तपट्टी जांच परिणाम
												पी.वी./पी.एफ.	आर0डी0टी परिणाम ऋणात्मक होने पर x अंकित करें	रक्त पट्टी क्रमांक	जाँच के लिए रक्त पट्टी भेजने की तिथि	जाँच प्रतिवेदन प्राप्ति की तिथि	Pv/Pf/Mix
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

गर्भवती (यदि हाँ तो √ करें)	उपचार प्रारम्भ करने की तिथि	उपचार (गोलियों की सं0)						गम्भीर मलेरिया के लिए √ करें	रोगी को रेफर करने की तिथि	मृत्यु की तिथि	प्रतिवेदन जाँचकर्ता का हस्ताक्षर
		क्लोरोक्वीन	प्राइमाक्वान (2.5 मिग्रा)	प्राइमाक्वान (7.5 मिग्रा)	ए0सी0टी0 पैक	इंजेक्शन आर्टिसुनेट	टेबलेट क्यूनिन				
19	20	21	22	23	24	25	26	27	28	29	30

1. उपयोग की गई आर.डी.टी. जांच संख्या ..... (कॉलम 12)
2. आर.डी.टी. धनात्मक पी.वी. ....., पी.एफ., कुल धनात्मक ..... (कॉलम 13)
3. रक्त पट्टी संग्रहण संख्या ..... (कॉलम 15)
4. रक्त पट्टी जांच संख्या ..... (कॉलम 17)
5. रक्त पट्टी धनात्मक पी.वी. ....., पी.एफ. कुल धनात्मक (कॉलम 18)
6. कुल रक्त परीक्षण (कॉलम 12 + 17) .....
7. कुल धनात्मक ....., पी.वी. ..... पी.एफ. (कॉलम 13 + 18)

टीप :– 1. रोगी के पहचान हेतु आर.डी. टेस्ट/रक्त पट्टी पर मार्क पेन्सिल से, जिला/प्रा0स्वा.केन्द्र/उप स्वा0 केन्द्र/ग्राम का नाम/क्रमांक लिखें (संक्षेप के लिए उपयुक्त अक्षर दर्शाये)

2. मिश्रित संक्रमण को पी0एफ0 के रूप में दर्ज करें।
3. जाँच के बाद पाये गये मलेरिया रोगी को लाल से दर्शायें

भण्डार की स्थिति (सं0 एवं पैक में अंकित करें।)

भण्डार की स्थिति	आर0डी0 किट	क्लोरोक्वीन	ए0सी0टी0 पैक	इंजेक्शन आर्टिसुनेट	टेबलेट क्यूनिन	प्राइमाक्वान (2.5 मिग्रा)	प्राइमाक्वान (7.5 मिग्रा)
पूर्व का बचत							
प्राप्त मात्रा							
कुल							
उपयोग की गई							
बचत							

राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम, छत्तीसगढ़

Annexure 2
एम 2

एम–2 – रक्त पट्टी जाँच के लिए प्रपत्र

यह प्रपत्र रक्त पट्टी संग्रहकर्ता/जाँचकर्ता द्वारा भरा जायेगा।

गांव का नाम **स्वा0 उपकेन्द्र का नाम**

रक्त पट्टी संख्या	रोगी का नाम	उम्र	लिंग	बुखार की अवधि	सक्रिय/निष्क्रिय (ए/पी)	जाँच के लिए रक्त पट्टी भेजने की तिथि	रक्त पट्टी प्राप्त करने की तिथि	**Pv : Pos (√) Neg (-)**	**Pf : Pos (√) Neg (-)**	रक्त पट्टी गुणवत्ता से संबंधित मंतव्य	परीक्षण प्राप्ति की तिथि
1	2	3	4	5	6	7	8	9	10	11	12

रक्त पट्टी संग्रहकर्ता प्रथम सात कॉलम को भरकर रक्त पट्टी के साथ जाँचकर्ता को भेजें।

यह प्रपत्र दो प्रति में भरी जानी चाहिए। एक प्रति अपने पास सुरक्षित रखें एवं दूसरी प्रति को जाँचकर्ता के पास भेजें। जाँचकर्ता उसी प्रपत्र को जाँच के बाद वापस भेजेंगे।

कॉलम 8 से 12 तक रक्त पट्ट जाँचकर्ता के द्वारा भरा जायेगा। कॉलम 12 रक्त पट्ट संग्रहकर्ता द्वारा भरा जायेगा।

रक्त पट्ट जाँच के बाद प्राप्त इस प्रपत्र की सूचना एम–1 में अंकित करें।

संग्रहकर्ता का हस्ताक्षर **जाँचकर्ता का हस्ताक्षर**

राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम, छत्तीसगढ़

Annexure 3
एम 3

एम–3 प्रयोगशाला में रक्त पट्ट जाँच संबंधी प्रपत्र

जिला का नाम .....

स्वा. उपकेन्द्र का नाम ..... ग्राम का नाम .....

क्र.सं.	जाँच की तिथि	आर.डी.टेस्ट से जाच किया है हा/नहीं	सेवादाता का नाम	रक्त पट्ट संख्या	रोगी का नाम	उम्र	लिंग (स्त्री/पु0)	बुखार की अवधि (दिन)	जाँच के लिए रक्त पट्टी भेजने की तिथि	रक्त पट्टी प्राप्त करने की तिथि	परीक्षण परिणाम		रक्त पट्ट संग्रहकर्ता को परिणाम भेजने की तिथि	रिमार्क
											Pv	Pf - R, G, RG		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

नोट : यदि आर.डी.टेस्ट से जांच किया गया है एवं रोगी में धनात्मक मलेरिया पाये जाने पर एम 1 के अनुसार कॉलम नम्बर 3 भरें। रक्तपट्टी के जानकारी कॉलम नम्बर 5 में भरें एवं परीक्षण परीणाम पी.वी.एवं पी.एफ. के लिए क्रमशः कॉलम नम्बर 12 एवं कॉलम 13 भरें।

राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम, छत्तीसगढ़

Annexure 4
एम 4

एम–4 मासिक मलेरिया प्रतिवेदन

उप स्वा0 उपकेन्द्र / प्रा0 स्वा0 केन्द्र / सामु स्वा. केन्द्र / जिला का नाम **वर्षः–** **माहः–**

क्र.सं.	उप.स्वा. . केन्द्र / प्रा. स्वा. / सामु. स्वा. केन्द्र का नाम	जनसंख्या I	चालू माह में एम–1 प्रपत्र में अंकित कुल बुखार पीड़ितों की संख्या	आर.डी.टी.			आर.डी.टी. टेस्ट से कुल धनात्मक रोगी संख्या कॉलम 6 + 7	रक्त पट्टी						कुल जाँच (RDT + Slide) [Col 5+ Col 10]	कुल पी. वी. [Col 6+col 12]	कुल पी. एफ. (RDT + Slide) [Col 7 + Col 13]	कुल मलेरिया रागियों की संख्या [Col 16 + Col 17
				उपयोग की गई आर.डी.टी. की संख्या	आर.डी.टी. धनात्मक की संख्या			रक्त पट्टी संग्रह की संख्या	रक्त पट्टी जाँच	24 घंटे के अंदर जाँच कर भेजे गये रक्त पट्टी की संख्या	पी. वी.	पी. एफ.	रक्तपट्टीजांच से कुल धनात्मक रोगी संख्या कॉलम 12 + 13				
					पी.वी.	पी.एफ.			कुल								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

कुल मलेरिया रोगियों का वितरण										ए.सी.टी. पैक से उपचारित पी.एफ. रोगी की संख्या	इंजेक्शन आर्टिसुनेट से उपचारित गम्भीर मलेरिया रोगी की संख्या	आउटब्रेक (महामारी) (Y / N)	विगत पखवाड़ा में मलेरिया रोधी / आर.डी.के. की स्थिति		रेफर किये गये मलेरिया रोगी की संख्या	मृतक की संख्या (आर.डी.टी. या स्लाईड धनात्मक)	मृतक का नाम / उम्र / लिंग
निष्क्रिय	0-4 y		5-14 y		15+ y		अनु सूचित जाति	अनु सूचित जनजाती	गर्भवती महिला				RDT की उपलब्धता (Y / N)	ACT की उपलब्धता (Y / N)			
	M	F	M	F	M	F											
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

नोट : यदि रोगी का आर.डी. टेस्ट से जांच एवं रक्तपट्टी बनया गया हो, आर.डी. टेस्ट धनात्मक पाए जाने पर रक्तपट्टी को जांच के लिए प्रयोगशाला में नहीं भेजा जावे।

भण्डार की स्थिति (सं. एवं पैक में अंकित करें।)

भण्डार की स्थिति	आर.डी. किट	क्लोरोक्वीन	ए.सी.टी. पैक	इंजेक्शन आर्टिसुनेट	टेबलेट क्यूनिन	प्राइमाक्वान (2.5 मिग्रा)	प्राइमाक्वान (7.5 मिग्रा)
पूर्व का बचत							
प्राप्त मात्रा							
कुल							
उपयोग की गई							
बचत							

सेन्टीनल साइट मलेरिया पंजी

माह ..... वर्ष .....

सेन्टीनल साइट ..... जिला/सा0 स्वा0 केन्द्र/ प्राथ0 स्वा0 केन्द्र/मेडिकल कॉलेज अस्पताल/अन्य

सरल क्रमांक	दिनांक	रोगी का नाम	पता ग्राम का नाम/उप. स्वा. केन्द्र/वार्ड	उम्र	लिंग	गर्भवती माता हां/नही	अ.ज./ अ.ज.जा.	बुखार आने का दिनांक	स्वास्थ्य कार्यकर्ता/ मितानिन से किए गए सम्पर्क दिनांक	मलेरिया से जांच जानकारी		
										स्थान का नाम जहां जांच की गई	आर.डी. /स्लाइड	परिणाम
1	2	3	4	5	6	7	8	9	10	11	12	13

उपचार प्रारंभ होने की दिनांक	रोगी को अस्पताल में भर्ती किया गया या नहीं	भर्ती किये गये रोगियों की जानकारी			मृत्यू
		भर्ती दिनांक	रोग का अंतिम निदान	रोगी स्वस्थ हुआ/संदर्भन हुआ/एल.ए.एम.ए.	
14	15	16	17	18	19

टीप :– रोग के अंतिम निदान में **Uncomplicated/Complicated** मलेरिया की स्थिति दर्शाये।

राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम, छत्तीसगढ़
सेन्टीनल साइट प्रेतिवेदन

माह **माह**

ए.

सेन्टीनल साइट के नाम	कुल नया ओपीडी प्रकरण	संभावित मलेरिया रोगी की संख्या	मलेरिया प्रकरण			मलेरिया से ग्रसित गर्भवती महिला की संख्या	अनु. जाती / अनु. जनजाती	मलेरिया प्रकरण की उम्रवार जानकारी								कुल
								एक वर्ष से कम		1 से 4 वर्ष		5 से 14 वर्ष		15 वर्ष से अधिक		
			पी.वी.	पी. एफ.	कुल			पुरूष	महिला	पुरूष	महिला	पुरूष	महिला	पुरूष	महिला	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

बी.

सेन्टीनल साइट के नाम	कुल भर्ती किये गये मरीजो की संख्या	गंभीर मलेरिया से ग्रसित मरिज जो कि भर्ती किये गये है कि संख्या	गंभीर मलेरिया प्रकरण			मलेरिया से ग्रसित गर्भवती महिला	अनु. जाती / अनु. जनजाती	गंभीर मलेरिया प्रकरण की उम्रवार जानकारी								बुखार की अवधि			चिकित्सालय मे हुई मृत्यु की संख्या	मलेरिया से हुई मृत्यु कि संख्या
								एक वर्ष से कम		1 से 4 वर्ष		5 से 14 वर्ष		15 वर्ष से अधिक						
			पी.वी.	पी. एफ.	कुल			पुरूष	महिला	पुरूष	महिला	पुरूष	महिला	पुरूष	महिला	3 दिन से कम	3 से 7 दिन	7 दिन से अधिक		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

नोट :– सेन्टीनल साइट का प्रतिवेदन प्राथमिक स्वास्थ केन्द्र, सामुदायिक स्वास्थ केन्द्र एवं जिला चिकित्सालय मे संधारण किया जाना है ।

INVESTIGATION REPORT FOR DEATH DUE TO MALARIA

Investigation to be done by District Malaria Officer/AMO/ District VBD Consultants in consultation with a Medical Officer

1. Basic information:

- Name of the deceased _____Age (in years)_____Sex _____
- In adult female, indicate status of pregnancy and its complications, if any:_____
- Date of onset of illness _____ Date of Death _____
- Date of first contact with health care provider (ASHA/MPW/SC/PHC/CHC/District Hospital/ Other (specify) _____
- Occupation of the deceased:_____
- Complete address (usual place of residence)_____ _____ _____
- Place where disease started_____
- History of movements (within 3 weeks preceding from the date of onset of illness) _____ _____
- Source of information: Relatives/Paramedical staff/ Treating physician/ Specialist/other (specify) _____
- Place of Death _____

2. Major Signs and symptoms (S/S) with duration:

S/S	Duration	S/S	Duration	S/S	Duration	S/S	Duration
Fever		Anaemia		Jaundice		Rash	
Bleeding		Diarrhoea		Dyspnoea		Oliguria/anuria	
Neck rigidity		Altered Sensorium		Convulsions		Coma	

Other signs/symptoms:_____ _____

H/O of chronic illnesses (Diabetes, hypertension, asthma, HIV etc)_____ Relevant History in the past:_____

H/O of similar illness in family/neighbourhood in the past:_____

3. Parasitological Investigation:

Date	Date of RDT Testing/Collection of slide	Done by whom? (Mitanin/ANM/Male MPE/other)	Place of test	Results (Pf/Pv/Other)	Date of Receipt of result
RDT					
Blood slide					

Was Patient refer to Hospital ? yes/No .If Yes by whom (Mitanin/ANM/MPW male/MO/Self).If Yes ,Did patient reach to Hospital.Yes/No.If No.Write the reason for not reaching.

4. Other Biochemical/Pathological investigations done (specify): _____
_____
_____

5. Diagnosis: Clinical Diagnosis:_____
Confirmed Diagnosis: Malaria (Pf or PV specify) _____ other _____

6. Treatment before hospitalization: Date of starting treatment _____
Details of Treatment given before hospitalization:

Name of Drug	Dose	Date		Route of Administration
		From	To	

7. Treatment after admission to hospital:

Name of Drug	Dose	Date		Route of Administration
		From	To	

- Other supporting treatment_____
  _____
  _____

8. Cause of Death:

Confirmed Malaria (*Pf/Pv*/Others)	Clinically suspected Malaria	Others (Specify)

Post-mortem diagnosis (if undertaken)_____

9. Public health follow-up preventive/control actions taken by State/District/local health authorities in affected area:

10. Remarks of the investigating officers:

Name and Signature of DMO/
Assistant DMO/VBD Consultant

Name/ Signature Medical Officer