1. Introduction:

Malaria is one of the major public health problems in India. Around 1.5 million confirmed cases are reported annually by the National Vector Borne Disease Control programme (NVBDCP), of which 40-50% are due to Plasmodium falciparum. Malaria is curable if effective treatment is started early. Delay in the treatment may lead to serious consequences including death. Prompt and effective treatment is also important for controlling the transmission of malaria.

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

In West Bengal also malaria is remaining as major public health problem. The major problem districts are Jalpaiguri, Coochbehar, Birbhum, Purulia, Bankura, West Dinajpur, Malda, Murshidabad.

<table>
<thead>
<tr>
<th>Year</th>
<th>BSE</th>
<th>Total MP+Ve</th>
<th>Total Pf cases</th>
<th>ABER</th>
<th>API</th>
<th>Pf%</th>
<th>SPR</th>
<th>SFR</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>3879239</td>
<td>221617</td>
<td>60643</td>
<td>4.57</td>
<td>2.61</td>
<td>27.36</td>
<td>5.71</td>
<td>1.56</td>
<td>184</td>
</tr>
<tr>
<td>2005</td>
<td>4408763</td>
<td>185964</td>
<td>39640</td>
<td>5.5</td>
<td>2.32</td>
<td>21.31</td>
<td>4.21</td>
<td>0.9</td>
<td>175</td>
</tr>
<tr>
<td>2006</td>
<td>5271645</td>
<td>159646</td>
<td>42999</td>
<td>6.15</td>
<td>1.86</td>
<td>26.93</td>
<td>3.02</td>
<td>0.81</td>
<td>203</td>
</tr>
<tr>
<td>2007</td>
<td>4648787</td>
<td>86132</td>
<td>21415</td>
<td>5.80</td>
<td>1.07</td>
<td>24.86</td>
<td>1.85</td>
<td>0.46</td>
<td>96</td>
</tr>
<tr>
<td>2008</td>
<td>446519</td>
<td>89443</td>
<td>24453</td>
<td>5.39</td>
<td>1.08</td>
<td>27.34</td>
<td>2.0</td>
<td>0.55</td>
<td>104</td>
</tr>
</tbody>
</table>

Source: IBD cell, Dept. G. H & FW, Govt. of West Bengal

The death audit shows that the deaths are due to delay in reporting to health care delivery system. A major part are being treated by the quack practitioners in
the rural areas. Also it is seen that when the patients are admitted in government hospitals including medical colleges, they are not treated properly as per treatment guideline. It appears that doctors are even not aware how to treat malaria case because they have not gone through the recent guidelines. As a result they are treating the patients with their preoccupied knowledge or experiences—which are not proper as per the death audit analysis. That is why it is an attempt to make aware regarding the guidelines through this news letter.

The Control strategy of Malaria for prevention, Diagnosis and treatment has been changed in many ways.

(i) For prevention: Besides indoor residual spray (IRS) with DDT now the mosquito nets are being impregnated with Deltamethrin in the malaria prone areas. These mosquito nets require re impregnation at internal of six months.

Long lasting insecticidal nets (LLIN) are also being distributed in the rural areas with Annual Parasitic Incidence (API) more than 2.

Other larvicidal, antiadult, biological control measures are being continued. IEC definitely plays an important role.

(ii) Regarding Diagnosis: Besides time tested blood slide examination now Rapid Diagnostic Test (RDT) has been introduced. This will diagnose a case of P. falciparum immediately in the rural field. And treatment is started immediately. This will reduce malaria death. This rapid diagnostic test is being introduced through the ASHA worker meant for 1000 population in the villages.

(iii) Regarding Treatment: In chloroquin resistant area ACT (Artimisin Combination therapy) in blister pack is introduced. For radical treatment of malaria in case of P. vivax primaquin is to be given for 14 days instead of 5 days which was used previously. Radical treatment for P. falciparum is same.

In case of presumptive treatment after blood slide previously 4 tab of chloroquin was given. Now in non-resistant areas 4-4-2, a total of 10 tablets are to be given in malaria suspect cases in prone areas.

A revised National drug policy on Malaria has been adopted by the Ministry of Health and Family Welfare, Govt. of India in 2008 and these guidelines have been prepared for clinicians involved in treatment of Malaria.

2. Clinical features:

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

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

* Runing nose, cough and other signs of respiratory infections
* Diarrhoea / Dysentery
* Burning micturition and / or lower abdominal pain
* Skin rash / infections
* Abscess
* Painful swelling of joints
* Ear dischange
* Lymphadenopathy

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

3. Diagnosis

3.1 By microscopy:

Microscopy of stained thick and thin blood smears remains the gold standard for confirmation of diagnosis of malaria.

The advantages of microscopy are:

• The sensitivity is high. It is possible to detect malarial parasites at low densities. It also helps to quantify the parasite load.
• It is possible to distinguish the various species of malaria parasite and their different stages. The thick film is for identification of malaria parasite and thin film is to identify the species.

3.2 Rapid diagnostic test

Rapid diagnostic tests are based on the detection of circulating parasite antigens. Several types of RDTs are available in the market. Some of them can only detect P. falciparum, while others can detect other parasite species also. The later kits are expensive and temperature sensitive. Presently, NVBDCP supplies RDT kits for detection of P. falciparum at locations where microscopy results are not obtainable within 24 hours of sample collection.

RDTs are produced by different companies, so there may be differences in the contents and in the manner in which the test is done. The users’ manual should always be read properly and instructions followed meticulously. It is the responsibility of the clinician or technician doing a rapid test for malaria to ensure that the kit is within its expiry date and has been transported and stored under recommended conditions. Failure to observe these criteria can lead to false positive / negative results. It should be noted that pfHRP2 based kits may show positive results up to three weeks of successful treatment.
Early diagnosis and treatment of malaria cases aims at:
* Complete cure
* Prevention of progression of uncomplicated malaria to severe disease.
* Prevention of death of
* Interruption of transmission
* Minimising risk of selection and spread of drug resistant parasites

4. Treatment of uncomplicated malaria:
All fever cases diagnosed as malaria by RDT or microscopy should promptly be given effective treatment.

4.1 Treatment of P. vivax cases:
Positive P. vivax cases should be treated with chloroquin in full therapeutic dose of 25mg/kg body weight divided over three days. Vivax malaria relapses due to the presence of hypnozoites in the liver. The relapse rate in vivax malaria in India is around 30%. For its prevention, primaquine may be given at a dose of 0.25 mg/kg daily for 14 days under supervision. Primaquin in contraindicated in G6PD deficiency patients, infants and pregnant women. Caution should be exercised before administering primaquin in areas known to have high prevalence of G6PD Deficiency, therefore, it should be tested if facilities are available. Primaquin can lead to haemolysis in patients with G6PD deficiency. Patient should be advised to stop primaquin immediately if he/she develops symptoms like dark coloured urine, yellow conjunctiva, bluish discoloration of lips, abdominal pain, nausea, vomiting etc., and should report to the doctor immediately.

4.2 Treatment of Falciparum Cases:
The treatment of P. falciparum malaria is based on areas identified as chloroquin resistant/sensitive as listed in the last page. Artimisinin combination therapy (ACT) should be given in resistant areas whereas chloroquin can be used in sensitive areas. ACT should be given only to confirmed cases of P. falciparum found positive by microscopy or RDT.

4.2.1. What is ACT?
ACT consists of an artemisinin derivative combined with a long acting antimalarial drug (Amodiaquin, lumefantrine, mefloquin or sulfadoxine-pyrimethamine). The ACT used in the national programme in India is: Artisunate+Sulfadoxine-Pyrimethamine (SP). Presently, Artemethen+Lumefantrine fixed dose combination and blister pack of Artisunate+Mefloquine are also available in the country. Other ACTs which will be registered and authorised for marketing in India may be used as alternatives.

4.2.2. Should artemisinin derivatives be given alone?
Artemisinin derivative must not be administered as monotherapy for uncomplicated malaria. These rapidly acting drugs, if used alone, can lead to development to parasite
resistance.

4.2.3. Treatment in chloroquin resistant areas:
Areas which qualify for ACT:
- High Pf endemic districts in seven North-Eastern states, Andhra Pradesh, Chattisgarh, Jharkhand, Madhya Pradesh and Orissa, West Bengal in selected areas.
- Other chloroquin resistant PHCs and cluster of blocks surrounding identified drug resistant foci.

Individual cases who qualify ACT:
- Patients with history of travel to listed areas.
- No clinical or parasitological response to full dose of chloroquin within 72 hrs of starting the therapy.

4.2.4 Can ACTs be given in pregnancy?
According to current WHO guidelines, ACTs can be given in the second and third trimester of pregnancy. The recommended treatment in the first trimester of pregnancy is quinine.

4.3. Treatment of mixed infections:
Mixed infections with P. falciparum should be treated as falciparum malaria.

4.4. Treatment based on clinical criteria without laboratory confirmatin
All efforts should be made to diagnose malaria either by microscopy or RDT. However, special circumstances should be addressed as mentioned below:
What is the treatment, if RDT is negative and a microscopy result can not be obtained without 24 hours?
If RDT for only P. falciparum is used, negative cases showing signs and symptoms of malaria without any other obvious cause for fever should be considered as “clinical malaria” and treated with chloroquin in full therapeutic dose of 25 mg/kg body weight over three days. If the slide result is obtained later the treatment should be adjusted according to species.
What is the treatment, if neither RDK nor microscopy is available?
“Clinical malaria” cases should be treated with chloroquin in full therapeutic dose.

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

The algorithm for diagnosis and treatment is as follows:
When microscopy result is available within 24 hours

Clinically suspected malaria cases

↓

Take slide for microscopy

<table>
<thead>
<tr>
<th>P. Vivax</th>
<th>P. falciparum</th>
<th>Negtive</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQ 3 days+</td>
<td>ACT-3 days+PQ single dose</td>
<td>Needs further evaluation</td>
</tr>
<tr>
<td>PQ 14 days</td>
<td>(in CQ resistant area)</td>
<td></td>
</tr>
<tr>
<td>CQ 3 days+PQ single dose</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Where microscopy result not available within 24 hours

Clinical suspected malaria cases

Perform RDT

RDT for Pf, also prepare blood smear

Pf RDT Positive
ACT 3 days+PQ
Single dose in listed areas or
CQ 3 days + PQ single dose

RDT for Pf & Pv

Combo RDT
Pf RDT negtive
Send blood smear to laboratory.
Give CQ for 3 days and await microscopy result.

Microscopy result

• +Ve for Pv – PQ for 14 days under supervision
• +Ve for Pf – ACT 3 days+PQ single dose in tested areas or CQ-3 days+PQ single dose

* Look for the causes of fever, repeat blood slide examination after appropriate interval.

Table 1. Chloroquin for P.vivax and P. falciparum cases in areas considered to be chloroquin sensitive.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number of tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
</tr>
<tr>
<td></td>
<td>(10mg/kg)</td>
</tr>
<tr>
<td>&lt;1</td>
<td></td>
</tr>
<tr>
<td>1-4</td>
<td>1</td>
</tr>
<tr>
<td>5-8</td>
<td>2</td>
</tr>
<tr>
<td>9-14</td>
<td>3</td>
</tr>
<tr>
<td>15 &amp; above</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 2. Primaquin for P.vivax (daily dose for 14 days)

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Daily dose (in mg base)</th>
<th>No. of tablets (2.5 mg base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>1-4</td>
<td>2.5</td>
<td>1</td>
</tr>
<tr>
<td>5-8</td>
<td>5.0</td>
<td>2</td>
</tr>
<tr>
<td>9-14</td>
<td>10.0</td>
<td>4</td>
</tr>
<tr>
<td>15 &amp; above</td>
<td>15.0</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 3. Primaquin for P.falciparum (single dose on first day)

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Dose (in mg base)</th>
<th>No. of tablets (7.5 mg base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Nil</td>
<td>0</td>
</tr>
<tr>
<td>1-4</td>
<td>7.5</td>
<td>1</td>
</tr>
<tr>
<td>5-8</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>9-14</td>
<td>30</td>
<td>4</td>
</tr>
<tr>
<td>15 &amp; above</td>
<td>45</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: Primaquin should be given for 14 days under supervision.

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

Table 4. ACT (Artesunate+SP) dosage schedule for P.falciparum cases in chloroquin resistant cases.

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number of Tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
</tr>
<tr>
<td>&lt;1</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>1-4</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>5-8</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>9-14</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>SP</td>
</tr>
<tr>
<td>15 &amp; above</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td>SP</td>
</tr>
</tbody>
</table>

AS - Artesunate 50 mg, SP-Sulfadoxin-500 mg+Pyrimethamin 25 mg.
5. Severe Malaria :
5.1 Clinical features

Severe manifestations can develop in P. falciparum infection over a span of time as 12-24 hours and may lead to death, if not treated promptly and adequately. Severe malaria is characterised by one or more of the following features :
- Impaired consciousness/coma
- Repeated generalised convulsions
- Renal failure (serum creatinine > 3 mg/dl)
- Jaundice (serum bilirubin > 3 mg/dl)
- Severe anaemia (Hb < 5 mg/dl)
- Pulmonary oedema/acute respiratory distress syndrome
- Hypoglycemia (plasma glucose < 40 mg/dl)
- Metabolic acidosis
- Circulatory collapse/shock (systolic BP<80 mm of Hg).
- Abnormal bleeding and DIC
- Haemoglobinuria
- Hyperthermia (temperature > 104°F)
- Hyperparasitaemia (>5% parasitized RBC in low endemic and > 10% in hyperendemic area)

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

5.2 Can cases of severe malaria be negative on microscopy

Microscopic evidence may be negative for asexual parasite in patients with severe infections due to sequestration and partial treatment. Efforts should be made to confirm these cases by RDT or repeat microscopy. However, if the symptoms clearly points to severe malaria and there is no alternative explanation, such a case should be treated according.

5.3 Requirements for management of complications :

For management of severe malaria, health facilities should be equipped with the following :
- Parenteral anti malarials, antibiotics, anticonvulsants, antipyretic, antiemetics.
- Intravenous infusion equipments and fluids
- Special nursing for patients in coma
- Blood transfusion
- Well-equipped laboratory
- Oxygen.

If these items are not available, the patient should be refered without delay to a facility, where these are available.

5.4 Specific anti malarial treatment of severe malaria :

Severe malaria is an emergency and treatment should be given promptly. In endemic area in every hospital emergency RDK should be available to do the test in hospital emergency.

Parenteral artemisinin derivatives or quinine should be used irrespective of chloroquin sensitivity.
Artesunate: 2.4 mg/kg iv or IM given on admission (Time=0) then at 12 hours and 24 hours, then once a day (case should be taken to dilute artesunate power in 5% sodium bi carbonate provided in the pack).

- Quinine: 20 kg quinine salt/kg on admission (i.v. infusion in 5% dextrose/dextrose saline over a period of 4 hours) followed by a maintances dose of 10 mg/kg 8 hour; infusion rate should not exceed 5 mg/kg per hour. Loading dose of 20 mg/kg should not be given, if the patient has already received quinine. NEVER GIVE BOLUS INJECTION OF QUININE. If parenteral quinine therapy needs to be continued beyond 48 hours, dose should be reduced to 7 mg/kg 8 hourly.
- Artemethen: 3.2 mg/kg iv given or admission then 1.6 mg/kg per day.
- αβ Artuthen: 150 mg daily im for 3 days in adult only (not recommended for children).

Note:
- One the patient can take oral therapy, the further follow up treatment should be as below:
  - Patients receiving parenteral quinine should be treated with oral quinine 10mg/kg three times a day to complete a course of 7 days along with doxycycline 3 mg/kg per day for 7 days (Doxycycline is contraindicated in pregnant women and children under 8 years of age; instead clindamycin 10mg/kg body weight 12 hourly for 7 days should be used).
  - Patients receiving artemisinin derivatives should get full course of ACT. However, ACT containing mefloquine should be avoided in cerebral malaria due to neuropsychiatric complications.
    - Intravenous preparations should be preferred over IM preparations.
    - In first trimester of pregnancy, parenteral quinine is the drug of choice. However if quinine is not available, artemisinin derivatives may be given to save the life of the mother. In second and third trimester, parenteral artemesinin derivatris are preferred.

5.5. Can P. vivax lead to severe malaria?

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

6. Chemoprophylaxis:

Chemoprophylaxis is recommended for travellers, migrant labours and military personal exposed to malaria in highly endemic area. Use of personal protection measures like insecticide treated bed nets (ITBN) should be encouraged for pregnant women and other vulnerable populations.

6.1. For short time chemoprophylaxis (less than 6 weeks)

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

Note: Doxycycline in contraindicated in pregnant women and children less than 8 years.
6.2 For long term chemo prophylaxis (more than 6 weeks)

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

Note: Mefloquin is contra indicated in cases with history of convulsion, neuropsychiatric problems and cardiac conditions.

**Annexure**:

Districts / area identified for use of ACT combination (AS+SP) for treatment of *P. falciparum* malaria.

<table>
<thead>
<tr>
<th>District</th>
<th>Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Bengal (39 PHCs of 5 distracts)</td>
<td>Purulia (11 PHCs) Bagmundi, Sadar, Bandwan, Srikabad Jhaldo-II, Balarampur, Jhalda-I, Joypur, Barabzar, Manbazar-I Manbazar-II</td>
</tr>
<tr>
<td>Jalpaiguri (13 PHCs)</td>
<td>Uttar Latabani, Mal, Kalimpong, Sukna, Falakata, Kumargram Garubathan, Rajgunj, Moynagni Matiall, Madarihat, Alipurduar-I, Alipurduar-II</td>
</tr>
<tr>
<td>Bankura (5 PHCs)</td>
<td>Ranibandh, Raipur, Khatra, Belpahari, Hirbandh.</td>
</tr>
<tr>
<td>Darjeeling (8 PHCs)</td>
<td>Naxalbari, Sukna, Kurseong, Mirik, Phansidewa, Kalimpong-I, Rajgunj</td>
</tr>
<tr>
<td>Kokata Municipal Corporation*</td>
<td>Ward No. 37 and 43</td>
</tr>
</tbody>
</table>

* NOW NVBDCP is advocating to cover whole KMC area with ACT.

Hope that the doctors will follow the guidelines in treating malaria cases

*Source: Guidelines for Diagnosis and treatment of malaria cases in India 2009*  
Published by: Director, National Institute of Malaria Research  
Sector 8, Dwarka, New Delhi - 110077  
E-mail: director@mrc.india.org, Website: www.mrcindia.org