

# Ensuring appropriate treatment of uncomplicated malaria:

## Training programme for health workers



# Participant's Manual

Prepared by REACT Cameroon  
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Collaborating Institutions

### Collaborating Institutions

University of Yaoundé I,  
Cameroon

London School of  
Hygiene and Tropical  
Medicine, UK

University of Nigeria  
College of Medicine,  
Enugu

National Malaria Control  
Programme, Cameroon

The Fobang Foundation,  
Cameroon

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## **List of Abbreviations**

ACTs: Artemisinin Based Combination Therapies

CBC: Communication for Behaviour Change

HF: Health Facility

HW: Health Worker

MD: Medical Doctor

NMCP: National Malaria Control Programme

RDTs: Rapid Diagnostic Tests

REACT: Research on the Economics of ACTs

WHO: World Health Organisation

## **TRAINING PROGRAMME ON MALARIA DIAGNOSIS AND TREATMENT**

### **Overview of the Training Programme**

#### **Introduction to the course**

Malaria is a major public health problem in Cameroon. You will already know something on how to diagnose and treat malaria. This training course has been developed to introduce a new method of diagnosing malaria which uses a test kit known as a Rapid Diagnostic Tests or RDT and provide updates in changes to the malaria treatment guidelines.

The training programme has been developed jointly by REACT Cameroon, the National Malaria Control Programme and other partners in Cameroon and Nigeria. The Research on the Economics of ACTs (REACT) project is an international collaboration between the University of Yaoundé I, University of Nigeria and the London School of Hygiene and Tropical Medicine whose objective is to design and evaluate an intervention to improve the delivery of ACTs.

#### **Aim of the Training Programme**

The aim of the training programme is to improve on the treatment provided to patients that are suspected of having malaria.

#### **Specific Objectives**

1. To improve health workers knowledge and skills in using malaria rapid diagnostic tests
2. To increase the percentage of patients who are tested before treatment is prescribed
3. To increase proportion of patients who receive treatment that is consistent with their parasitological status as shown by the malaria test.
4. To improve the accuracy of the dosing and the quality of advice given to patients
5. To increase the level of patient satisfaction with their health facility visit

#### **Training Modules**

The training programme is organized into 3 modules which will cover the following topics:

Module 1: Malaria Diagnosis

Module 2: Using Rapid Diagnostic Tests (RDTs)

Module 3: Providing Treatment

**Targeted Participants**

The training has been developed for health workers involved in prescribing and testing of patients in public and mission health facilities. These include: medical doctors, nurses, laboratory technicians and pharmacists.

**Organization and Logistics**

The training programme will last for 1 day. The course is organised for a maximum of 25 participants per workshop. One lead facilitator and 2 co-facilitators will handle the different training sessions. The schedule is based on an 8 –hour working day; 4 hours in the morning and four hours in the afternoon. Prior to initiating the training course, training materials need to be prepared and verified using a checklist

## **Introduction Lecture: Evolution of malaria management**

Before we start the first module on malaria diagnosis you may be wondering why the treatment guidelines have been updated. These are the main reasons:

### **1. Malaria remains a major problem in Cameroon**

Malaria is a life-threatening parasitic disease transmitted by Anopheles female mosquitoes. It is an important cause of death and illness in children and adults, especially in tropical countries.

In Cameroon, malaria continues to be endemic and is the first major cause of morbidity and mortality among the most vulnerable groups-children under 5 years, pregnant women and people living with HIV/Aids. According to the NMCP annual report (2008), malaria accounts for 35 to 43% of all deaths in health units, 50 to 60% of morbidity among children under the age of 5, 40 to 45% of medical consultations and 30 to 47% of hospitalisation. It is also the cause of 26% of absences in the workplace and 40% of the health expenditure of households.

Malaria case management remains a vital component of the malaria control strategies. This entails early diagnosis and prompt treatment with effective antimalarial medicines

### **2. New technological advances: a new simple, quick and accurate method for malaria testing**

It will be important that we make clear this distinction between fever and malaria. For a long time the two have been used interchangeably, but with advances in the methods for diagnosing malaria we can now easily test the patient to see if the fever is caused by malaria. This training is meant to prepare participants towards the introduction of this new methods which we will see in the next section.

### **3. It is important to test for malaria, because not all fever is caused by malaria**

As a health worker, you will regularly see patients with a fever or history of fever. Fever is a common and important sign of malaria. In Cameroon and other parts of Africa, a patient with fever is often assumed to have malaria. This is because malaria is a serious illness and many health facilities did not have the equipment and health personnel required to accurately diagnose malaria.

Fever is a clinical manifestation characterised by a rise in body temperature above 37°C and it is common to many disease conditions. This means that not all patients suffering with a fever will have malaria.

### **4. There is global evidence of falling malaria transmission**

Although malaria remains a major public health concern, we also know that there has been a global reduction in the transmission of malaria in many parts of Africa. This represents the success of numerous prevention and vector control strategies that have been put in place. For example, the widespread use of insecticide-treated bed nets will reduce malaria transmission.

The Government of Cameroon in revising its treatment guidelines with the aim of reducing morbidity and mortality due to malaria by 50% by the year 2010.

**5. Use of antimalarials in patients that do not have malaria, means patients are taking medicines that they do not need****6. Overuse of antimalarials also has economic consequences**

By testing patients to find out if they are suffering from malaria, we can avoid unnecessary costs to the patient as patients will no longer buy medication that they do not need. The Cameroon government subsidises the cost of ACTs in the public sector, and by ensuring that ACTs are only received by those that really need them will save money.

By ensuring that the patient receives the right medication at their first visit should also reduce the costs of seeking treatment as they are less likely to need to return to the health facility.

Other economic consequences of malaria include the loss of productive activity during the time that the patient is ill with malaria or when an individual is caring for someone that is suffering from malaria.

**7. All of these reasons has led to changes in the international and national guidelines for the treatment of malaria**

The World Health Organization (WHO) released new guidelines in 2010 which emphasize the importance of diagnosing malaria using parasitological tests. This is consistent with the advice provided by the National Malaria Control Programme (NMCP) in Cameroon in 2004 and 2007. The recommendations include:

- ACTs were adopted as the first-line treatment for uncomplicated malaria in 2004, with the following types of ACT recommended for use in the public health system: Artesunate Amodiaquine (AS+AQ); and Artemether Lumefantrine (AL). It was later on revised to exclude AL.
- Quinine (Qn) should be reserved for treatment of severe malaria and cases of treatment failure.
- The method of malaria diagnosis to be expanded will include Rapid Diagnostic Tests in all facilities.

## **Quiz on Malaria Diagnosis and Treatment (10 minutes)**

### **Instructions**

You are now asked to complete this malaria quiz. Don't worry if you don't know the answer, the purpose of the course is to help guide the facilitator in undertaking the course, so that he/she knows what level to pitch the course. It will also help evaluate the benefits of the training course by seeing what you will learn.

Q1: What is simple malaria?

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Q2: List three signs and symptoms of uncomplicated malaria?

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Q3: What is the difference between a clinical and parasitological diagnosis

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Q4: What is the advantage of conducting a parasitological diagnosis?

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Q5: List two methods of diagnosing malaria?

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Q6: Is it always necessary to do a parasitological diagnosis? Yes or No? Explain

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Q7: What is an RDT?

Q8: When is it necessary to conduct an RDT?

Q9: How long does it take to obtain the results from an RDT?

Q10: Who is qualified to conduct an RDT?

Q11: Briefly describe how an RDT is conducted?

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Q12. Describe the different steps that the national malaria programme recommends for the management of a patient with fever?

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Q13. If a patient is tested positive for malaria, what are the actions you will take?

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Q14. What is the first and second line medicines recommended for the treatment of uncomplicated malaria in Cameroon? (give the generic name)



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Q15. What is an ACT?

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Q16. For each of these drugs listed below, complete table with different brands, their dosages and advice to patient

Generic name	Brand name (at least two)	Dosage (per body weight)	Advice to patient
Artesunate amodiaquine			
Artemether lumefantrine			

End of Quiz

## **MODULE 1: MALARIA DIAGNOSIS**

### **Overview of Module 1**

Being in an endemic area, malaria is diagnosed in our health facilities only on the basis of symptoms. Though fever is one of the main signs of malaria it is not specific or limited to malaria and so could be caused by another illness. It is therefore important to conduct a parasitological diagnosis to confirm our symptomatic diagnosis.

### **Module Objective**

- To understand the advantages of parasitological diagnosis

### **Module Description**

This is divided into two sessions:

- Session 1.1 - Symptomatic diagnosis
- Session 1.2 - Parasitological diagnosis

### **Module Duration**

1 hour

### **Training Methods**

- Lectures
- Case studies

## **SESSION 1.1: SYMPTOMATIC DIAGNOSIS OF MALARIA**

### **Session Objectives**

- To understand the signs and symptoms of malaria (uncomplicated and severe)
- To understand that malaria can be diagnosed based on signs and symptoms, but this method has limitations

**Duration:** 30mins

### **Learning objectives**

At the end of the session, participants should be able to:

- Know the signs and symptoms of uncomplicated malaria
- Know the signs and symptoms of severe malaria
- Know that not all fevers are caused by malaria

### **Methods**

- Lecture
- Case Studies

## Lecture 1.1: What is symptomatic diagnosis?

Symptomatic diagnosis of malaria is a diagnosis based on patient's signs and symptoms. This is also known as clinical diagnosis. Malaria has been classified into two types, based on the severity of the symptoms and extent of the infection: uncomplicated (or simple) malaria and severe (or complicated) malaria.

### What are the signs and symptoms of uncomplicated malaria?

Fever is the main symptom of malaria. It can be reported by the parents (even if the temperature is normal at the time of examination) or ascertained by taking the temperature (higher or equal to 37.5° under the armpit or 38° rectally).

These are some of the other signs and symptoms that may occur in uncomplicated malaria:

- headache
- fatigue
- abdominal discomfort
- muscle and joint aches
- chills
- perspiration
- digestive disorder: loss of appetite, diarrhoea, nausea, vomiting
- worsening malaise



These can be identified by asking the patient or their caregiver about the signs and symptoms that have occurred since patient started this illness episode. The health worker can also take the patient's vital signs, including taking their temperature.

### What are the signs and symptoms of severe malaria?

Malaria is said to be severe when a patient presents with one or more of these signs and symptoms:

- high temperature (>40° C)
- consciousness disorders (confusion, agitation, drowsiness and coma)
- convulsion
- repeated vomiting (hindering oral treatment),

- dehydration (thirst, dry lips, sunken eyes and deep set fontanel),
- icterus (jaundice),
- dark coloured (coca-cola coloured) urine
- severe anemia

NB. Pregnant women and children below 5 years of age presenting with malaria are considered under severe malaria.

**Symptomatic diagnosis is a suspected diagnosis.**

The sign and symptoms of uncomplicated malaria are not specific to malaria, and fever is a symptom of many illnesses. If we presume that all fevers are caused by malaria then this will lead to over-diagnosis and over-use of antimalarials.

The table below lists other possible causes of fever and some additional signs and symptoms. As you can see fever may be caused by other illnesses and it is important to test to confirm whether the fever is caused by malaria. If any of these additional signs and symptoms is present then the patient should be treated according to that disease.

**Table 1.1: Other diseases for which fever is a symptom**

<b>Suspected Disease</b>	<b>Additional Signs and Symptoms</b>
Common cold	Running nostril Cough
Gastroenteritis	Colicky pains Diarrhoea (bloody or not) Vomiting
Hepatitis	Icterus Enlarged spleen Right hypochondrac pain
Meningitis	Stiff neck Bulging fontanel (young infants)
Mumps	Bilateral or unilateral swelling on the jaw
Osteo-arthritis	Functional impotence Local inflammation of the limp
Otitis	Spontaneous pain in the ear Pain with pressure in the tragus Drawing ear
Pneumonia	Cough Fast breathing Chest in-drawing
Septicaemia	Fever resistant to appropriate treatment Altered general physical state

Tonsillitis sore throat	Pains in the throat Red inflamed throat with or without whitish spots Painful cervical lymph nodes
Typhoid fever	Prolonged treatment not responding to appropriate antimalarial treatment. Dissociation between pulse rate and temperature.
Urinary infection	Abdominal pain Pains (burns) on urination Turbid urine
Viral diseases These include measles and varicella	Many cases in the neighbourhood with characteristic skin rash

### ACTIVITY 1.1

#### Activity Description:

Read the two case studies below and then answer the question:

#### Case study 1.1

A patient comes to you in a health centre and complains that he has fever, headache, joint pains. He also says that the fever has been on and off for the past three days. He feels fine during the day but in the evening he has fever.

What do you think he/she is suffering from?

#### Case study 1.2

A patient comes to you in a health centre with a fever which has been persistent for five days. She cannot recall any other sign and symptom but actually tells you, 'I have malaria'.

What do you think the possible diagnoses are?

### Conclusion

We have come to the end of this first session which enabled us to better understand the signs and symptoms of uncomplicated and severe malaria and also to know that though fever is the principal sign of malaria, it can sometimes be related to another disease rather than malaria.

## **SESSION 1.2: PARASITOLOGICAL DIAGNOSIS**

### **Session Objective**

- To explain the advantages of diagnosing malaria based on parasites and not treating presumptively

**Duration:** 30mins

### **Learning objectives**

At the end of the session, participants should be able to know:



- Know what is a parasitological test
- Know the advantages of testing compared to symptomatic diagnosis
- Know alternative methods for testing: microscopy and RDT

### **Methods**

- Lecture

## Lecture 1.2: What is parasitological diagnosis?

A parasitological diagnosis is the identification of the malaria parasites in the patient's blood. Two methods for parasitological diagnosis are:

<p style="text-align: center;"><u>Microscopy</u></p> <p>This involves taking some of the patient's blood, placing this on a glass slide and reading the slide using a microscope.</p>	
<p style="text-align: center;"><u>Rapid Diagnostic Test (RDT)</u></p> <p>This is a new method for diagnosing malaria that uses a test kit. You will learn more about this method in the next module.</p>	

- The test is positive if the malaria parasites are found in the patient's blood. This can be seen on the blood slide or smear, or indicated on the RDT.
- The test is negative if there are no malaria parasites in the patient's blood having examined the blood slide or smear, or as indicated on the RDT. This means that further investigation is required to know the cause of the fever.

### What are the advantages of testing?

It is very important to conduct a parasitological test because it helps us to confirm the clinical diagnosis and ensure that the patient is treated appropriately following the cause of the fever

### What is the benefit of parasitological diagnosis?

- Not all fevers are malaria e.g in Cameroon only 45% of all fevers are caused by malaria (NMCP, 2008)
- The only way to know if the patient has malaria is to test them.
- Why should we really test? –
- To treat the illness that a patient is suffering from.
  - This will also avoid making people pay for drugs they really do not need. This is bad as the patient could have used their money on other things.
  - When we give drugs to people who do not need them, we waste the drugs.
  - This also causes financial lose to the state as the government subsidises the cost.
  - Drugs do have side effects, so when we give a drug to people who really do not need them, we expose them to unnecessary risk.
- Parasitological diagnosis has the following advantages:
  - Improved patient care in parasite-positive patients;



- Identification of parasite-negative patients in whom another diagnosis must be sought;
- Prevention of unnecessary use of antimalarials, reducing frequency of adverse effects, especially in those who do not need the medicines, and drug pressure selecting for resistant parasites;
- Improved malaria case detection and reporting;
- Confirmation of treatment failures.

### **Conclusion**

We have come to the end of this session where we learnt that:

- Not all fevers are malaria
- We should conduct a parasitological test to determine what the patient is suffering from.
- Diagnosis based on clinical signs alone has very low specificity and may result in over-treatment.
- Prompt parasitological confirmation by microscopy or RDTs is recommended in all patients suspected of malaria before treatment is started.

## **MODULE 2: USING RAPID DIAGNOSTIC TESTS (RDT)**

### **Overview of Module 2**

In Module 1 we have talked about the signs and symptoms of malaria, why it is important to test for malaria and different methods for diagnosing malaria. In this module you will learn more about a new method for testing malaria: rapid diagnostics test.

Until now, malaria parasitological diagnosis has been done by examining a blood smear under a microscope. There are, however, often problems with this method because many health facilities do not have the necessary resources, such as a functioning microscope, skilled laboratory personnel, supplies and reagents. In settings such as these there are advantages in using a simple test, which is not reliant on the resources available and does not need specialist laboratory skills. Malaria Rapid Diagnostic Tests (RDTs) are simple to use and offers several advantages in allowing parasitological diagnosis where traditional malaria microscopy diagnosis is impractical.

In many cases, the use of rapid diagnostic tests has also been found to be a more cost-effective method than microscopy (Shillcutt, 2008). For this reason there is a great interest in using RDTs more widely.

### **Module Objective**

- To understand what is an RDT, that it is an effective diagnostic method and how to use it safely and effectively.

### **Module Description**

This module consists of four sessions:

- Session 2.1: What is an RDT?
- Session 2.2: Advantages of RDT compared to microscopy
- Session 2.3: How to use an RDT?
- Session 2.4: Practical session on using RDTs

### **Module Duration:**

3 hours and 45minutes

## **SESSION 2.1: WHAT IS AN RDT?**

### **Session Objective**

- To understand what is an RDT

**Duration:** 20 minutes

### **Learning objective**

At the end of the session, participants should be able to know:

- Describe what is an RDT and explain how it works

### **Training method**

- Lecture

## Lecture 2.1: What is an RDT?

Rapid Diagnostic tests (RDTs) are a way to test to confirm if the patient is suffering from malaria. The RDT is a small plastic cassette, and typically looks like this:



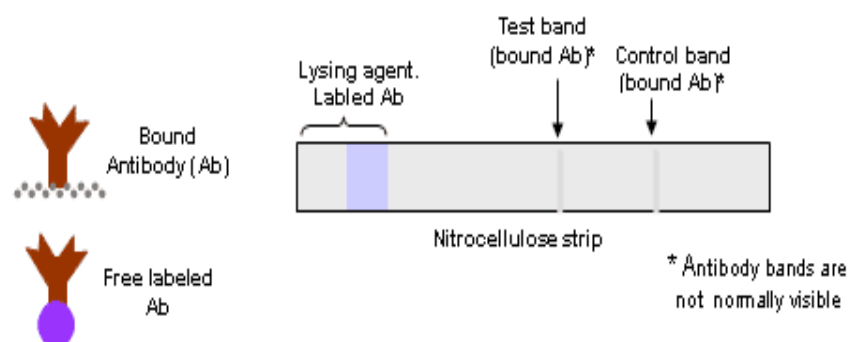
Different brands of RDTs manufactured by different companies are available. Some RDTs can detect only one species e.g: Histidine-rich protein 2 (HRP2) RDT which are specific for *P. falciparum*, some detect other species of the parasite e.g: Plasmodium lactate dehydrogenase (pLDH) RDT can distinguish *P. falciparum* from the non-*falciparum* species, but cannot distinguish between *P. vivax*, *P. ovale* and *P. malariae*. For now, let us focus on the RDT that will be used in this training. This RDT has been used in some clinical trials in some countries like Tanzania and some health facilities in Cameroon.. They have shown high specificity (target a parasite species) and sensitivity (detect the presence of parasite in the patient's blood) in diagnosing malaria.

### How does the RDT work?

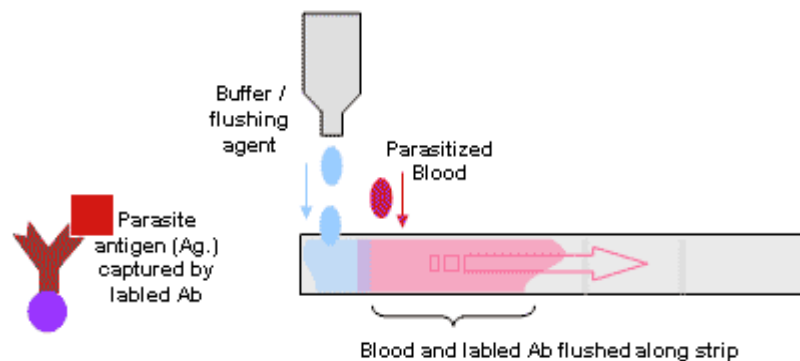
Malaria is transmitted to man by mosquitoes capable to carrying the malaria parasite. When mosquitoes bite humans they suck up blood. If the person they bite has the malaria parasite, parasites in the blood breed and develop in the mosquito. When the mosquito bites the next person the malaria parasites infect this person. When a person is infected with malaria, malaria parasites make modules, known as antigens, in the patient's blood.

Malaria RDT detects specific antigens (proteins) produced by malaria parasites. Different types of RDTs detect different antigens. Some antigens are produced by a single species of malaria parasite (e.g. *Plasmodium falciparum*), some are produced by all malaria species (including *P. vivax*, *P. ovale* and *P. knowlesi*).

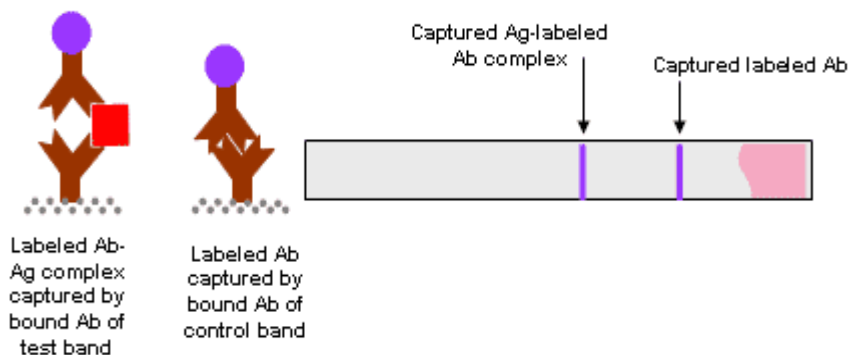
The rapid diagnostic test signifies their presence by a colour change on an absorbing nitrocellulose strip. Dye-labelled antibody, specific for targeting antigen, is present on the lower end of nitrocellulose strip or in a plastic well provided with the strip. Antibody, also specific for the target antigen, is bound to the strip in a thin (test) line, and either antibody specific for the labelled antibody, or antigen, is bound at the control line.



Blood and buffer, which have been placed on strip or in the well, are mixed with labelled antibody and are drawn up the strip across the lines of the bound antibody.



If antigen is present in the blood, and the antibodies in the RDT bind to it, the antigen + antibody complex is trapped at the test line (position T: see fig 1 above) and forms a red or purple line. This gives a positive RDT result. Excess-labelled antibody is trapped on the control line. This control line tells us whether the RDT has worked correctly.



If there is no parasite antigen the antibodies have nothing to bind to, and they do not form a test line. This gives a negative RDT result.

All completed RDTs should show a red or purple control line. If we do not see a control line, the RDT result is invalid. In this case, we must repeat the patient's test with a new RDT.

### Conclusion

We have come to the end of this session on what is an RDT. We have learned how RDTs work to diagnose malaria. It has been shown to be a good and accurate method that can be useful for malaria diagnosis.

## **SESSION 2.2: COMPARISON OF RDT AND MICROSCOPY**

### **Session Objective**

- To enable health workers to understand the differences between these two methods of malaria diagnosis.

**Duration:** 15min

### **Learning objective**

By the end of this session, participants should be able to:

- Compare the key advantages of RDTs compared to microscopy

### **Training method**

- Lecture

**Lecture 2.2: What are the advantages of RDTs compared to microscopy?**

Both microscopy and RDTs enable the health worker to confirm whether the patient is suffering from malaria, and therefore both methods are better than symptomatic diagnosis. RDTs have some practical advantages compared to microscopy and these are explained below:

**Table 2.2: Advantages of RDTs compared to microscopy**

<b>Items</b>	<b>Rapid Diagnostic Test</b>	<b>Microscopy</b>
<b>Time for reading result</b>	RDTs are a simple and fast way to test for malaria parasites in a patient's blood. The result is ready in 15 minutes	Need more than one steps and time
<b>Sensitivity</b>	RDTs are highly sensitive (detecting presence of parasite)	Depends on the skills of the person reading the slide
<b>Specificity</b>	RDTs are highly specific (detecting the parasite species)	Depends on the skills of the person reading the slide
<b>Equipment</b>	RDTs do not require any expensive or complicated equipment.	Requires expensive equipment (energy source, apparatus, reagents, slides etc...)
<b>Staff</b>	Anybody can do it	Require well-trained special skill
<b>Cost</b>	The cost of these two methods will be the same as promised by the NMCP	
<b>Home management</b>	Suitable for the community, in the home or by private providers	Not adapted for community or home use

Both RDTs and microscopy have some limitations which include:

<b>RDTs</b>	<b>Microscopy</b>
i) RDTs cannot tell how many malaria parasites are present in blood. They can only test whether parasites are present or absent.	Need a high skill personal with good vision to count the parasite
ii) RDTs are not ideal for monitoring treatment outcomes: some RDTs especially RDTs that detect HRP2 remain positive for up to 2 weeks after treatment of a malaria episode, because they detect the remaining antigens of dead parasites. In this particular situation, the answer can only be given by malaria microscopy.	Can be used to monitor treatment outcome: presence of parasites indicate treatment failure. However this depends on the skills of the microscopist
iii) Some RDTs have a limited ability to differentiate species of malaria parasite. In the market, there are mRDTs that only detects <i>Plasmodium falciparum</i> and those which detect both <i>Plasmodium falciparum</i> and non-falciparum species.	Need a high skill personnel with good vision to differentiate the parasite species
iv) RDTs can be damaged by heat and humidity	Reagents e.g the stains could be invalid if not prepared and use fresh

## Conclusion

We have come to the end of this session comparing RDT and microscopy. The rapid diagnostic test is a good method for malaria diagnosis and does not require expensive equipment or special skills.



**SESSION 2.3: HOW TO USE RDT?****Objective**

- Using the WHO Job Aid follow the step-by-step instructions on how to use RDTs to ensure health workers use RDTs safely and effectively

**Duration: 40min****Learning objective**

By the end of this session, participants should be able to:

- Explain step-by-step how to perform an RDT
- Know the risks and safety measures at the work place
- Know the importance of safety measures during RDT procedure
- Demonstrate proper waste disposal

**Training method**

- Lecture
- Discussion

**Training materials required**

Table 2.3: Material needed for performing the RDT test

<b>Reagents</b>	<b>Supplies</b>	<b>Equipment</b>
<ul style="list-style-type: none"> <li>• Buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Loop or pipette or capillary tube</li> <li>• Lancet</li> <li>• Alcohol Prep Pad</li> <li>• Gloves</li> <li>• Permanent marker</li> </ul>	<ul style="list-style-type: none"> <li>• RDT device</li> <li>• Clock/Timer</li> <li>• Sharps containers</li> <li>• Infectious containers</li> <li>• Non Infectious containers</li> </ul>

### Lecture 2.3: How to use an RDT?

The following instructions provide step-by-step how to use an RDT.

*There are 16 steps to performing an RDT:*

1. Ensure that you have all the materials need to perform the RDT, as listed in table 1, check the expiry date RDT kit and put all on the table.



2. Put on gloves before beginning. Use a new pair of gloves for each patient. Do not re-use gloves.



3. Open the test packet and remove the contents (buffer, loop or pipette or capillary tube, lancet, alcohol prep pad, and RDT device)

4. Write the patient's name on the cassette with an indelible ink.



5. Select an appropriate finger. To be able to perform a good capillary sampling you need a finger (preferably the middle finger of the inactive hand) with good capillary circulation.

The circulation in the finger can be improved before the blood sample is taken. First of all you need a warm relaxed hand. This sounds very easy, but it is the most important thing when you are performing capillary sampling. Therefore the rule is: Never take a blood sample from a cold finger!! If you do, you might get incorrect results.

There are many ways to keep the hand warm. The easiest way is to rub the hands against each other as if the hands were cold. If this does not help, rinse the hands in warm water. There must be good capillary circulation before puncturing the finger.

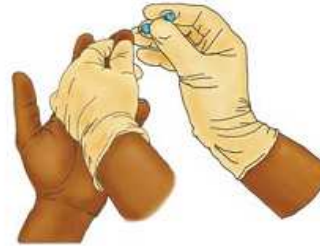
6. Clean the finger with alcohol to prevent infection.



7. Allow the finger to air dry. If the fingertip is still wet when puncturing the finger, the blood will float out and might be diluted with alcohol and affect the RDTs performance.

8. Open the lancet immediately prior to use. Once the lancet is open, do not set it down.

9. Prick the side of the finger (not directly on the pulp or ball). Stab firmly and deep enough to draw an adequate amount of blood.

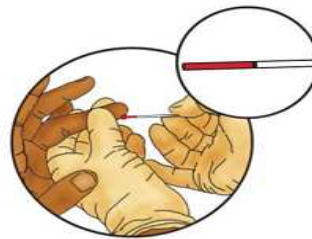


10. Dispose of the used lancet safely in the sharps box. Do not set it down before disposing.

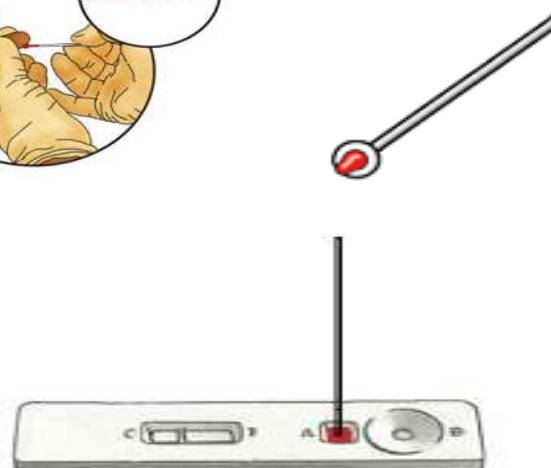


11. Collect required amount of blood (5ul)

Touch the drop of blood and collect required amount of blood by using loop (there picture only with capillary tube and pipette)



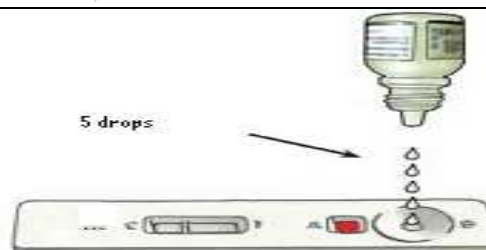
Touch the loop on the hole/well marked "A" (the small well) on the device. Make sure the loop is 90° to the hole well



Discard the loop into proper waste containers



12. Put three to five drops (according to manufacturer) of the appropriate buffer in to the cassette.



13. Wait for the correct time (e.g., *15 minutes*) after adding buffer before reading test results.



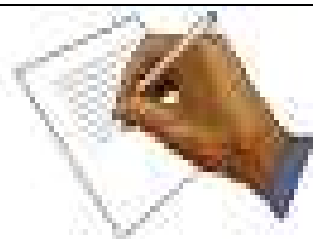
14. Read test results: the different possible results could be obtained

- Red line in the test window and red line in control window = **Positive** (Note: test is positive even if the red line in the test window is very faint.)
- No line in the test window and red line in control window = **Negative**
- Red line in the test window and no line in control window = **Invalid**
- No line in the test window and no line in control window = **Invalid**

15. Remove and discard your gloves.




16. Record the result on a patient's booklet and health worker's register, and then discard the cassette in non-sharp waste container.



**Note: Each test can be used only once.**


# How To Do the Rapid Test for Malaria

Modified for training in the use of the Generic Pf Test for falciparum malaria.




**Collect**


- a. NEW unopened test packet
- b. NEW unopened lancet blade
- c. NEW unopened lancet
- d. NEW pair of disposable gloves
- e. Buffer
- f. Timer




Disposable gloves



Timer



Buffer




Test packet

**READ THESE INSTRUCTIONS CAREFULLY BEFORE YOU BEGIN.**


- 1. Check the expiration date on the test packet.**
- 2. Put on the gloves. Use new gloves to reach patient.**
- 3. Open the packet of lancet.**
- 4. Write the patient's name on the test packet.**
- 5. Open the alcohol swab. Gently rub the patient's thumb. Clean the thumb with the alcohol swab. Allow the thumb to dry before pricking.**
- 6. Open the lancet. Hold patient's thumb to get a drop of blood.**
- 7. Dip the lancet in the Sharp Side immediately after pricking. To get a good cut, the Sharp Side should be clean and dry before using.**
- 8. Use the capillary tube to collect the drop of blood.**
- 9. Use the capillary tube to put the drop of blood into the well labeled "S."**
- 10. Dip the capillary tube in the Sharp Side.**
- 11. Add buffer into the non-circle well labeled "B."**
- 12. Wait 15 minutes for reading, but be ready to read the results.** (NOTE: Do not read the test after 15 minutes at all during the entire training.)
- 13. Read the results.**

**14. How to read the test results:**


**POSITIVE**  
A line near letter "C" and a line near letter "T" means the patient is POSITIVE for malaria.




The test is positive when 2 lines near "T" appear.



A line near letter "C" and a line near letter "T" means the patient DOES NOT have malaria.



**INVALID RESULT**  
NO line near letter "C" and one line near letter "T" means the test is INVALID.



NOTE: The test is invalid if no line appears.

If no line appears near the letter "C," repeat the test using a NEW unopened test packet and a NEW unopened lancet.

- 15. Dispose of the gloves, alcohol swab, and used lancet in a plastic biohazard container.**
- 16. Record the test results in your client register or book of records in a separate name container.**

**NOTE: Each test can be used ONLY ONE TIME.**  
Do not try to use the test more than once.


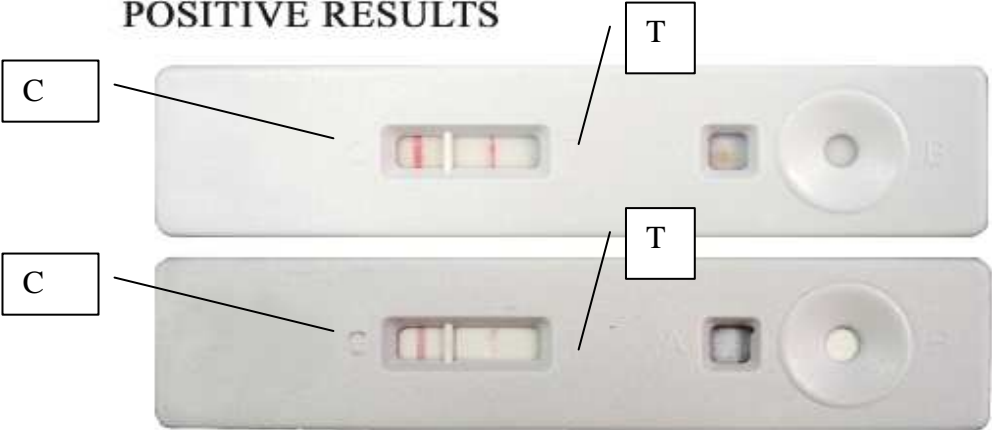


Figure 1: Steps for the use of RDT

**Reading an RDT and recording result (step14 and 16)**

- Ensure there is good light (preferably natural light) to read of RDTs. Even with excellent vision, faint positives can be difficult to detect in conditions where light is not sufficient. At night where electricity is not available a strong flashlight or kerosene pressure lantern bright enough to illuminate even a faint positive result should be used.
- Read results when the RDT device is placed on flat surface
- Read the control line (band) first
- Possible RDTs results may be as follows:

**POSITIVE RESULTS**



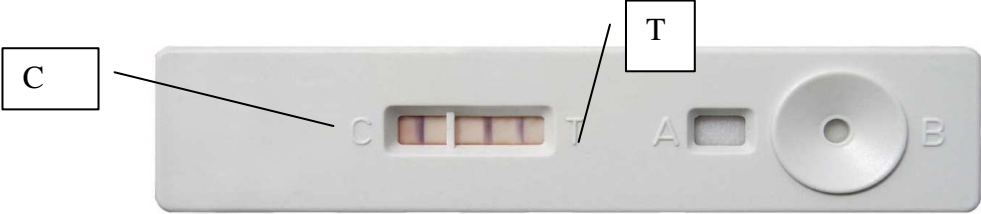
- Line at position 'C' AND line at position 'T' = **positive**.
- Line at position 'C' AND faint line at position 'T' = **positive** even if the line in position 'T' is very faint.

***If the RDT is positive, write: RDT pos***

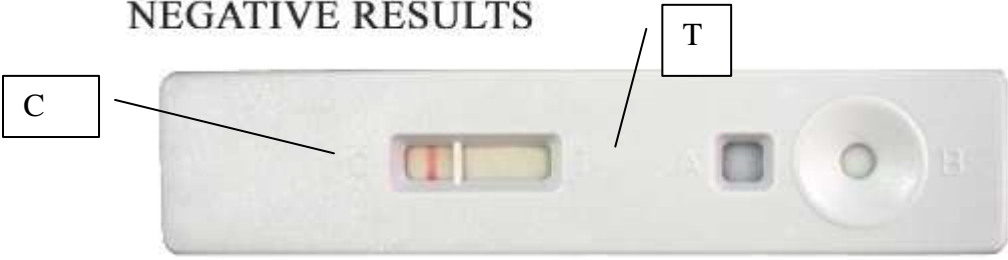
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**Some types of RDTs test for a Mixed Infection of *P. falciparum* and other non *falciparum* species** (Note: we will use this type)

Line at position 'C' AND line at position 'T1' and at position 'T2' = positive for *P. falciparum* and any other plasmodium (mixed infection of *P.f* and non *P.f.* species)



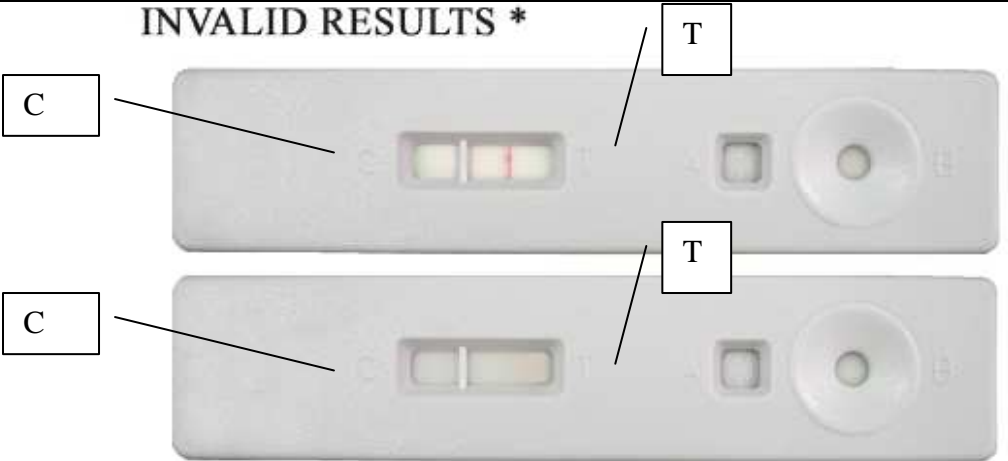
**NEGATIVE RESULTS**



Line at position 'C' and NO LINE at position 'T' = *negative*.  
***If the RDT is negative, write: RDT neg***

---

**INVALID RESULTS \***



**\* No Control Lines (repeat tests)**

No line at position 'C' AND line at position 'T' = *invalid*.  
 No line at position 'C' and NO LINE at position 'T' = *invalid*.

## RDT interpretation chart

This is the summary of how to read and interpret an RDT result

<b>P. falciparum detecting- RDT</b> e.g: detect Histidine-rich protein 2 (HRP2) only			
		<b>Test lines</b>	
	<b>Control line</b>	<i>P. falciparum</i>	<i>P. falciparum</i>
Positive <sup>1</sup>			N/A
Negative			N/A
Invalid			N/A
Invalid			N/A

<b>P. falciparum / Pan-specific RDT2</b> e.g: detects P. falciparum-specific pLDH and pan-specific pLDH, or HRP2 and pan-specific pLDH or aldolase			
		<b>Test lines</b>	
	<b>Control line</b>	<i>P. falciparum</i>	<i>Pan specific</i>
Positive P. falciparum only <sup>1</sup>			
Positive P. falciparum only or mixed P falciparum and other species			
Positive non-P. falciparum <sup>1</sup> (e.g P. vivax)			
Negative			
Invalid			
Invalid			
Invalid			
Invalid			

### NOTES:

1. ANY visible test line, even if very faint, indicates malaria (as long as a control line is also present).
2. Some products may have the P. falciparum and pan-specific test lines in reverse order to that shown here. Some products may also include additional lines specific for P. vivax, P. ovale or P. malariae. It is good practice to read the manufacturer's instructions.

### Conclusion

We have come to the end of this session concerning how to use RDT effectively and safely and how to read the patient's result. It is important to follow all the steps mentioned above to have a good and acceptable result like putting glove to protect HWs and patient from possible infection with blood-borne diseases, including HIV-AIDS, adding the buffer to the correct well (hole)...



## **SESSION 2.4: PRACTICAL SESSION ON THE USE OF RDTs.**

### **Session Objective**

- To allow participants to observe how an RDT is conducted and then give participants the opportunity to use an RDT.

**Duration:** 1h 30min

### **Learning objectives**

At the end of this session, participants should be able to:

- Perform a finger prick correctly and safely
- Collect the required amount of blood correctly and safely
- Perform a malaria rapid diagnostic test.
- Interpret different RDTs results
- Report RDTs results
- Record results in Laboratory register

### **Training method**

- Demonstration to whole group
- Practical session in groups
- Question and answer session
- Practical session in a lab of a chosen health facility at the end of training

### **2.4.1 Demonstration on how to perform malaria RDT**

- Prepare material as shown in session 2.3
- Demonstrate the process of performing the tests while participants observe :
  - How to put on gloves safely
  - How to perform finger pricking safely
  - How to dispose of waste correctly
  - How to collect a required amount of blood correctly
  - How to transfer blood to the hole /well of the device correctly
  - How to perform RDT correctly and safely
  - How to remove and dispose the gloves safely
  - How to read and interpret result
  - Interpret different RDTs reactions
  - How to report RDTs results
  - How to record results in Laboratory register

### **2.4.2 Practical Session: Using RDTs**

#### **Activity Description**

1. Each group (2 participants/group) will receive two cassettes of RDTs
2. Use your job-aid for performing a test if possible
3. Each participant is going to play two roles
  - a. Patient's role: let your colleague practice an RDT test using you as a patient and paid attention when he/she is perform the test
  - b. Health worker's role: now use same colleague as a patient and practice the test
4. Record the test result in your manual and wait for instructions from the facilitator

## MODULE 3: MALARIA TREATMENT

### Overview of Module 3

In the previous modules the participants will have learnt how to diagnose and test malaria. The focus of this module is on what steps to take for patients presenting with a fever and what treatment should be provided following the diagnostic test.

### Module Objective

- To explain that treatment depends on the patients symptoms and on the test result

### Module Description

This module consists of 4 sessions:

- Session 3.1: Introduction to the Treatment Algorithm for the Management of Fever
- Session 3.2: Treatment with ACTs when the test result is positive
- Session 3.3: Malaria treatment in special cases: severe malaria, malaria during pregnancy, in children <5yrs and co-morbidity
- Session 3.4: Treatment when the test result is negative

### Module Duration:

3 hours



## **SESSION 3.1: ALGORITHM FOR MANAGING PATIENTS WITH FEVER**

### **Session Objective**

- To describe the algorithm for the management of fever

**Duration:** 20 minutes

### **Learning objective**

By the end of this session participants should be able to:

- Understand the National Malaria Control Programme (NMCP) recommended algorithm for treating patients with fever

### **Training method**

- Lecture
- Job aids ( laminated copies of the treatment algorithm and the WHO guidelines on how to test)
- Discussion

## **LECTURE 3.1 Algorithm for the management of fevers in Cameroon.**

### **Algorithm for the management of fevers**

We now focus on what treatment should be given once the patient has been tested. The guidelines for diagnosis and treatment have been incorporated into a treatment algorithm. An algorithm is a simplified diagram that explains the different steps that the health worker should follow for the management of a specific condition. Algorithms are developed on the basis of clinical evidence and are intended to ensure that the patients receive the best quality of care. The treatment algorithm shows what to do when a patient presents at the health facility with a fever

There have been several guidelines for the management of malaria in Cameroon. The main difference between the actual guideline and the former ones is that this latest version emphasizes on the fact that a parasitological test should be done before any antimalarial is prescribed to a patient. It also stipulates that uncomplicated malaria should be treated with ACTs, instead of monotherapies as it used to be in the earlier version. Figure 3.1 below, shows the various steps that you should follow for the management of malaria:

- First, evaluate the patient's signs and symptoms determine whether malaria is suspected. If there are signs of other illnesses they should be treated for that condition.
- The next step is to perform a parasitological test using either microscopy or a RDT.
- If the test is positive the next step is to determine if there are any signs of severe malaria.
  - If there are signs of severe malaria then the patient should be treated for severe malaria. We will talk of this treatment in detail in the next session.
  - If there are no signs or symptoms of severe malaria then the patient has uncomplicated malaria. The patient should be provided the recommended treatment.
- The recommended treatment for uncomplicated malaria is an Artemisinin-based Combination Therapy (ACT) for all patients except pregnant women. For ACTs, the correct dose depends on the patient's weight (or age). In the next section you will be given more information about ACTs and the recommended ones in Cameroon.
- The patient should be given advice on how to take the medicine and advised to return to the health facility in 48 hours for the patient's condition to be evaluated.
  - After 48 hours the patient's condition should be re-evaluated. If the patient has improved the patient should be advised to continue the full three-day dose of the treatment. If the patient's condition has worsened, then the health worker is advised to start the treatment of severe malaria.
  - In case of treatment failure (the patient's general state has neither improved nor worsened) a further investigation should be done to look for other possible origins of fever. If this is found, a new treatment should be prescribed. If not, the patient should be considered as a case of severe malaria and treated as such.

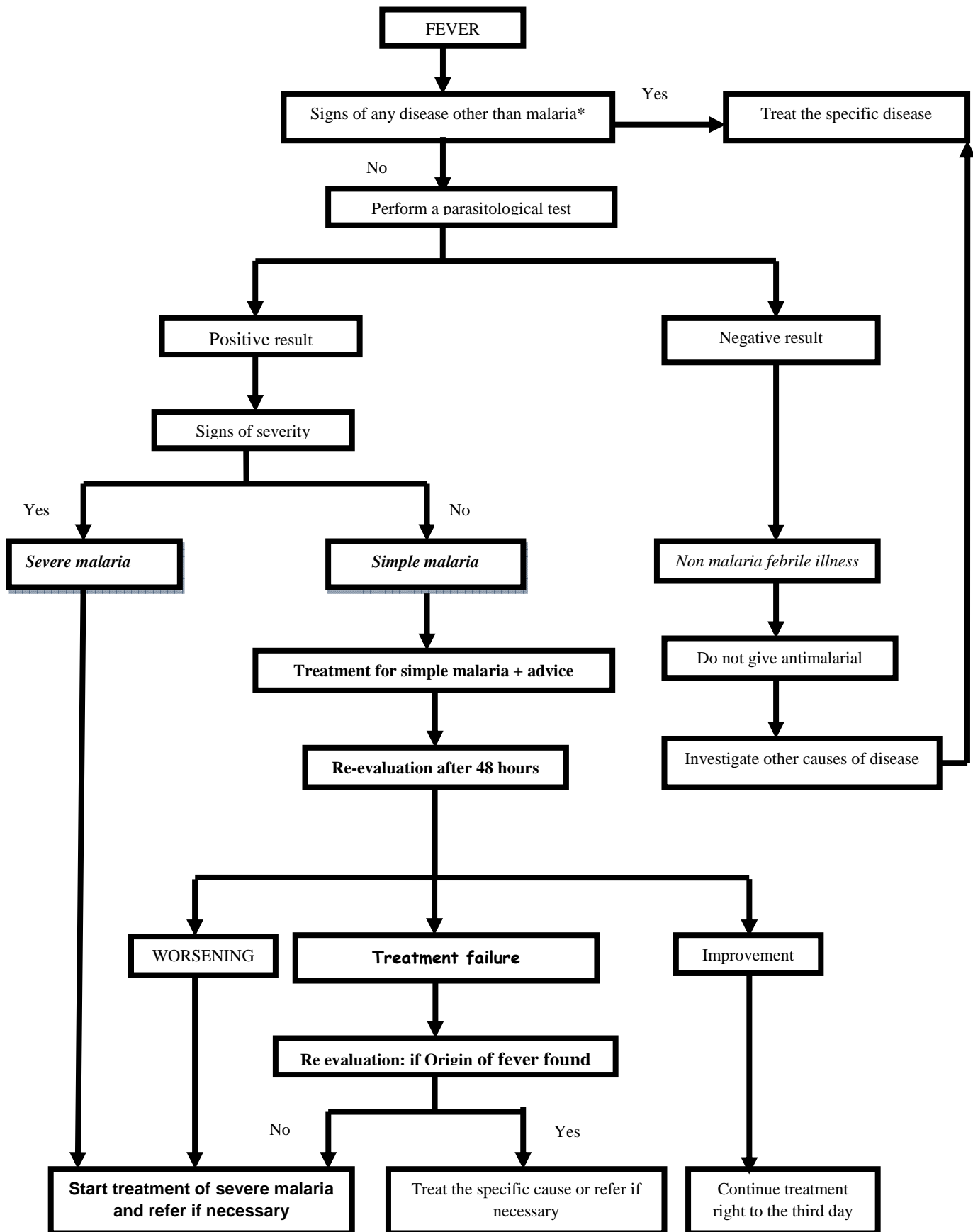


Figure 3.1: Treatment algorithm for the management of malaria in Cameroon

## **SESSION 3.2: TREATMENT WHEN THE TEST RESULT IS POSITIVE**

### **Objective**

- To explain to the participants what to prescribe to patient when their malaria test is positive.

### **Learning objectives**

By the end of this session participants should:

- Be able to describe the action recommended following a positive RDT result
- Know that Artemisinin-based Combination Therapies (ACTs) are the recommended treatment for uncomplicated malaria in all patients (except pregnant women)
- Understand what an ACT is and the different types of ACTs available
- Know the dosage and treatment regimen for the recommended ACTs in Cameroon.
- Know how to manage fever, vomiting and seizures in patients with malaria
- Know what advice to give patients with uncomplicated malaria

**Duration of the session:** 2 hours

### **Training Method**

- Lecture
- Discussions

**LECTURE 3.2.1 Recommended treatment for uncomplicated malaria**

If the test has confirmed that the patient is suffering from malaria and there are no signs or symptoms of severe malaria then the patient is suffering from uncomplicated malaria. You should record his test result in his hospital booklet and in the hospital register. If you are not the one performing the test, you should start by explaining to the patient that the results show that he has malaria and manage him appropriately.

The national guideline for the management of uncomplicated malaria states that the recommended treatment for all patients except pregnant women is an Artemisinin-based Combination Therapy (ACT).

ACTs are type of an antimalarial drug, and became the first-line treatment for uncomplicated malaria in Cameroon in 2004. ACTs replaced sulfadoxine-pyrimethamine (SP) as the recommended treatment because there was evidence that SP was no longer effective and resistance to this drug had been developed in the population. ACTs are highly effective at treating malaria and ensure rapid resolution of symptoms and clearance of malaria parasites. ACTs are taken over three days and the full dose should be taken.

ACTs are a combination therapy because they contain two active ingredients. The first is an artemisinin derivative (known as artesunate, artemether or dihydroartemisinin) and the second is another type of antimalarial (usually amodiaquine, lumefantrine, mefloquine, sulfadoxine-pyrimethamine or piperazine). These two ingredients are used in combination to prevent the onset of drug resistance.

**Lecture 3.2.2: Different types of ACTs**

There are many different brands of ACTs, however all of these brands constitute five different types of ACTs that have been recommended by the World Health Organization (WHO) for the treatment of uncomplicated malaria.

The five ACTs for the treatment of uncomplicated malaria are:

- artemether plus lumefantrine (AL)
- artesunate plus amodiaquine (AS-AQ)
- artesunate plus mefloquine (AS-MQ)
- artesunate plus sulfadoxine-pyrimethamine (AS-SP)
- dihydroartemisinin plus piperazine (DHA-PQ)

***Artemether lumefantrine (AL)***



Artemether lumefantrine is only found as a fixed dose combination. This means that both active ingredients are contained in a single tablet. Each tablet of AL usually comprises of 20mg of artemether and 120mg of lumefantrine and the dosage depends on the weight of the patient. Age may be used as a proxy for weight if there are no weighing scales available. Some packs of AL are provided for specific age groups and the number of tablets in these packs varies. Details of the dosage are contained in the next section. The tablets should be administered after a meal containing at least 1.2g of fat.

There is also a paediatric formulation which comes in a powder form that has to be diluted into a 5ml of solution. This 5ml contains 15mg of artemether and 90mg of lumefantrine. The dosage for the suspension in children is the same as that for the tablets.

#### ***Artesunate Amodiaquine (AS AQ)***

Artesunate amodiaquine comes in both as a fixed dose combination and as a co-blister. In a co-blister the active ingredients are presented in separate tablets, though these should be taken at the same time. For many brands one tablet is yellow and the other is white. Some brands of ASAQ provide powder sachets and suspensions which are suitable for young children.

The amount of the active ingredients contained in each tablet varies by brand. The dosage for the drug is 4mg/kg of artesunate and 10mg/kg of amodiaquine each day for three days. The amount of active ingredients in each tablet varies by brand and may also vary depending on the age of the patient. For some brands the amount of active ingredients in each tablet remains the same for all ages and the number of tablets is varied. For other brands the amount of active ingredients in each tablet varies and depends on the age of the patient. Details of the dosage are contained in the next section.

#### ***Artesunate Mefloquine (AS MQ)***

Artesunate mefloquine is available as a co-blister with separate tablets typically containing 50mg of artesunate and 250mg of mefloquine. A fixed-dose formulation of artesunate and mefloquine is at an advanced stage of development.

Mefloquine is associated with an increased incidence of nausea, vomiting, dizziness, dysphoria and sleep disturbance in clinical trials, but these are seldom debilitating, though where this ACT has been deployed evidence shows it has been well tolerated. There are two possible therapeutic dosages: 4mg/kg of artesunate once a day for three days plus 8.3mg/kg of mefloquine once a day for three days; or 4mg of artesunate once a day for three days plus 15mg/kg of mefloquine the second day and 10mg/kg of mefloquine the third day.

#### ***Artesunate plus sulfadoxine-pyrimethamine (AS SP)***

Artesunate sulfadoxine-pyrimethamine is available as a co-blister and typically with separate tablets containing 50 mg of artesunate and tablets containing 500 mg of sulfadoxine and 25 mg of pyrimethamine. The amount of active ingredients may vary by brand. The recommended dose is 4 mg/kg/day artesunate given once a day for 3 days and a single administration of 25/1.25 mg/kg sulfadoxine-pyrimethamine on day 1.

#### ***Dihydroartemisinin plus piperaquine (DHA PQ)***

This antimalarial is available as a fixed dose combination with tablets usually containing 40mg of dihydroartemisinin and 320 mg of piperaquine. The recommended dose is 4 mg/kg/day dihydroartemisinin and 18 mg/kg/day piperaquine once a day for 3 days.

### **Lecture 3.2.3: Dosage and Treatment Regimen for the recommended ACTs in Cameroon**

Countries often develop national guidelines for the treatment of illnesses, which are based on international evidence and tailored to the specificity and needs of their population. Many criteria affect the choice of the recommended drug for the treatment of uncomplicated malaria by the governments. The most important of these is the resistance and tolerability of the partner medicine.










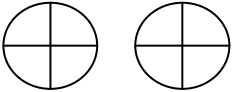
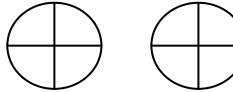
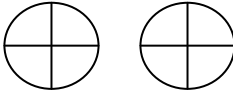
The Cameroon government recommends AS-AQ and AL for the treatment of uncomplicated malaria. The government also uses resources from the Global Fund to subsidize the provision of AS-AQ in a fixed dose combination. It is recommended that AS-AQ is used as the first-line treatment and AL is used as second-line.

The dosage and treatment regimen for AS-AQ and AL are provided in the following tables. There are two tables for AS-AQ, one which provides the dosage for the fixed dose combination Coarsucam which is subsidized by the government and ASAQ when the tablets each contain 50mg of artesunate and 153mg of amodiaquine (which frequently occurs). The dosage for AL is based on tablets which contain both 20mg of artemether and 120mg of lumefantrine. In addition to these guidelines, it is highly recommended that the manufacturer's dosage instructions are consulted. There should be instructions contained in all packs of ACTs which explain the correct dose for the weight or age of the patient.

The following tables present the recommended dosages for AS-AQ and AL (used in the past) for uncomplicated malaria in Cameroon.

















































Treatment of uncomplicated malaria with Artesunate Amodiaquine (as a fixed dose)

- **Brands include: Coarsucam, ASAQ Winthrop**
- **Advisable to take the drug during the meal**
- **If possible, use the weight of the patient as this is more specific than the age**

WEIGHT OF THE PATIENT	AGE OF THE PATIENT	PRESENTATION	1 <sup>st</sup> DAY	2 <sup>nd</sup> DAY	3 <sup>rd</sup> DAY
4.5 – 9 kg	2 months – 11 months	Blister of 3 tablets, each containing: 25mg artesunate and 67.5 mg amodiaquine			
9 – 18 kg	1 year – 5 years	Blister of 3 tablets, each containing: 50 mg artesunate and 135 mg amodiaquine			
18 – 36 kg	6 years – 13 years	Blister of 3 tablets each containing: 100 mg artesunate and 270 mg amodiaquine			
≥36 kg	≥14years	Blister of 6 tablets each containing: 100 mg artesunate and 270 mg amodiaquine			

























Treatment of uncomplicated malaria with Artesunate Amodiaquine (as a co-blister 50/153)

- **Brands include: falcimon kit**
- **It is advised to take the drug during the meal**
- **If possible, use the weight of the patient as this is more specific than the age**

WEIGHT OF THE PATIENT	AGE OF THE PATIENT	PRESENTATION	1 <sup>st</sup> DAY		2 <sup>nd</sup> DAY		3 <sup>rd</sup> DAY	
			Morning	Evening	Morning	Evening	Morning	Evening
4.5 – 9 kg	2 months – 11 months	1.5 x 50 mg artesunate 1.5 x 153 mg amodiaquine	 	 	 	 	 	 
9 – 18 kg	1 year – 5 years	3 x 50 mg artesunate 3 x 153 mg amodiaquine	 	 	 	 	 	 
18 – 36 kg	6 years – 13 years	6 x 50 mg artesunate 6 x 153 mg amodiaquine	 	 	 	 	 	 
≥36 kg	≥14years	12 x 50 mg artesunate 12 x 153 mg amodiaquine	 	 	 	 	 	 

Treatment of uncomplicated malaria with Artemether Lumefantrine (fixed dose 20/120)

- **Brands include: Coartem, lumatem, artefan**
- **The drug should be taken alongside with fatty foods**
- **If possible, use the weight of the patient as this is more specific than the age**

WEIGHT OF THE PATIENT	AGE OF THE PATIENT	PRESENTATION	1 <sup>st</sup> DAY		2 <sup>nd</sup> DAY		3 <sup>rd</sup> DAY	
			0 hours	8 hours	24 hours	36 hours	48 hours	60 hours
5 - 14 kg	1 months – 35 months	6 tablets, each contains 20 mg artemether and 120 mg lumefantrine						
15 – 24 kg	3 year – 8 years	12 tablets, each contains 20 mg artemether and 120 mg lumefantrine						
25 – 34 kg	9 years – 14 years	18 tablets, each contains 20 mg artemether and 120 mg lumefantrine						
≥35 kg	≥14years	24 tablets, each contains 20 mg artemether and 120 mg lumefantrine						

- **Brands include: Coartem Dispensible, co-artesiane**
- **The suspension is active for one week after the powder has been diluted.**
- **If possible, use the weight of the patient as this is more specific than the age**

WEIGHT OF THE PATIENT	AGE OF THE PATIENT	1 <sup>st</sup> DAY	2 <sup>nd</sup> DAY	3 <sup>rd</sup> DAY
< 5 kg	<1month	5ml	5ml	5ml
5 – 7.5 kg	1month – 3 months	7 ml	7 ml	7 ml
7.5 – 10 kg	6month – 10 months	10 ml	10 ml	10 ml
10 – 12.5 kg	11months – 1 year	14 ml	14 ml	14 ml
12.5 – 15 kg	1year – 2 years	17 ml	17 ml	17 ml
15 – 17.5 kg	3years – 4 years	20 ml	20 ml	20 ml
17.5 – 20 kg	4 years – 5 years	23 ml	23 ml	23 ml
20 – 22.5 kg	5 years – 6 years	28 ml	28 ml	28 ml
22.5 – 25 kg	7 years – 8 years	33 ml	33 ml	33 ml
25 + kg	9 years – 11 years	40 ml	40 ml	40 ml

**Lecture 3.2.4: Supportive treatment in patient with uncomplicated malaria**

We have seen that uncomplicated malaria usually manifest with different symptoms among which fever is the most prevalent. Appropriate management of an uncomplicated malaria case will therefore include management of the fever and possible also vomiting.

***Use of antipyretics***

Antipyretics are used to reduce fever. They should be prescribed if the patient's body temperature is  $\geq 38.5^{\circ}\text{C}$ /or patients complains of pains. The fever could be reported or diagnosed.

Paracetamol is the most widely used antipyretics. It is well tolerated and can be given orally or as a suppository. The recommended dosage is 60 mg/kg every 6 hours; do not exceed 3g/day in adults

Acetyl-salicylic acid is another antipyretic, though it should not be used in children <12 years because of the risk of Reyes's syndrome. The recommended dosage is 50mg/Kg every 6 hours; do not exceed 3g/day in the adult.

***Use of antiemetics***

These have been widely used in managing vomiting in malaria cases. Nevertheless, patients diagnosed positive for malaria, who vomit everything, including medicines should be considered as cases of severe malaria.

**Lecture 3.2.5: Advice to patients**

Advices to be spread to the population relate to the seriousness of malaria, how to take antimalarial drugs, how to manage side effects of ACTs, how to keep medicines at home and how to prevent malaria. It is good practice to start by explaining to the patient, or their caregiver, their diagnosis and what treatment is provided.

- Explain that the test result showed that they are suffering from uncomplicated malaria.
- Explain that uncomplicated malaria can be effectively treated with ACTs.
- Explain how to take the medicine. This should be both when to take the medicine and any dietary requirements. The dosage schedule varies for the different types of ACTs. Some common dosage schedules have been given, but for others consult the manufacturer's instructions.

Henceforth, you can proceed by citing these general advices

***General advice on how to take antimalarials***

- It is recommended to take antimalarials only when they have been prescribed by a health worker.
- The prescribed antimalarial should be only given to the patient to whom it has been prescribed, and only for the disease he is currently suffering from.
- Treatment for uncomplicated malaria is taken orally (by mouth).
- The first dose of any antimalarial treatment should be taken under the observance of a health worker (preferably at the health centre). If the patient vomits in less than 30 minutes, wait 10 minutes and then give a second dose. If the second dose is also vomited, change to injectable quinine or artemether.
- Artemether Lumefantrine (Coartem, ) should be taken with food or fluids. If possible the patient should take each dose of Coartem with milk or breast milk, or fatty or oily food (for example, meat or bean sauce made with cooking fat or oil or groundnut sauce). This improves absorption of the drug.
- Artesunate Amodiaquine (Coarsucam, Falcimon kit, ) should be taken during the meal.
- Even if the patient feels better, it is important to complete the full dose of the medicine and take the medicine at the times advised.
- Patients will be more comfortable if they: rest, undress the patient, are given plenty of water to drink, and administer a lukewarm bath or sponge with tepid water.
- If the patient does not improve, they should immediately return to the health facility or go to the nearest hospital.
- It is also recommended that patients return to the health facility after 48 hours for a follow-up visit.

***General advice on the management side effects of ACTs***

There are no serious adverse effects related to Artesunate-Amodiaquine and Artemether-lumefantrine combinations administered in correct dosages. Minor effects (vomiting, dizziness or headache) can occur after the administration of ACTs. They are rare, temporary and disappear in 24 hours following administration. The various minor adverse effects and their management are reported in the following table:



**Table 3.1 Guidelines for the management of side effects in the treatment of uncomplicated malaria by ACTs**

<b>Adverse effects</b>	<b>Treatment</b>
Headache, malaise, fatigue	Rest, Paracetamol
Skin eruption, itching	Refer the patient to the health centre
Weakness or dizziness	Rest
Diarrhoea	Give a lot of water and/or rehydration salt
Abdominal pains	Paracetamol
Repeated vomiting, nausea	Refer the patient to the health centre
Impossibility for patient to stand	Refer the patient to the health centre
The patient shivers uncontrollably	Refer the patient to the health centre

***General advice on keeping medicines at home***

- Keep medicines out of reach of children.
- Medicines should be kept in a cold and dry area, protected from direct sunlight and not on the floor.
- Medicines should be bought at the hospital pharmacy or any pharmacy to avoid counterfeit drugs or poorly stored drugs.

***General advice on preventing malaria***

- Malaria can be prevented by sleeping under an insecticide treated bed net. The bed net can be a long lasting impregnated bed net. Otherwise, one should make sure that it is impregnated every 6 month with an insecticide. Whatever be the kind, it should not have any hole, and should be well tucked in the bed
- Other measures for preventing malaria include: keeping the environment clean to avoid mosquitoes breeding; installation of wire-netting on the windows, indoor spraying with insecticides and spraying of mosquito breeding sites.
- It is advisable to come to the health facility within 24 hours of the onset of malaria symptoms in order to maximize benefits from ACTs.

**Conclusion**

We have come to the end of this session which relates to the treatment when the test is positive. When a malaria test is positive and there are no signs of severity, the patient is suffering from uncomplicated malaria and should be prescribed an appropriate treatment. There are some correct practices as regards the treatment of uncomplicated malaria:

- Explaining to the patient, or their caregiver, their diagnosis and what treatment is provided.
- Prescribing an antimalarial according to the current guideline that is giving an ACT ( Artesunate Amodiaquine, or if the later is not available, Artemether Lumefrantrine).
- Ensure the patient has the correct antimalarial dose for his or her weight or age.
- Advising the patient on how to take his drug.
- Ensure the patient understands how to manage side effects of ACTs,
- Ensure the patient understands the importance of completing the full treatment.
- Start antimalarial therapy as soon as possible after diagnosing the patient.
- Give advice on supportive treatment to relieve symptoms and speed recovery.
- Watch for signs of severe malaria, give pre-referral treatment and REFER any patient with severe disease to a higher level facility immediately.
- Advising the patient on how to prevent malaria, and also how to keep medicines at home.

### **SESSION 3.3 MALARIA TREATMENT IN SPECIAL CASES**

#### **Objective**

- To know how to treat special cases of malaria like severe malaria, pregnancy, children below 5 years and co morbidity

**Duration:** 20 minutes

#### **Learning Objectives**

By the end of this session participants should be able to:

- Understand the various actions recommended for the treatment of special cases of malaria

#### **Training method**

- Lecture
- Use of job aids

**Lecture 3.3 Treatment of Special Cases**

There are a few exceptional cases which need to be given specific attention. They are: treatment of malaria during pregnancy, treatment of malaria in pregnancy, and cases with co morbidity.

**3.3.1. Treatment for severe malaria**

The treatment of severe malaria is put in place in one of the following situations:

- Existence of one or several signs of severity
- Worsening of patient on first line treatment
- Malaria in pregnancy

Severe malaria should be managed at an appropriate level of care. Refer the patient IF NECESSARY after the parenteral administration of an initial dose of quinine or artemisinin derivative. Treatment should always start through parenteral route followed by oral relay as soon as the patient is able to drink. Two types of treatment regimens are possible: quinine and artemisinin derivative.

**a) Treatment with quinine**

**Regimen 1:** (see details on Appendix III)

This regimen entails a loading dose of quinine and is administered in two daily infusions:

**Loading Dose:** 16.6 mg/kg of quinine base (see appendix 8 for equivalents in quinine salts) in 5 % or 10% glucose with electrolytes (NaCl, KCl, calcium gluconate), without exceeding 1 gram of quinine base, to be run in 4 hours

**Maintenance Dose:** 12 hours after the onset of the loading dose, give 8.3 mg/kg of quinine base in 5 % or 10% glucose to be run in 4 hours every 12 hours without exceeding 500mg of quinine per dose. If the patient is a pregnant woman, or if he/she had taken quinine within the previous 24 hours or Mefloquine within the 7 previous days or is a cardiac Patient, do not administer the loading dose. Quinine will be given at the dose of 8.3 mg/kg of quinine base every 12 hours.

**Regimen 2**

This treatment is given in three infusions per day:

**Quinine base:** 8.3 mg /kg/ of quinine base in four-hour infusions, every 8 hours maximum dose: 1,5 g/day of quinine base

Whatever the chosen regimen, switch to Oral treatment as soon as the patient is able to swallow, that is, 8.3 mg/ kg of quinine base every 8 hours for a total of 7 days from the beginning of treatment, or an artemisinin based combined therapy, for three days.

**b) Treatment with artemisinin derivatives by parenteral route.**

Severe malaria can also be treated using artemether injectable ampoules.

**In adults:**

Administer 160mg per day i.e 80mg in two doses (with an interval of 12 hours), administered by IM injections the first day. Then, 80mg once a day by IM injections for the 6 remaining days.

**In children:**

Administer 3.2mg per day i.e 1.6mg in two doses (with an interval of 12 hours), administered by IM injections the first day. Then, 1.6mg once a day by IM injections for the 6 remaining days. The injection is administered on the superior external quadrant of the buttock or on the anterior surface of the lap

**3.3.2 Treatment of malaria in pregnancy and children <5years**

The symptomatic diagnosis is acceptable only in these particular situations: i.e malaria in the vulnerable groups (children < 5 years and pregnant women) if the confirmation is not available within 2 hours.

**a) For pregnancy**

Falciparum malaria is an important cause of maternal, perinatal and neonatal morbidity in high transmission settings in Cameroon. Intermittent preventive treatment (IPT) with sulphadoxine-pyrimethamine (SP-) has proven efficacious in reducing the burden of pregnancy-associated malaria. Malaria in pregnancy is considered as severe and treated as such. Any pregnant woman who presents with malaria, whether she is on preventive treatment or not, should be considered as having great potential to developing severe malaria. This also applies to strangers coming into an endemic zone. As judge by the health personnel, they may either receive quinine or ACT in the usual doses.

**b) For Children < 5years**

According to the national guideline children below five years suffering for malaria are put under treatment immediately after collection of blood sample for lab test confirmation. Curative treatment is done as presented in **session 3.3** according to the clinical presentation of the patient.

**Co-existing morbidities**

Co infection of malaria can occur with other diseases such as HIV/AIDS, malnutrition, tuberculosis, diabetes, typhoid, filariasis, bacterial and other parasitological infections. The spectre of co infection and drug resistance compound the challenge of identifying and treating people with AIDS, Malnutrition, TB, or malaria as well as preventing further infection. Strategies that simultaneously address these health problems include building on and strengthening the existing health infrastructure, increasing the number and skills of health care workers, and coordinating and integrating services. With regard to WHO guideline on the treatment of the co existing morbidity with malaria, we will present some treatments suit in the case of co existing morbidity with malaria.

**Treatment for HIV-Infected patient with uncomplicated *P.falciparum* malaria**

Patients with HIV infection who develop malaria should receive prompt, effective antimalarial treatment regimens as recommended in the relevant sections this manual. Treatment or intermittent preventive treatment with sulfadoxine-pyrimethamine should not be given to HIV-infected patients receiving cotrimoxazole (trimethoprim plus sulfamethoxazole) prophylaxis. Treatment in HIV-infected patients on zidovudine or efavirenz should, if possible, avoid amodiaquine-containing ACT regimens.

**Treatment of uncomplicated falciparum malaria in malnourished patient**

Although there are many reasons why antimalarial pharmacokinetics may be different in malnourished patients as compared with those who are well nourished, there is insufficient evidence to change current mg/kg body weight dosing recommendations

**Conclusion**

We have come to the end of this session where we learnt about malaria treatment in special cases such as children < 5 years, pregnancy, comorbidity and strangers coming into an endemic area. Quinine is reserved for the treatment of severe malaria and all cases of severe malaria should be referred to the appropriate level of care.

### **SESSION 3.4 TREATMENT WHEN THE TEST RESULT IS NEGATIVE**

#### **Objective**

- How to manage patient with negative result

**Duration:** 20 minutes

#### **Learning objective**

- By the end of this session participants should be able to:1. Outline the benefits of treating patients on the basis of RDT results
- 2. Explain the meaning of a negative RDT in a patient with fever
- 3. Describe the management of a patient with fever but a negative RDT

#### **Training method**

- Lecture
- Discussion



**Lecture 3.4.1 Benefits of treating on the basis of RDT results**

There are a number of possible benefits if you do not recommend antimalarial treatment for patients with negative RDTs. These include:

- You are more likely to focus on the true cause of fever.
- You may treat the true cause of fever in a timely manner.
- You can reduce the risk of antimalarial stock-outs in your health centre.
- You can help to limit the development and spread of drug resistance.
- You may reduce the patient's risk of side effects (drug reactions) due to unnecessary antimalarial treatments. A common example of a drug reaction is ringing in the ears after taking quinine.

**Lecture 3.4.2: Meaning of a negative RDT in a patient with fever**

We will carry out an RDT to confirm the diagnosis and guide treatment decisions. RDTs have been studied in many regions of the world. It has been shown that they are able to detect *Plasmodium falciparum* infections even in patients with very low numbers of parasites in their blood. This gives us confidence that if performed correctly, a negative RDT means that the patient does not have malaria. The patient most likely has another disease that presents with similar symptoms as malaria.

**Lecture 3.4.3: Management of a patient with fever but a negative RDT**

Although fever is the main symptom of malaria, not all fevers are due to malaria. Therefore, the causes of fever should be sought by thorough clinical examination. If a patient has fever but the RDT is negative, you should reconsider the history and clinical signs. You may ask for the following symptoms in the table below, since they will be clues to help you diagnose the patient correctly.

**Table 3.1 Signs and symptoms of the causes of fever to be sought at first contact with a febrile patient:**

SIGNS AND SYMPTOMS	THINK OF :
Stiff neck Bulging fontanel (young infant)	MENINGITIS*
Running nostrils Cough	COMMON COLD*
Cough, Fast breathing	PNEUMONIA*

Chest in-drawing (sub-costal, intercostal...)	
Spontaneous pain in the ear Pain with pressure on the tragus Draining ear	<b>OTITIS*</b>
Pain in the throat Red inflamed throat with or without whitish spots Painful cervical lymph nodes	<b>TONSILLITIS (sore throat)*</b>
Colicky pains, Diarrhoea (bloody or not) Vomiting	<b>GASTRO-ENTERITIS</b>
Prolonged fever not responding to appropriate antimalaria treatment. Dissociation between the pulse rate and temperature	<b>TYPHOID FEVER‡</b>
Abdominal pains Pains (burns) on micturition, Turbid urine	<b>URINARY INFECTION*</b>
Many cases in the neighbourhood Characteristic skin rash	<b>VIRAL DISEASE : * Measles, Varicella etc....</b>
Bilateral or unilateral swelling behind the jaw	<b>MUMPS</b>
Functional impotence, local inflammation of a limp	<b>OSTEO-ARTHRITIS</b>
Fever resistant to appropriate treatment Altered general physical state	<b>SEPTICAEMIA</b>
Icterus, Enlarged spleen Right hypochochondrac pain	<b>HEPATITIS</b>

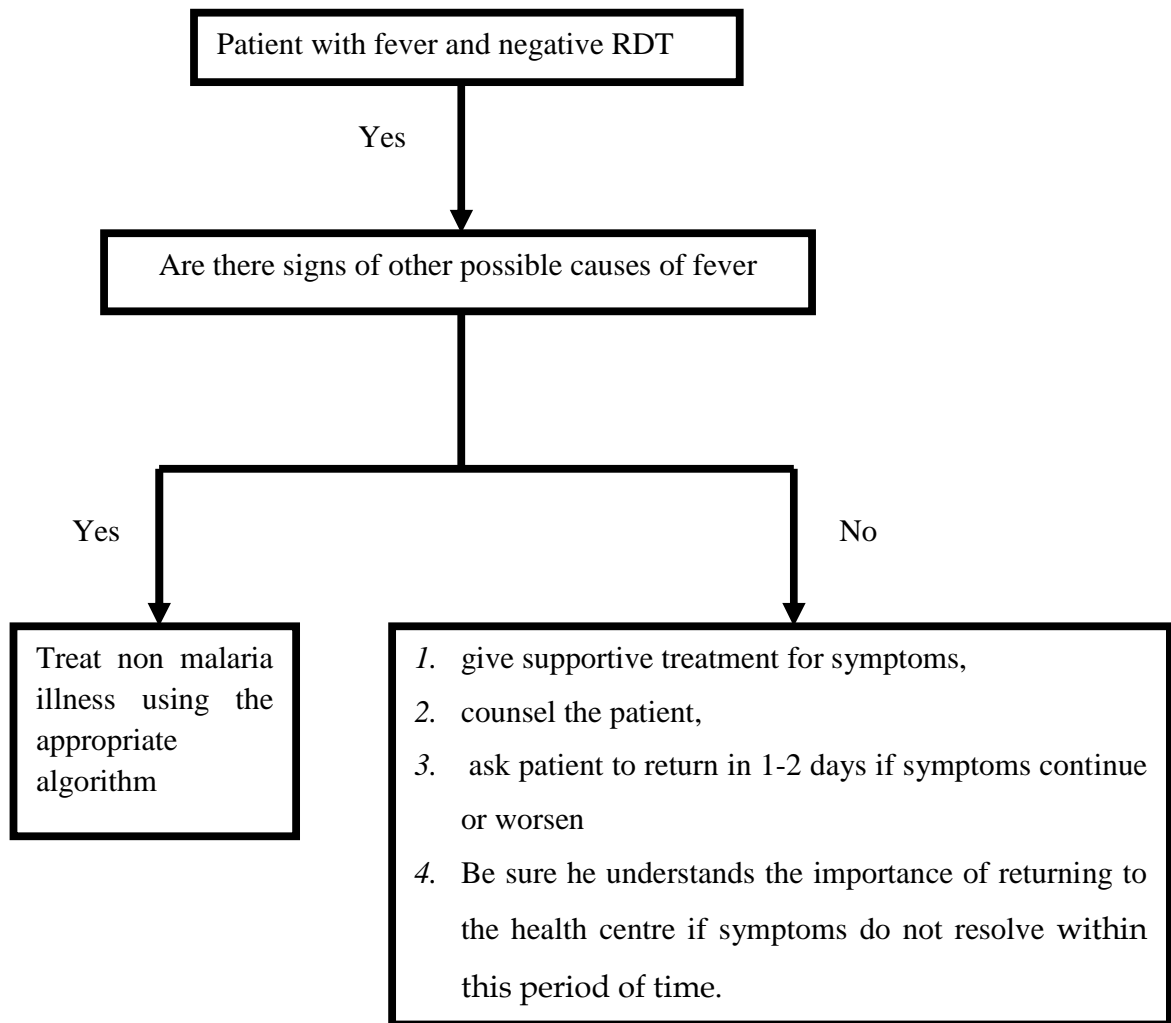
*\* Refer to the appropriate algorithms*

### **Conclusion**

When you have a patient with a negative RDT result, this means that the patient is not suffering from malaria and you should look for other causes through further clinical examination, questioning and laboratory investigation.

1. If any of the above diseases is diagnosed, it should be treated appropriately.
2. If none of the signs of the diseases mentioned above are found:
  - a. give supportive treatment for symptoms,
  - b. counsel the patient,
  - c. ask patient to return in 1-2 days if symptoms continue or worsen
  - d. be sure he understands the importance of returning to the health centre if symptoms do not resolve within this laps of time.

The following chart depicts the different steps you should take in managing a patient with a negative RDT result



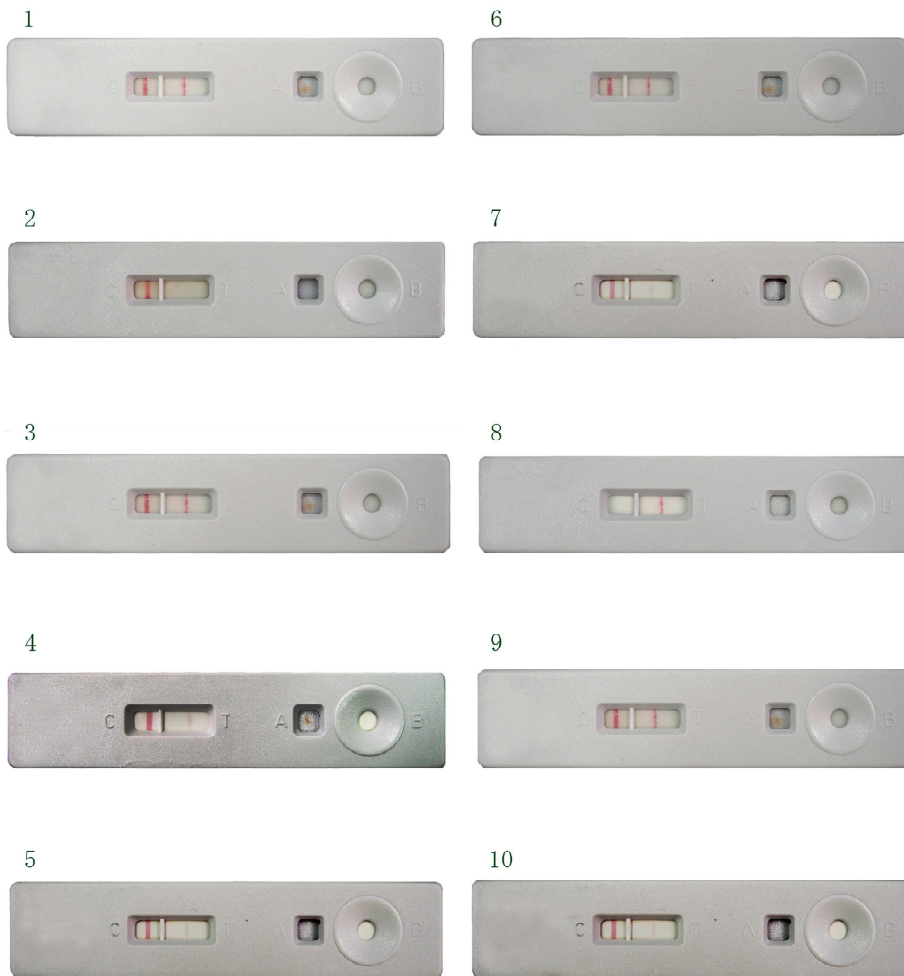
**Figure 3.2** Algorithm for the management of a febrile patient with a negative RDT

**REFERENCES**

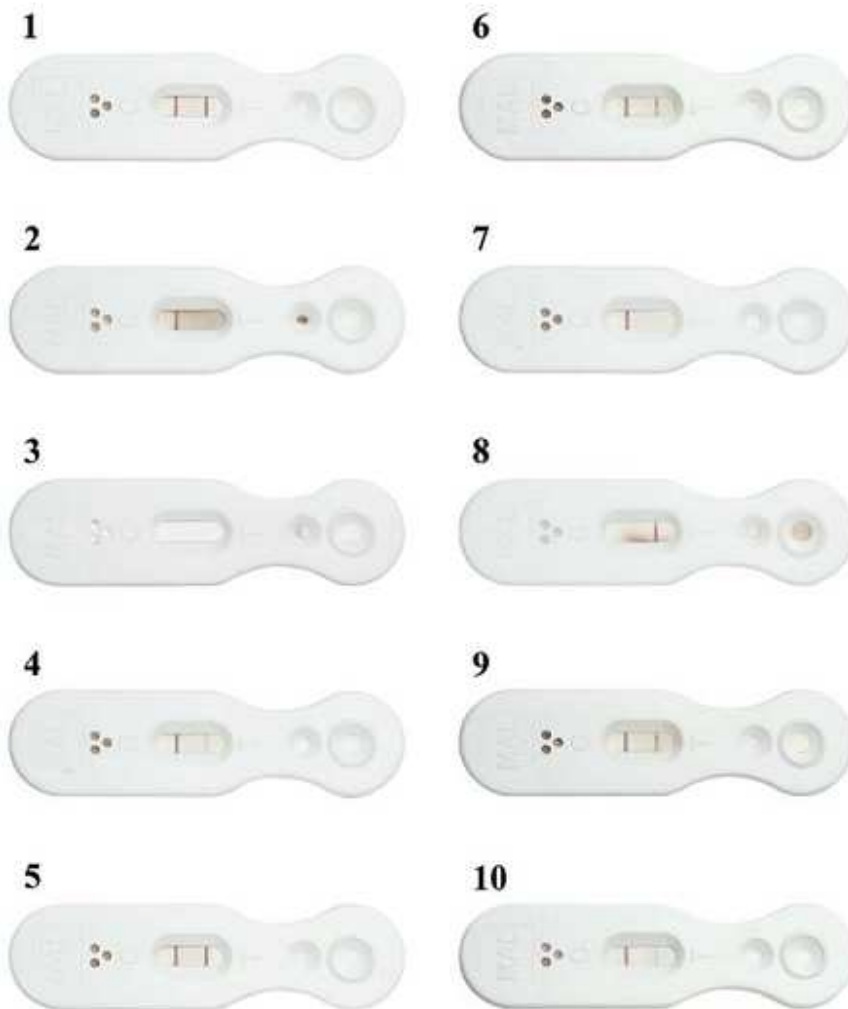
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## APPENDIX I

- Practice these malaria RDT quiz exercise for *P. falciparum* (if we have time) **Sample test set 1**



**Sample test set 2**



**Appendix II**

**ANSWER SHEET FOR SAMPLE TEST SETS Quiz**

NAME \_\_\_\_\_

DATE \_\_\_\_\_

TEST \_\_\_\_\_

	Positive (+)	Negative (-)	Invalid
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

TEST \_\_\_\_\_

	Positive (+)	Negative (-)	Invalid
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

**Appendix III**

**a) DETAILED QUININE ADMINISTRATION REGIMEN INTRAVENOUS ROUTE (INFUSION)**

Intravenous (infusion) administration of quinine has to follow the following

**Regimens:**

**Regimen 1:**

**Loading Dose:**

**H 0 to H 4:** 20mg/ kg of quinine salt in 5% or 10% glucose (+ electrolytes) without exceeding 1.2 g of quinine salt.

**H 4 to H 12:** Glucose 5 % or 10% only (+ electrolytes)

**H 12 to H 16:** 10 mg/kg of quinine in 5 % or 10% glucose (+ electrolytes) without exceeding 600mg of quinine salt.

**H 16 to H 24:** Glucose 5 % or 10% only (+ electrolytes)

**Maintenance treatment:** From day 2 right to the day that the patient can take oral treatment.

**H 0 to H 4:** 10 mg / kg of quinine in 5 % or 10% glucose (+ electrolytes) without exceeding 600mg of quinine.

**H 4 to H 12:** Glucose 5 % or 10% only (+ electrolytes)

**H 12 to H 16:** 10 mg / kg of quinine salt in 5 % or 10% glucose (+ electrolytes) without exceeding 600mg of quinine.

**H 16 to H 24:** Glucose (+ electrolytes)

***Regimen 2***

**No loading dose**

**Day 1:**

**H 0 to H 4:** 8 mg/kg of quinine base in 5% or 10% glucose + electrolytes

**H 4 to H 8:** glucose 5% or 10 % only (+ electrolytes)

**H 8 to H 12:** 8 mg/kg of quinine base in 5% or 10% glucose + electrolytes

**H 12 to H 16:** glucose 5% or 10 % only (+ electrolytes)

**H 16 to H 20:** 8 mg/kg of quinine base in 5% or 10% glucose + electrolytes

**H 20 to H 24:** glucose 5% or 10 % only (+ electrolytes)

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**Day 2 to day 7:** Same regimen if the patient cannot take orally

Use 10% glucose in case of hypoglycaemia. Add electrolytes to the drip. Watch out for any case of diabetes. If the quinine cannot be administered by infusion, give it intramuscularly according to the regimen below and refer the patient to the appropriate level of care

**INTRAMUSCULAR ROUTE**

For intramuscular injections, it is recommended that the chlorhydrate should be diluted in 0.9% normal saline at the concentration of 60mg/ml and half of the quantity injected in the anterior surface of each lap. To avoid abscesses, tetanus, hepatitis and HIV, use only disposable injection material.

*Switch to oral treatment as soon as possible and continue at the same dose to the seventh day*

**All forms of quinine, injectable or oral should be used taking into consideration the quantity of quinine base in the tablet or vial.**

WEIGHT OF PATIENT (Kg)	AGE OF PATIENT*	HOURS					
		H0-H4	H8-H12	H16-H20	H4-H8	H12-H16	H20-H24
3	£ 1 month	Q = 0.1 ml ; G = 50 ml			Q = 0 ; G = 50 ml		
4	1 – 2 months	Q = 0.13 ml ; G = 75 ml			Q = 0 ; G = 50 ml		



5	<b>2 – 3 months</b>	Q = 0.16 ml ; G = 100 ml	Q = 0 ; G = 70 ml
6	<b>3 – 4 months</b>	Q = 0.20 ml ; G = 100 ml	Q = 0 ; G = 100 ml
7	<b>4 – 6 months</b>	Q = 0.23 ml ; G = 100 ml	Q = 0 ; G = 150 ml
8	<b>7 – 9 months</b>	Q = 0.26 ml ; G = 150 ml	Q = 0 ; G = 125 ml
9	<b>10 – 12 months</b>	Q = 0.30 ml ; G = 200 ml	Q = 0 ; G = 100 ml
10	<b>13 – 15 months</b>	Q = 0.32 ml ; G = 200 ml	Q = 0 ; G = 150 ml
11-12	<b>16 – 24 months</b>	Q = 0.37 ml ; G = 200 ml	Q = 0 ; G = 150 ml
13-14	<b>2 – 3 years</b>	Q = 0.44 ml ; G = 200 ml	Q = 0 ; G = 200 ml
15-16	<b>3 – 4 years</b>	Q = 0.50 ml ; G = 200 ml	Q = 0 ; G = 225 ml
17-18	<b>4 – 5 years</b>	Q = 0.56 ml ; G = 200 ml	Q = 0 ; G = 225 ml
19-20	<b>5 – 6 years</b>	Q = 0.63 ml ; G = 250 ml	Q = 0 ; G = 225 ml
21-25	<b>6 – 8 years</b>	Q = 0.74 ml ; G = 250 ml	Q = 0 ; G = 250 ml
26-30	<b>8 – 10 years</b>	Q = 0.9 ml ; G = 250 ml	Q = 0 ; G = 300 ml
31-35	<b>10 – 11 years</b>	Q = 1.1 ml ; G = 300 ml	Q = 0 ; G = 300 ml
36-40	<b>11 – 13 years</b>	Q = 1.2 ml ; G = 300 ml	Q = 0 ; G = 325 ml
41-45	<b>13 – 14 years</b>	Q = 1.4 ml ; G = 300 ml	Q = 0 ; G = 350 ml
46-50	<b>14 – 15 years</b>	Q = 1.6 ml ; G = 350 ml	Q = 0 ; G = 375 ml
51-55	<b>15 – 16 years</b>	Q = 1.7 ml ; G = 400 ml	Q = 0 ; G = 400 ml
56-60	<sup>3</sup> <b>16 years</b>	Q = 1.9 ml ; G = 400 ml	Q = 0 ; G = 450 ml
<b>&gt; 60</b>	<sup>3</sup> <b>16 years</b>	Q = 1.95 ml ; G = 450 ml	Q = 0 ; G = 450 ml

*12.5mg of quinine base = 0.45 ml of quinine hydrochloride/chlorhydrate of quinine. G =*

*Glucose or*

*Dextrose*

*\*If there is a weighing machine available, it is preferable to use the body weight which is more specific,*

*and not the age.*

If on the 3rd day, the patient is still comatose, reduce the total quantity of infusions and tube feed the patient to provide the latter with calories.

**THE QUANTITIES OF SOLUTION PROVIDED HERE ARE ONLY INDICATIVE.**

**IT IS UP TO THE PRESCRIBING PHYSICIAN TO MODIFY THESE QUANTITIES OR TO PRESCRIBE**

**OTHER SOLUTIONS DEPENDING ON THE CLINICAL OUTLOOK OF THE PATIENT**

**24 -HOUR TREATMENT OF SEVERE MALARIA WITH QUINIMAX ®**

Q = Quinimax; G = glucose (or Dextrose) 5% or 10% (+ electrolytes)

WEIGHT OF HOURS PATIENT (Kg)	AGE OF PATIENT*	HOURS		
		H0-H4	H8-H12	H16-H20
3	1 month	Q = 0.2 ml ; G = 50 ml		Q = 0 ; G = 50 ml
4	1 – 2 months	Q = 0.26 ml ; G = 75 ml		Q = 0 ; G = 50 ml
5	2 – 3 months	Q = 0.32 ml ; G = 100 ml		Q = 0 ; G = 75 ml
6	3 – 4 months	Q = 0.4 ml ; G = 100 ml		Q = 0 ; G = 100 ml
7	4 – 6 months	Q = 0.45 ml ; G = 100 ml		Q = 0 ; G = 150 ml
8	7 – 9 months	Q = 0.5 ml ; G = 150 ml		Q = 0 ; G = 125 ml
9	10 – 12 months	Q = 0.6 ml ; G = 200 ml		Q = 0 ; G = 100 ml
10	13 – 15 months	Q = 0.65 ml ; G = 200 ml		Q = 0 ; G = 150 ml
11-12	16 – 24 months	Q = 0.75 ml ; G = 200 ml		Q = 0 ; G = 150 ml
13-14	2 – 3 years	Q = 0.8 ml ; G = 200 ml		Q = 0 ; G = 200 ml
15-16	3 – 4 years	Q = 1.0 ml ; G = 200 ml		Q = 0 ; G = 225 ml
17-18	4 – 5 years	Q = 1.1 ml ; G = 200 ml		Q = 0 ; G = 225 ml
19-20	5 – 6 years	Q = 1.25 ml ; G = 250 ml		Q = 0 ; G = 225 ml
21-25	6 – 8 years	Q = 1.5 ml ; G = 250 ml		Q = 0 ; G = 250 ml
26-30	8 – 10 years	Q = 1.8 ml ; G = 250 ml		Q = 0 ; G = 300 ml
31-35	10 – 11 years	Q = 2.1 ml ; G = 300 ml		Q = 0 ; G = 300 ml
36-40	11 – 13 years	Q = 2.1 ml ; G = 300 ml		Q = 0 ; G = 325 ml
41-45	13 – 14 years	Q = 2.75 ml ; G = 300 ml		Q = 0 ; G = 350 ml
46-50	14 – 15 years	Q = 3.1 ml ; G = 350 ml		Q = 0 ; G = 375 ml

51-55	<b>15 – 16 years</b>	Q = 3.4 ml ; G = 400 ml	Q = 0 ; G = 400 ml
56-60	<b>16 years</b>	Q = 3.7 ml ; G = 400 ml	Q = 0 ; G = 450 ml
<b>&gt; 60</b>	<b>16 years</b>	Q = 3.9 ml ; G = 450 ml	Q = 0 ; G = 450 ml

*12.5 mg of quinine base = 0.1 ml of quinimax new presentation. G = Glucose or Dextrose*  
*\*If there is a weighing machine available, it is preferable to use the body weight which is more specific, and not the age. If on the 3rd day, the patient is still comatose, reduce the total quantity of infusions and tube-feed the patient to provide the latter with calories.*

**THE QUANTITIES OF SOLUTION PROVIDED HERE ARE ONLY INDICATIVE.**

**IT IS UP TO THE PRESCRIBING PHYSICIAN TO MODIFY THESE QUANTITIES OR TO PRESCRIBE OTHER SOLUTIONS DEPENDING ON THE CLINICAL OUTLOOK OF THE PATIENT.**

**Appendix****NUMBER OF DROPS PER MINUTE TO BE RUN IN A DRIP  
DEPENDING ON THE QUANTITY OF FLUIDS****5 to 10 ml./Kg/4heures**

QUANTITY OF FLUIDS TO BE RUN IN 4 HOURS	NUMBER OF DROPS PER MINUTE
50 ml.	4
75 ml.	7
100 ml	9
150 ml	13
200 ml	17
250 ml	21
500 ml	42

**Calculation of dose to be administered**

$$82 \text{ mg/ml} = \text{Weight} \times \text{Dose (mg/kg)} / \text{Quantity to be taken per dose}$$
**Dilution of quinine**

- a) 1 vial of 600mg/2ml at 82% of quinine base + 4 ml of sterilized water, that is 600mg/6ml representing 100mg of salt per ml or 82 mg of quinine base per ml.  
 b) 1 vial of 600mg/2ml at 82.6% of quinine base + 4 ml of sterilized water, that is 600mg/6ml or 82.6 mg of quinine base per ml.

**Appendix****SALT / BASE EQUIVALENCE OF THE MAIN ANTI MALARIAL DRUGS**

QUININE SALTS		
QUININE	SALT	BASE
Quinine Sulphate tabs	362 mg	300 mg
Quinine Disulphate tabs	508 mg	300 mg
Quinine Chlorhydrate tabs (Quinine Laf ran* , ...)	500 mg	408,5 mg
Quinine Dichlorhydrate tabs	405 mg	300 mg (74 %)
Quinine-Gluconate, inj . ( <i>Quinimax*</i> )	100 mg	100 mg (100 %)