LRI Children's Hospital

Malaria management in Children

Staff relevant to:	Clinicians and Health Professionals within UHL Children's Hospital assessing and managing children up to the age of 16 years with suspected or proven malaria.
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Written by:	S Bandi
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1. Introduction and Who Guideline applies to

This guideline is for Clinicians and Health Professionals assessing and managing children up to the age of 16 years with suspected or proven malaria.

Malaria is the most common imported tropical disease into the UK. Between 1300 and 1800 malaria cases are reported each year in the UK [(1)]. Approximately three quarters of reported malaria cases are caused by *Plasmodium falciparum*, capable of causing severe or life-threatening multi-organ disease. Most non-falciparum malaria cases are caused by *Plasmodium vivax*, a few are caused by *ovale, malariae and knowlesi*. Infections cause by mixed malarial *Plasmodium* organisms, commonly involve *P.falciparum* and carry the risk of severe malaria.

Malaria should be suspected in anyone with a fever or a history of fever who has returned from or previously visited a malaria endemic country, regardless of whether they have taken prophylaxis.
Most patients with falciparum present in the first month of exposure and almost all present within six months of exposure. Vivax or ovale infections commonly present later than six months after exposure and presentation may be delayed for years.

Specific country information on malaria can be found at http://travelhealthpro.org.uk
(If you are unable to open the link directly, copy & paste to Google Chrome search)

2. Presentation: It is important to separate uncomplicated and severe malaria.

Uncomplicated malaria:
Positive blood film for malaria and none of the features of severe malaria (as below) in a clinically stable child.

Severe malaria:
Severe or complicated malaria is defined by one or more of the following: (for more details see https://www.britishinfection.org/

- Impaired consciousness or seizures
- Respiratory distress (careful fluid balance, fluid overload may induce pulmonary oedema)
- Signs of shock
- Hemoglobinuria or renal impairment
- Jaundice and other organ dysfunction
- Abnormal spontaneous bleeding
- P. falciparum in a child with sickle cell disease
- Parasitaemia > 5%
- Metabolic acidosis (sodium bicarbonate < 15 mmol/l)
- Raised lactate (lactate >5 mmol/l)
- Severe anaemia (<8 g/dL)
- Hypoglycaemia (blood sugar <3 mmol/L)

3. Investigations

Thick and thin films allow specification and quantification of malaria parasitaemia (prepared from EDTA blood). If the initial test is negative but the diagnosis is suspected, the film needs to be repeated up to 3times (12, 24 and 48 hours).

Rapid antigen tests are sensitive, and should be requested on the blood form, but can remain positive for 4 months after treatment.

Other essential investigations:

- FBC
- Blood glucose rapid test and laboratory sample
- Blood gas
- U+Es, LFTs, CRP, Clotting screen
- Blood cultures
- G6PD if primaquine is required

For clinical advice during day time please discuss with the Paediatric ID. During out of hours' please contact the on-call Infectious disease doctor or contact the on call paediatric infectious disease team at St George's hospital, London..
If a child is diagnosed then please inform Public Health as malaria is a notifiable disease. Only commence treatment in confirmed cases of malaria.

4. Management:

Children with P. falciparum malaria should be admitted to the hospital for at least 24 hours regardless of parasite load. Treatment should always be initiated by an ST4+ doctor and above.

Children with uncomplicated non-falciparum malaria if clinically well, after having been observed for 4 hours can be treated as outpatient. They will need to be followed up on day care between 24 – 48 hours to ensure there has not been an Hb drop and the parasitaemia is no longer present. They also need a G6PD test as primaquine needs to be started once the negative result is available.

Please admit all patients returning from South East Asia (Cambodia, Thailand, Vietnam and Laos) even if they fulfil the criteria for uncomplicated malaria, given the high probability of resistance in this area.

4.1 Treatment of complicated malaria (mostly due to P falciparum, but occasionally due to P ovale, vivax, malariae, knowlesi).

Parenteral treatment with IV Artesunate is recommended in all cases of complicated malaria. Give IV Quinine if Artesunate is not available. Do not delay treatment. (inform paediatric/on call pharmacist as soon as it is prescribed)

4.1.1 First line treatment for severe malaria:

Intravenous artesunate - Also can be used if the patient cannot tolerate oral treatment.

Dose: 2.4mg/kg/dose (3 mg/kg if < 20 kg) at time 0, 12, 24 and then daily until able to take medications orally. In severe malaria IV artesunate needs to be given for a minimum of 24 hours.
When treatment is stopped a full course of oral treatment, as specified in uncomplicated malaria needs to be given. Alternatively artesunate can be continued IV for 7 days.

Hourly observations including neurological observations are essential in the first 12 hours as there is risk for rapid deterioration.

When the patient is able to tolerate oral medications, a full course of oral Artemether-lumefantrine
OR
Atovaquone + proguanil
OR
Quinine + clindamycin 7–13 mg/kg/dose (max. 450 mg) every 8 hours for 7 days
OR
Quinine + doxycycline (in children>12 years of age and tolerating orals) 200 mg once daily for 7 days is required.

The decision to admit to ICU is guided by clinical criteria in a case by case basis by the treating clinician.

4.1.2 Second line treatment for severe malaria: Intravenous Quinine

Dose: 20mg/kg loading dose and subsequently 10 mg/kg, up to 600 mg, given in 5% dextrose (50- 250 ml) over 4 hours and repeated 8 hourly. Dosing should be reduced to 12 hourly if IV quinine is continued for more than 48 hours.
PLUS:
Clindamcyin or doxycyline as above

Major side-effects include hypoglycaemia and arrhythmias. The child should be on a cardiac monitor and blood sugars should be checked two hourly.
Consider exchange transfusion if parasitaemia > 15%.

4.1.3 Adjunct Management

• In the case of shock, after taking blood cultures, add Ceftriaxone once daily to cover bacterial sepsis
• Oxygen
• Strict fluid balance
• Transfuse if Hb<8g/dl (watch for fluid overload)
• Support clotting if necessary

4.2 Treatment of uncomplicated falciparum malaria

4.2.1 First line treatment

First line treatment is with either Artemether-lumifantrine or DHA-PPQ (Dihydroartemisinin-piperaquine).
Quinine with doxycycline or clindamycin, or Atovaquone-proguanil can also be used.

Artemether - lumefantrine schedule: 6 doses are necessary and it needs to be given at 0, 8, 24, 36, 48 and 60 hours

Doses	
5 – 14 kg	1 tablet
15 – 24 kg	2 tablets
25 – 35 kg	3 tablets
>35 kg	4 tablets

Dihydroartemisinin – piperaquine (DHA-PPQ): 3 doses at 0, 24 and 48 hours

Doses	
5 – 7 kg	0.5 standard tablet
8 – 10 kg	0.75 standard tablet
11 – 16 kg	1 standard tablet
17 – 24 kg	1.5 standard tablets
25 – 35 kg	2 standard tablets
>35 kg	3 standard tablets

Atovaquone – proguanil: once daily for 3 days

Doses	
5 – 8 kg	2 paediatric tablets
9 – 10 kg	3 paediatric tablets
11 – 20 kg	1 standard tablet
21 – 30 kg	2 standard tablets
31 – 40 kg	3 standard tablets
>40 kg	4 standard tablets

Oral Quinine is the least preferable drug
Dose:
10 mg/kg tds for 7 days and needs to be given in conjunction with clindamycin (7-13 mg/kg/dose 8 hourly for 7 days) or doxycycline (if >8 years old) 200 mg once daily for 7 days.

4.3 Treatment of Non falciparum malaria

- Usually sensitive to chloroquine (chloroquine-resistant *P.vivax* reported in Indonesia, New Guinea and some adjacent islands)
- Chloroquine should not be used for suspected mixed infections with falciparum
- Does not need routine admission unless ill/complicated

Chloroquine: 10 mg/kg initial dose then, 5 mg/kg after 6-8 hours and then once daily for 2 days

Primaquine: If malaria due to *P.vivax* or *P.ovale* and the child is **not** G6PD deficient this is followed by a 14 day course of Primaquine.

G6PD levels need to be checked and seen before giving Primaquine as severe haemolysis can occur if G6PD deficient. Primaquine should not be used under 6 months of age.

Dose of primaquine:
1. Ovale malaria: 0.25 mg/kg OD for 14 days
2. Vivax malaria: 0.5 mg/kg once daily for 14 days
3. Patients with mild-moderate G6PD deficiency: Consider after seeking expert opinion - 0.75 mg/kg single weekly dose for 8 weeks

5. Congenital and Neonatal Malaria

Congenital malaria is very rare and is acquired via placental transmission from an infected mother. It is mostly caused by P falciparum, ovale and vivax. The signs are similar to neonatal sepsis (fever, poor feeding, irritability, lethargy). The baby might be born IUGR, or premature and anaemia, haepatosplenomegaly at birth has been described.

The evidence for treatment doses is scarce.

5.1 Falciparum malaria

Consider quinine (in 10% Dextrose); loading dose 20mg (base)/kg IV (**ONLY if mother not yet treated pre delivery**) otherwise 10mg/kg/dose IV then every 8h, for a full 7 day course. All infusions have to be over 4 hours.

Alternatively Artesunate IV initial dose 2.4mg/kg/dose at 0 and 12 hrs on day 1, then once daily for a full 7-day course or IV.

5.2 Non-*falciparum* malaria

Chloroquine 10 mg/kg/dose for the first two days, followed by 5 mg/kg/dose at 6 h, 24 h and 48 hr.
Primaquine is not given.

6. Public Health implications:

There is a statutory obligation to notify all cases of malaria promptly to the local Public Health authority.

7. Contacts for advice: Paediatric ID team (In hours) -Dr S Bandi, Dr R Radcliffe

Out of hours: On call Microbiology/ID team

8. Education and Training:

None required

9. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Management of children with malaria	Audit	S Bandi	Every three years	Presentation in the departmental audit meeting

10. Supporting References

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11. Key Words

Knowlesi, Malaria, Malariae, Ovale, Palsmodium Falciparum, Parasitaemia, Vivax

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The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.
As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title) Dr S Bandi – Consultant Paediatrician	**Executive Lead** Chief Nurse
Details of Changes made during review: 2022 No changes	