REPUBLIC OF RWANDA

MINISTRY OF HEALTH

National Guidelines for the Treatment of Malaria in Rwanda

3rd Version 2013

RWANDA BIOMEDICAL CENTER

A Healthy People. A Wealthy Nation

MALARIA & OPDD Division

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PREFACE

For the past years, the Ministry of Health has made progress in health indicators such as reduction of child mortality, reduction of malaria and other infectious diseases. Achievements in the Rwanda health sector has been facilitated by innovations like evidence based diseases control interventions, community based interventions, access to community health insurance, performance based financing etc. Most of these innovations are implemented to improve access to health care through the delivering of effective and efficient health services.

The epidemiology of malaria has changed over the last few years with the burden of disease decreasing dramatically following the scale-up of malaria control interventions. Malaria morbidity decreased by 87% between 2005 and 2011 while the mortality decreased by 74% during the same period. There is however, provincial and district variations in the gains in malaria control. According to the latest Malaria Programme Review conducted in March 2011, indications of malaria transmission trends show that Rwanda is heading towards the pre elimination phase of malaria. For this reason, it is very important that the National Guidelines for the treatment of malaria in Rwanda serves as one of the means by which quality of care can be provided for malaria patients seeking health care.

Through the use of well-established methods of prevention, diagnosis and treatment of malaria seen in the health facilities, these guidelines bring together essential and current knowledge necessary for health care providers to provide the best care to malaria patients at all level of health care. This updated version emphasizes the parasitological laboratory confirmation of all suspected malaria cases by using microscopy to examine blood smears (BS) or by rapid diagnostic tests (RDTs) before initiating any malaria treatment at all level of health care including the community through integrated community case management by community health workers. It also introduces the use of Artesunate for the treatment of severe malaria as well as for simple malaria with minor digestive symptoms at health center and district hospital.

This edition of the National Guidelines for the treatment of malaria in Rwanda is meant to be used at all levels of healthcare, both in the public and private sectors, throughout the country and will guide healthcare professionals in their treatment choices. This is a comprehensive document, designed to serve as a clinical guide as well as an educational tool for health professionals. I believe that it will bring us closer to ensuring the proper management of all patients suffering from malaria throughout Rwanda in a standardized, quality and cost-effective manner.

Dr. Agnes BINAGWAHO
Minister of Health

OVERVIEW

The National Guidelines for the treatment of malaria in Rwanda provides up-to-date WHO recommendations to all health facilities on malaria diagnosis and treatment in accordance with the Rwanda national malaria control strategies. In scope, the Guidelines cover the diagnosis and treatment of uncomplicated and severe malaria caused by all types of malaria,

The first edition of National Guidelines for the treatment of malaria in Rwanda using ACTs was published in 2006 when Rwanda introduced the artemesinin based combination therapy with artemether-lumefantrine (A-L) for the treatment of uncomplicated malaria in conformity with WHO guidelines.

The second edition introduced a parasitological laboratory confirmation in the diagnosis of malaria in all patients suspected of having malaria before treating as well as new classification of malaria in addition to the traditional simple malaria and severe malaria. This additional classification as, "simple malaria with minor gastrointestinal symptoms", which took into consideration the clinical experiences of the different health care providers.

The move towards universal diagnostic testing of malaria is a critical step forward in the fight against malaria as it will allow rational use of ACTs only to those who actually have malaria. This will help to prevent and reduce the emergence and spread of drug resistance. It will also help identify patients who do not have malaria, so that alternative diagnoses can be made and appropriate treatment provided.

This manual is a third version of the national treatment guidelines of malaria in Rwanda with the introduction of artesunate in the treatement of severe malaria.
These guidelines highly recommend also compulsory laboratory diagnostic of all malaria cases including severe malaria in all age groups.

The new formulation of dispersible artemisinin combination therapy (ACT) for children weighing between 5kg-15kg and 15kg-25kg is also recommended in order to improve drug compliance and adherence for the younger.

In revising the guidelines, comments and observations made by the health care providers during their training or during their day-to-day work have been taken into consideration.

This revised and simplified manual aims to improve the quality of management of malaria in Rwanda by serving as a guide for the health staff working in health facilities in the management of malaria for adults, pregnant women as well as children.

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OF MALARIA & OTHER
ITIC DISEASES DIVISION
EDICAL CENTER

Dr Corine KAREMA
Head of Mal&OPDD/RBC

ABBREVIATIONS AND ACRONYMS

ACT	Artemisinin combination therapy
AIDS	Acquired Immunodeficiency Syndrome
A-L	Artemether-lumefantrine
ANC	Antenatal care
APO	Acute pulmonary oedema
AQ/SP	Amodiaquine/sulfadoxine-pyrimethamine
BS	Blood smear
BP	Blood pressure
BW	Body weight
CHUB	Centre Hospitalier Universitaire de Butare
KUTH	Kigali University Teaching Hospital
CCM	Community case management
CTB	Belgian technical cooperation (Coopération Technique Belge)
DIVC	Disseminated Intravascular Coagulation
GE	Goutte epaisse
g/dl	Grams per deciliter
GoR	Government of Rwanda
Hb	Hemoglobin
HBMF	Home based management of fever/malaria
HC	Health Centre
HF	Health Facility
HG	Mercury
HIV	Human immunodeficiency syndrome
HMIS	Health Management Information System
ICCM	Integrated community case management
IEC	Information Education and Communication
IM	Intra muscular
IMCI	Integrated management of childhood illness
IPT	Intermittent preventive treatment
IR	Intra rectal
IRS	Indoor Residual Spraying
ITNs	Insecticide treated nets
IV	Intravenous
LLINs	Long lasting insecticides nets
Mg/kg	Milligrams per kilogram
Mg/l	Milligram per litre
mmHg	Millimeter of Mercury
Mmol/l	Millimole per litre
MCHIP	Mother and Child Health Integrated Program
MPR	Malaria Program Review
NGT	Naso gastric tube
OPD	Other parasitic diseases
ORS	Oral rehydration solution
PCR	Polymerase chain reaction
P.falciparum	Plasmodium falciparum
RBC	Rwanda Biomedical Center
RDT	Rapid diagnostic test
USD	United States Dollars
WHO	World Health Organisation

Important definitions in the context of Malaria:

Anti-pyretic. A drug such as paracetamol that relieves fever without affecting the parasite

Artemisinin-based combination therapy (ACT). A combination of artemisinin or one of its derivatives with an antimalarial of a different class

Cerebral malaria. Severe P. falciparum malaria with cerebral manifestations, usually including coma (Glasgow coma scale < 11, Blantyre coma scale < 3). Malaria with coma persisting for > 30 min after a seizure is considered to be cerebral malaria.

Combination treatment. A combination of two or more different classes of medicines with unrelated mechanisms of action.

Cure. Elimination of the symptoms and asexual blood stages of the malaria parasite that caused the patient or caregiver to seek treatment.

Drug resistance. The World Health Organization (WHO) defines resistance to antimalarials as the ability of a parasite strain to survive and/or to multiply despite the administration and absorption of a medicine given in doses equal to or higher than those usually recommended but within the tolerance of the subject, provided drug exposure at the site of action is adequate. Resistance to antimalarials arises because of the selection of parasites with genetic mutations or gene amplifications that confer reduced susceptibility.

Endemic. Occurring frequently in a particular region or population

Febrile. With an increase in temperature compared with the normal

Febrile convulsions. Convulsions occurring in children aged 6 months - 6yrs due to fever caused by infection outside the central nervous system

Gametocytes. Sexual stages of malaria parasites present in the host red blood cells.

Hemoglobin. concentration of Hb < 7g /100 ml (haematocrit <21%)
Lumbar puncture. The insertion of a needle into the fluid-filled space of the spinal cord in the lumbar region and the removal of a sample of that fluid for examination

Parenteral. The provision of medication into the body by any means other than through the alimentary canal (oral route or rectal), such as by subcutaneous, intramuscular or intravenous injection.

Plasmodium. A genus of protozoan vertebrate blood parasites that includes the causal agents of malaria. *Plasmodium falciparum, P. malariae, P. ovale* and *P. vivax* cause malaria in humans. Human infections with the monkey malaria parasite, P. knowlesi have also been reported from forested regions of South-East Asia.

Rapid diagnostic test (RDT). An antigen-based stick, cassette or card test for malaria in which a coloured line indicates that plasmodial antigens have been detected.

Recrudescence. The recurrence of asexual parasitaemia after treatment of the infection with the same infection that caused the original illness. This results from incomplete clearance of parasitaemia due to inadequate or ineffective treatment. It is, therefore, different to a relapse in *P. vivax* and *P. ovale* infections, and it differs from a new infection or re-infection (as identified by molecular genotyping in endemic areas).

Severe anaemia. Haemoglobin concentration of < 5g/100 ml (haematocrit < 15%).

Sporozoites. Motile malaria parasites that are infective to humans, inoculated by a feeding female anopheline mosquito. The sporozoites invade hepatocytes.

Simple malaria. Symptomatic infection with malaria parasitaemia without signs of severity and/or evidence of vital organ dysfunction.

INTRODUCTION

Many countries in sub-Saharan Africa have made significant progress toward achieving their malaria reduction goals. However, most are still far from achieving the targets set by the Millennium Development Goals and the Roll Back Malaria—reduction of malaria deaths by 50% in target countries—or the Millennium Development Goals—to have halted and reversed the incidence of malaria by 2015.

Rwanda has achieved more than most in regards to these goals. Malaria incidence has declined in Rwanda from about 120 cases per thousand people at risk in 2001, to less than 60 cases per thousand people at risk in 2010. In addition, more than 80 percent of its malaria control targets have been achieved and Rwanda has put in place a strategic plan to enter a pre-elimination phase by 2017.

As countries begin to move towards the pre-elimination of malaria, there is need to improve malaria case management in order to correctly treat all malaria cases.

It is within this framework that the MoH through the Malaria & OPD Division-RBC is revising the national guidelines for malaria treatment in Rwanda in order to sustain universal diagnostic testing of malaria and to protect the abusive use of ACTs for those only actually have malaria. This will help to reduce the emergence and spread of drug resistance. It will also help identify patients who do not have malaria, so that alternative diagnoses can be made and appropriate treatment provided.

What is new in these guidelines?

The new aspects introduced in this version include the following:

- The requirement for parasitological confirmation of all suspected malaria cases by using microscopy to examine blood smears (BS) or by rapid diagnostic tests (RDTs), before initiating treatment.
- Artesunate treatment in severe malaria at district or referral hospital.
- Artesunate treatment in simple malaria with minor digestive symptoms at health center and district hospital
- Some clarifications have been added regarding the dosages of the different recommended antimalarial drugs. The new formulation of Artemether 20mg + Lumefantrine 120mg dispersible for children weighing between 5kg-15kg and 15kg-25kg.
- The manual will be used for the basic as well as for in-service training of doctors, nurses and other medical personnel involved in the diagnosis and management of malaria.
- It provides essential information on the definition of the different clinical forms of malaria and the regime for their diagnosis and clinical management.
- It addresses more deeply, the management of hypovolaemia, acidosis, as well as other common co-infections, in the management of malaria. The duration of blood transfusion, measures for treating hypovolaemia and antibiotic therapy have also been elaborated.

To ensure better management of malaria in the country, health facilities have been classified into different levels based on the capacities of the health care workers as well as the quality of the available services for managing malaria.

The first level
This level is the community where the health service providers are represented by trained family members and especially the trained community health workers (CHWs). Their main activities are to provide information, education and communication (IEC) to the community, prevention as well the diagnosis using RDTs and treatment of simple malaria for children under five as recommended by the Ministry of Health.

The second level
This is the typical level of health care service providers which comprise of health posts, dispensaries, health centers, public and private clinics. This level will be in charge of malaria diagnosis using microscope and treatment of simple malaria cases and simple malaria cases with minor digestive symptoms. This level also ensures referral or pre transfer treatment for patients with severe malaria and supervision of the activities at the first level.
It is also the level where operational research on treatment regimes can be conducted.

The third level
This level includes the district hospitals and the private hospitals that fulfil the criteria required for the diagnostic and treatment of severe malaria (see section 4.3.3).
It is also the level where operational research on treatment regimes can be conducted.

The fourth level
This is the National referral hospitals in which different complications and sequalae of severe malaria cases are referred for diagnostic and case management. It is also the level where operational research on treatment regimes can be conducted.

OBJECTIVES OF THE GUIDELINES

1.1. General objective

To serve as a guide for health workers at all level of health care in reducing morbidity and mortality due to malaria in Rwanda

1.2. Specific objectives

- To diagnostic more than 95% of all malaria cases
- To achieve 95% of malaria cases treated according to norms and standards
- To treat 95% of children under five within 24 hrs of symptoms onset
- To reduce the mortality due to severe malaria in the under fives and pregnant women

2. STRATEGIES OF MALARIA CONTROL IN RWANDA

Summary of the Malaria Strategic Plan and Main Strategies

The current malaria control strategic plan 2012-2017 aims to contribute towards social- economic development of Rwanda through elimination of Malaria burden by strengthening and implementing appropriate control interventions such all malaria cases will be diagnosed and treated promptly in line with the national policies by improving malaria diagnosis by 100% of suspected malaria cases, providing prompt treatment to malaria cases at all levels, strengthening prompt access to treatment of severe malaria cases and generating the use of operational research findings information to improve case management program implementation and health delivery services in partnership with stakeholders.

The MSP has two goals: - to eliminate malaria deaths by 2017 and to reduce malaria morbidity pre-elimination level of less than 5% test positivity rate by 2017 based on the 2011 levels.

To achieve these two goals six specific objectives have been set out:

a) By 2017, 95% of the population will have correct knowledge, behaviors and practices towards malaria prevention and control
b) By 2017, all malaria cases will be diagnosed and treated promptly in line with the national policy
c) By 2017, 90% of population at risk will be effectively protected with locally appropriate vector control interventions based on evidence
d) By 2017, all health units will report on key indicators promptly for enhanced decision making and action
e) By 2017, all levels of the health system (including the local level) will have strengthened coordination, programme management, monitoring and capacity building
f) By 2017, develop local and international partnerships, including cross-border malaria control initiatives to accelerate malaria control and pre-elimination in Rwanda and the region.

These objectives have further been developed into strategies/interventions as outlines in the strategic plan document. These have further been developed into main activities.

The key strategies are:

- Improvement of Malaria Diagnosis and Case Management
- Implementation of case studies of malaria elimination in low endemicity areas
- Capacity building on integrated vector management (IVM) approach
- Cross-border collaboration
- Behavior Change Communication
- Epidemiological Surveillance, monitoring and evaluation and operational research
- Monitoring and evaluation
- Procurement and supply management system
- Partnership Coordination and Program Management
- Establish comprehensive national level data base including referral and Private sector

2.1. Improvement of malaria management at different levels of health care delivery system

This strategy essentially hinges on:

- Training of health providers and availability of policies and compliance to the guidelines for malaria case management;
- Early diagnosis with malaria confirmation before treatment and prompt treatment;
- Monitoring quality of malaria case management including those at the community level;
- Supply, distribution and rational use of the antimalarials and other malaria commodities;
- Monitoring the therapeutic efficacy and safety of antimalarial drugs;
- Integrated Supervision of all malaria control activities at all levels of the health system.

2.2. Integrated application of malaria prevention measures

This strategy comprises of:

- Ensuring universal coverage with insecticide treated mosquito nets with a especial target of under fives and pregnant women groups ;
- Indoor residual spraying (IRS) in high malaria transmission foci and epidemic prone areas
- Larval source management using approved larvicides, environmental management and sanitation and biological control of mosquito larvae.
- Developing and promoting an integrated vector management (IVM) for rational decision making and intersectorial collaboration on vector control interventions.

2.3. Strengthening of epidemiological surveillance of malaria

This strategy will set up a system of surveillance based on risk factors and other epidemic determinants of malaria. It includes:

- Epidemiological, entomological and environmental surveillance at sentinel sites.
- Analysis of data from sentinel sites and all health care facilities using the health management information system (HMIS) of the Ministry of Health.
- Expansion of areas of unstable malaria transmission due to the scale up of malaria interventions resulting in further decline of malaria morbidity and mortality and expansion of areas of unstable malaria transmission that will be prone to malaria epidemics;
- Due to the declining malaria burden and transmission, the current methods of epidemic prediction that utilize EPR thresholds are no longer sufficient since malaria incidence has drastically reduced;
- Set up a system focusing on geographic reconnaissance and malaria case active detection to boost malaria elimination activities in low endemicity areas.

- Cross border and local movements of people are other facilitating factors in epidemic outbreaks.

2.4. Information, Education and Communication (IEC) for behaviour change favorable for malaria control

Given the need for dissemination of accurate information on malaria control, emphasis will be put on diversification of channels and information to include, radio, television, meetings sports events, posters, evidence based on informative research on specific behaviors.
The malaria program plan for BCC organizes annual events that include, the World Malaria Day, Mother and Child Heath Week, Youth Week and Health Policy Week. During these campaigns, multiple channels of communications used are, radio, TV, newspapers, meetings, billboards, banners and songs.

2.5. Operational research

This will particularly focus on efficacy trials of antimalarial drugs and drug resistance:

- Basic and operational research is conducted;
- Collaboration with international research institutions and participation in multicentric studies.

2.6. Strengthening of the health system and coordination of the partnership in malaria control

This strategy emphasizes support to the districts in the development of integrated work plans for malaria control. The Malaria Division provides technical support and carries out advocacy towards mobilization of resources necessary for implementation of their work plans.

2.7. Monitoring and evaluation of malaria control activities

The implementation of the above strategies requires regular assessment of operational indicators of health systems such as the district hospitals and other health facilities to ascertain adherence with guidelines and the level of implementation of the activities of their work plans:

- Available routine program data from health facilities and the community (HMIS, SISCom);
- Demographic and other socio-economic data from DHS, IDHS and MIS. MIS indicators integrated into DHS and IDHS;
- Additional data available from sentinel sites;

3. DEFINITION AND CLASSIFICATION OF MALARIA CASES

Malaria is a febrile hematozoid parasitic illness due to *Plasmodium* parasites. To ensure a uniform understanding of the different clinical categories of malaria and to harmonize their management by all health practitioners in Rwanda, the following classification has been adopted:

- Simple malaria,
- Simple malaria with minor gastrointestinal symptoms and,
- Severe malaria

3.1. Simple Malaria

This is an illness characterized by axillary temperature higher or equal to 37.5 °C (hot body) or history of fever in the last 24 hours with or without the following signs: headache, weakness, chills, loss of appetite, stiffness, joints pain and muscular pains.
The parasitological confirmation of *Plasmodium* by either blood smear or rapid test is compulsory without any exception. Laboratory confirmation using either a blood smear or a rapid test is

compulsory in all cases without exception; signs of severity and other illnesses must be looked for and excluded systematically.

3.2. Simple malaria with minor digestive symptoms

This is an illness characterized by signs of simple malaria where the patient presents with vomiting that prevents oral medication with or without associated moderate diarrhea.
The danger signs as well as other differential diagnoses must be looked for systematically and excluded. The parasitological confirmation of *Plasmodium* by either blood smear or rapid test is compulsory without any exception.

3.3. Severe malaria

Severe malaria is marked by the presence of signs of vital distress. This form of malaria is an **extremely emergency** and requires hospitalization in a district or reference hospital.
It is characterized by positive parasitaemia due to *Plasmodium falciparum*, accompanied by one or more of the following signs of severity or danger:
Danger signs **(in children)**

- Inability to drink or suckle;
- Vomiting ;
- Convulsions (≥ 2 convulsions in 24 hours);
- Lethargy and unconsciousness.

Table: Signs of severity (in children and adults)

Clinical signs	Frequency		Prognosis	
	Children	Adults	Children	Adults
Prostration (extreme weakness, failure to be upright or walk)	+++	+++	+	+
Altered level of consciousness (somnolence, unconsciousness or deep coma)	+++	++	+++	+++
Respiratory distress (respiratory acidosis)	+++	++	+++	+++
Acute pulmonary oedema (radiological)	+	+	+++	+++
Repeated convulsions (≥ 2 convulsions in 24 hours)	+++	+	+	++
Cardiovascular collapse or shock	+	+	+++	+++
Spontaneous haemorrhages (or disseminated intravascular coagulation – DIVC)	+	+	+++	++
Jaundice (yellow colouration of the conjunctival membranes)	+	+++	++	+
Heamoglobinuria (coca cola or dark urine)	+	+	+	+
Paraclinical signs	**Frequency**		**Prognosis**	
	Children	**Adults**	**Children**	**Adults**
Severe anaemia (haemoglobin < 5 g/dl or hematocrit <15%);	+++	+	+	+
Hypoglycaemia (blood glucose < 40 mg/dl or 2,2 mmol/l);	+++	++	+++	+++
Renal insufficiency (little or dark urine/ creatinin >265 µmmol/dl);	+	+++	++	++
Hyperparasitaemia(over100000parasites/µl or over 2.5% red blood cells containing parasites);	++	+	+/-	++
Acidosis (plasma bicarbonate < 15 mmol/dl);	+++	++	+++	+++
Hyperlactataemia (lactate >5 mmol/dl)	+++	++	+++	+++

(See: Guidelines for the treatment of malaria/World Health Organization, 2009, Page 35 and Kenya national guidelines for diagnosis, treatment and prevention of malaria, 2006).

Severe malaria is a medical emergency. Delay in diagnosis and inappropriate treatment, especially in infants and children, leads to rapid worsening of the situation.
The key to effective management are early recognition, assessment and appropriate antimalarial and supportive therapy. The parasitological confirmation of *Plasmodium* by either blood smear or rapid test is compulsory without any exception.

To facilitate classification of severe malaria, the following types of malaria have been categorized as:

- Severe malaria associated with anaemia;
- Cerebral malaria;
- Other forms of severe malaria (renal, pulmonary,…).

4. DIAGNOSTIC OF MALARIA

The commonly used confirmatory tests to detect the presences of malaria parasites are microscopy or rapid diagnostic tests (RDTs). Quality assurance of microscopy and RDTs is vital for the sensitivity and specificity of the results.

4.1. *Community:*

- RDTs

Rapid diagnostic test (RDT) is a device that detects malaria antigen in a small amount of blood, usually 5–15 μL, by immunochromatographic test with monoclonal antibodies directed against the target parasite antigen and impregnated on a test strip.
Tests which detect histidine-rich protein 2 (HRP2) are specific for P.falciparum while those that detect parasite lactate dehydrogenase (pLDH) or aldolase have the ability to differentiate between P.falciparum and non-P.falciparum malaria (vivax, malariae and ovale).

With the appropriate training, RDTs are simple to use and are sensitive in detecting low parasitaemia.

When using RDTs, it is important to adhere strictly to the manufacturer's instructions especially the time of reading the results. Remember to observe safe medical waste disposal at all times. The recommended RDTs will be always based on WHO recommendation and also validate for the country settings and epidemiology**Purpose of using RDTs**

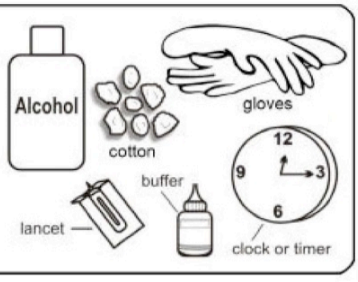
The changing epidemiology of malaria and the introduction of ACTs have increased the urgency ofimproving the specificity of malaria diagnosis. Parasitological diagnosis has the following advantages:

- 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.

Generic instruction for malaria rapid test cassette. Modify for specific product

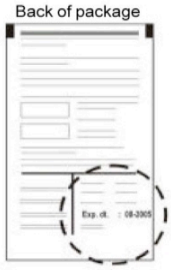
1 FIRST, read carefully these instructions.

2 Collect:
1) alcohol
2) cotton
3) gloves
4) lancet
5) buffer
6) timer



3 Look at the expiry date at the back of the package.

Use another package if expiry date has passed.



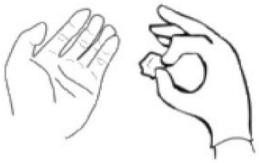
4 Open the package and look for the following:

1) Dessicant
(Check correct colour)

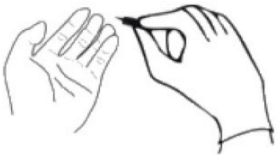
3) Loop

5 Write patient's name at the back of the device.

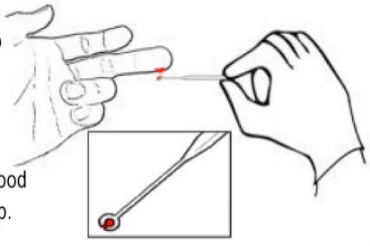
6 Clean the patient's finger with alcohol. The finger MUST be dry before pricking.



7 Prick the patient's finger to get a drop of blood.

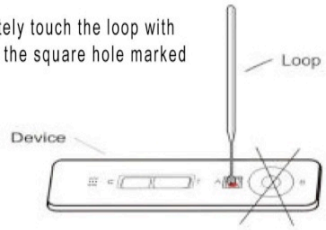


8 Touch the loop to the blood.

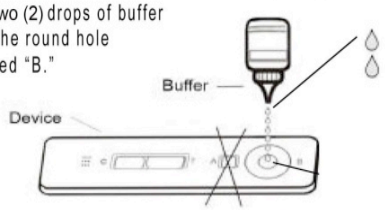


A film of blood fills the loop.

9 Immediately touch the loop with blood on the square hole marked "A."

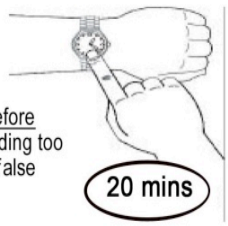


10 Put Two (2) drops of buffer into the round hole marked "B."



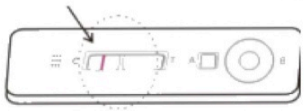
11 Read results exactly twenty (20) minutes after adding buffer.

Do not read the results before twenty (20) minutes. Reading too early or too late can give false results.

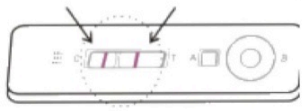


12 HOW TO READ:

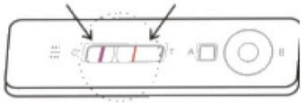
NEGATIVE (no falciparum malaria) - one line in window "C" at left.



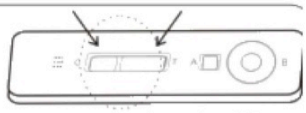
POSITIVE falciparum malaria - one line in window "C" at left and one line in window "T" at right.



It is positive even if test line is faint.



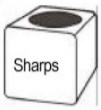
NO RESULT - no line in "C" or "T."



If the control line does NOT appear, any other lines should be disregarded. The test should be repeated!

13 Record results.

14 Dispose of infectious waste properly.



Use new package and lancet for each patient.

4.2. *Health center:*

a) Microscopy

Is the standard method for parasitological diagnosis of malaria and is performed by examining a stained thick or thin blood smear for the presence of malaria parasites.
Thick films are recommended for parasite detection and quantification and can be used to monitor response to treatment.Thin films are recommended for species identification.

Recommended procedure for microscopy:

- Make a thick or thin blood film on a clean microscope slide;
- Stain using giemsa stain;
- Examine under power 100 oil immersion objective lens starting with the thick followed by the thin film;
- Report the type of parasite(s) seen, developmental stage and parasite count as parasites per 200 WBCs or parasites per microlitre of blood;
- Ensure you always use relevant Standard Operating Procedures (SOPs) for all processes
- If the blood slide is negative, further investigations for the cause of febrile disease including repeating the blood slide should be carried out.

The plus system	**Number of parasites per microlitres**
+ :1-10 parasites per 100 fields of BS	4-40 parasites per µl
++ : 11-100 parasites per 100 fields of BS	40-400 parasites per µl
+++ : 1-10 parasites per 1 field of BS	400-4.000 parasites per µl
++++ : 11-100 parasites per 1 field of BS	4.00-40.0 rasites per µl

b)RDT

RDT is done for emergency or when the laboratory technician is not available especially during weekend and break time.

4.3. Hospital

a) Microscopy (parasite density, species

Is the standard method for parasitological diagnosis of malaria and is performed by examining a stained thick or thin blood smear for the presence of malaria parasites.
Thick films are recommended for parasite detection and quantification and can be used to monitor response to treatment.
Thin films are recommended for species identification.

Recommended procedure for microscopy:
• Make a thick or thin blood film on a clean microscope slide;
• Stain using giemsa stain;
• Examine under power 100 oil immersion objective lens starting with the thick followed by the thin film;

• Report the type of parasite(s) seen, developmental stage and parasite count as parasites per 200 WBCs or parasites per microlitre of blood;

$$\text{Number of parasites per microlitre} = \frac{\text{Number of parasites X 8 000 white blood cells}}{\text{Number of leucocytes counted}}$$

• Ensure you always use relevant Standard Operating Procedures (SOPs) for all processes;
• If the blood slide is negative, further investigations for the cause of febrile disease including repeating the blood slide should be carried out.

b) RDTs

RDT is done for emergency or when the laboratory technician is not available especially during weekend and break time.

4.4. Referral Hospital:

a) Microscopy (croix)

Is the standard method for parasitological diagnosis of malaria and is performed by examining a stained thick or thin blood smear for the presence of malaria parasites.
Thick films are recommended for parasite detection and quantification and can be used to monitor response to treatment.
Thin films are recommended for species identification.

Recommended procedure for microscopy
• Make a thick or thin blood film on a clean microscope slide;
• Stain using giemsa stain;
• Examine under power 100 oil immersion objective lens starting with the thick followed by the thin film;
• Report the type of parasite(s) seen, developmental stage and parasite count as parasites per 200 WBCs or parasites per microlitre of blood;

The plus system	**Number of parasites per microlitres**
+ :1-10 parasites per 100 fields of BS	4-40 parasites per µl
++ : 11-100 parasites per 100 fields of BS	40-400 parasites per µl
+++ : 1-10 parasites per 1 field of BS	400-4.000 parasites per µl
++++ : 11-100 parasites per 1 field of BS	4.000-40.000 parasites per µl

• Ensure you always use relevant Standard Operating Procedures (SOPs) for all processes;
• If the blood slide is negative, further investigations for the cause of febrile disease including repeating the blood slide should be carried out.

b) RDT

RDT is done for emergency or when the laboratory technician is not available especially during weekend and break time.

5. MANAGEMENT OF DIFFERENT FORMS OF MALARIA

5.1. Management of simple malaria

5.1.1. At family level

Strengthening information, education and communication (IEC):

- Knowledge of the mode of transmission of malaria
- Promotion and Utilization of long lasting insecticide treated nets (LLINs) as the principle means of prevention and utilization of other preventive measures
- Membership to the community health insurance scheme (mutuelle de sante) as means of ensuring early access to health care
- Recognition by the family members of the signs of simple malaria, simple malaria with minor digestive symptoms and severe malaria;
- Seeking care in a timely manner from a community health worker or the nearest health facility, after reducing fever, if present by using tepid sponging.
- hygiene

5.1.2. At community level (Community health workers)

The role of the community health worker is to:

- Sensitize the population on the mode of transmission of malaria;
- Sensitize the population on the recognition of signs of simple malaria, malaria with minor digestive symptoms and severe malaria;
- Sensitize the population on seeking care in a timely manner from a community health worker or the nearest health facility, after reducing fever, if present by using tepid sponging.
- Manage cases of children under five in accordance with the national guidelines after confirmation using a rapid diagnostic test (RDT), under the framework of home based management of fever (HBMF) or integrated community case management (iCCM), and if necessary refer to a health facility
- It is indicated to prescribe the first line of treatment only after obtaining a positive rapid diagnostic test. A rapid diagnostic test precludes the diagnosis of malaria and the administration of an antimalarial. Other causes of fever should be sought systematically according to ICCM algorythme and treated accordingly.
- The first line treatment recommended for all malaria positive cases is an artemisinin combination therapy (ACT) comprising of *Dispersible Artemether 20mg + Lumefantrine 120mg* taken preferably during meals *is available for use in the pediatric age. This formulation will be dissolved in few quantity of water on a spoon.* The formulation is used for both **6*1** tablets for infants and children weighing 5 to <15 kg bodyweight and **6*2** tablets for children weighing 15 to <25 kg bodyweight. This formulation is repacked respectively at the community level as Red and Yellow Primo, at health center and district hospital level as AL.
- Details administration

Category of body weight of the patient in kg	Type of blister administered	Number of tablets of AL dispersible per dose					
		Day 1		Day 2		Day 3	
		First dose	8 hours after first dose	24 hours after first dose	36 hours after first dose	48 hours after first dose	60 hours after first dose
5 kg ≤ weight < 14 kg	6*1 (5-15 kg)	1	1	1	1	1	1
15 kg ≤ weight < 24 kg	6*2 (15-25 kg)	2	2	2	2	2	2

- Orient the population to the health facility for appropriate management;
- Sensitize the population on the use of long lasting insecticide treated nets as principle means of prevention, environment hygiene and sanitation as well as other preventive measures;
- Participate in other malaria control activities at the community level such as indoor residual spraying campaigns, larval source management, etc;
- Monitor use of preventives measures such as LLINs
- Refer patients to health center if needed

5.1.3. At the level of the health facility.

It is indicated to prescribe the first line of treatment only after obtaining a positive blood smear or positive rapid diagnostic test in case of emergency or no availability of microscopy. A negative blood smear or rapid diagnostic test precludes the diagnosis of malaria and the administration of an antimalarial. Other causes of fever should be sought systematically and treated accordingly. In this case, glycemia and hematocrit / hemoglobin are recommended.
The first line treatment recommended for all malaria positive cases is an artemisinin combination therapy (ACT) comprising of Artemether 20 mg and Lumefantrine 120 mg, taken preferably during meals.

NB: Since May 2012 a formulation of Dispersible Artemether 20mg + Lumefantrine 120mg is available for use in the pediatric age. This formulation is dissolved in few quantity of water on a spoon. The formulation is used for both **6*1** tablets for infants and children weighing 5 to <15 kg body weight (BW) and **6*2** tablets for children weighing 15 to <25 kg body weight. The same formulation is used respectively at the community level by CHWs as Red and Yellow Primo, at health center and district hospital level as AL.

The ACT is administered orally, twice a day for 3 days.

A schematic diagram showing the dosing of ACT (AL) according to the body weight of the patient is shown below.

Category of body weight of the patient in kg	**Type of blister administered**	**Number of tablets of AL per dose**					
		Day 1		**Day 2**		**Day 3**	
		First dose	**8 hours after first dose**	**24 hours after first dose**	**36 hours after first dose**	**48 hours after first dose**	**60 hours after first dose**
5 kg ≤ weight < 14 kg	6*1 (5-15 kg)	1	1	1	1	1	1
15 kg ≤ weight < 24 kg	6*2 (15-25 kg)	2	2	2	2	2	2
25 kg ≤ weight < 34 kg	6*3 (25-35 kg)	3	3	3	3	3	3
≥ 35 kg	6*4 (> 35 kg)	4	4	4	4	4	4

Important instructions to follow:

- Directly observe the administration of the first dose;
- Artemether-lumefantrine is contraindicated in children weighing less than 5 kg, during the first trimester pregnancy, in cases of allergy to one of the two drugs in the combination and in cases of severe liver or renal disease. In such cases, **oral quinine sulphate** is indicated as 10 mg per kg body weight per dose, taken three times a day over seven consecutive days;
- If there is no improvement after 48 hours of treatment, verify if the patient swallowed the drugs correctly, re-examine the patient carefully and do another peripheral blood smear. If the test is **positive**, change the treatment to oral quinine sulphate at 10 mg per kg body weight per dose, taken three times a day over seven consecutive days. If the peripheral blood smear is **negative,** exclude and treat other causes of illness and/or refer the patient to the nearest district hospital;
- If there is no improvement after 48 hours of treatment with quinine probably due to associated pathologies other than malaria, refer the patient to the nearest District hospital or referral hospital.
- Monotherapy using artemisinin derivatives is not allowed and is banned for the management of simple malaria in Rwanda.

5.2. Management of simple malaria with minor digestive symptoms

5.2.1. At health facility level

The minimum requirements are:

- Qualified and trained staff;
- The existence of a continuous system of clinical and paraclinical monitoring of patients for 24 hours a day;
- A laboratory with the capacity to diagnose malaria with microscopy, rapid diagnostic tests and measure haemoglobin level.
- The management of simple malaria with minor gastrointestinal symptoms is done at the health centre, or when not possible, at the district hospital.
- The patient must be admitted in the health centre where he/she will receive treatment for at least 24 hours.

After this period, a clinical and paraclinical re-evaluation is done to assess if the patient can be discharged to go home (if there has been improvement and transition towards simple malaria), or can be transferred to the district hospital (in cases where there has been no improvement).

5.2.2. Modes of administration of the antimalarials

It is indicated to administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test.

Depending on the general status and level of hydration of the patient, drugs may be administered as follow:

1. **Artesunate by intramuscular injection or intravenous injection**: administered as dose of: 2.4 mg/kg BW IV given on admission (time = 0), then at 12h and 24h.

If the patient's condition does not improve within 24 hours of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.

2. If there is a contra indication to artemesinine derivates and depending on the general condition of the patient: **Quinine dihydrochloride (Salt) intra-rectal (for children)**: 15mg per kg body weight diluted in 4 ml of distilled water or physiological saline and administered rectally with a 5 ml syringe every eight hours. This dose is justified by the slow absorption of quinine by the rectal mucosa. The drug is administered slowly through the anus, and the buttocks are held together for 5 minutes to prevent a premature reflex ejection of the drug. If the patient's condition does not improve after 24 hours of treatment, refer the patient to the nearest hospital. If the patient's condition improves, change to oral quinine sulphate at 10 mg per kg body weight per dose, taken three times a day over seven consecutive days.

Note:

- If the drug is ejected during the first 10 minutes following its administration, administer another half dose;
- Diarrhoea and anal lesions limit the utilisation of this route of administration.

3. **Quinine dihydrochloride (salt) intravenous administration (Children and adults)**:

Administered as 10 mg per kg body weight per dose, diluted in 5 to 10 ml of 5% or 10% glucose, to run for 4 hours in IV, and then run IV glucose 5 or 10% for 4 hours as maintenance drip. Thereafter, every 8 hours till 24 hours. If the patient's condition does not improve within 24 hours of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral AL twice a day for three consecutive days, or to oral quinine in case of contraindications to AL.
Rapid administration of Quinine is unsafe. Each dose of parenteral Quinine must be administered as a slow rate-controlled infusion. The infusion rate should not exceed 5 mg/kg body weight per hour.

NB: Whatever the medicine and the mode of administration used, (IM/IV artesunate, IR/IV perfusion quinine), if the state of health of the patient doesn't improve in 24 hours, do a blood smear for microscopy or rapid diagnostic test and refer the patient with the referral note or treatment file, giving detailed information on the treatment provided so far, to the nearest hospital.

In this case of transfer, the loading dose of Quinine drug won't be administered at hospital.

5.2.3. Supportive treatment

In case of diarrhoea and/or vomiting:

- Evaluate and monitor the hydration status of the patient;
- Rehydrate the child with oral rehydration salts (ORS) or other available liquids, encourage breast feeding and other modes of feeding and if necessary use a naso-gastric tube;
- Anti-emetics should be avoided.

In case of fever, give oral Paracetamol 15 mg/ kg, or any other antipyretic as may be indicated.

5.3. MANAGEMENT OF SEVERE MALARIA

In all patients with suspected severe malaria with or without fever or history of fever, parasitological diagnosis is recommended. The treatment must be initiated based on malaria positive blood smear or rapid diagnostic test results.
Antimalarial treatment should not be withheld if parasitological diagnosis **is not feasible** but the lab confirmation is still an obligation. In that case, presumptive treatment will be started immediately while efforts to confirm diagnosis are ongoing (to make a blood smear for reading later).
Meanwhile, other investigations to determine severity and prognosis should be undertaken.
The management of severe malaria must be done in either district hospital or the national referral hospital (private or public) as recommended by the Ministry of Health.

5.3.1. Pre-transfer treatment at the health centre

It is indicated to administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test.

- While preparing for the transfer of the patient, urgently administer artesunate or quinine IR or IV (IV infusion) if there is a contra indication to artemesinine derivates and depending on the general condition of the patient (weak pulse or not, dehydration or none), the health centre staff will administer, either:
- Artesunate will be administered as a single dose before transferring the patient at 2.4 mg/kg BW IV or IM given on admission (time = 0), and refer the patient to the nearest district hospital.
- While at district hospital, the following dose will be administered at 12h then at 24h, then once a day is the recommended treatment for a maximum of 7days, until the patient is able to take oral medication If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.

If there is a contra indication to artemesinine derivates and depending on the general condition of the patient:

- Quinine, preferably by intravenous infusion as a loading dose of 20 mg per kg body weight to run in 4 hours (not exceeding a total dose of 1200 mg for the loading dose); or
- Quinine by intrarectal route in children; as 20mg per kg body weight diluted in 4ml of distilled water of physiological saline, administered with a 5 ml syringe without a needle. The drug is gently guided through the anus and the buttocks are held together for 5 minute to prevent the premature reflex expulsion of the drug. If the drug is expelled within the first 10 minutes following its administration, administration is repeated using half the original dose. Diarrhoea and anal lesion limit the utilization of this route for the administration of drugs

Note:

- Regardless of the pre-transfer treatment that is given (loading dose of Quinine or Artesunate),
- For all patients, artesunate 2.4 mg/kg BW IV or IM given on admission (time = 0), then at 12h and 24h. Then once a day is the recommended treatment for a maximum of 7days, until the patient is able to take oral medication.
- Quinine, is an acceptable alternative if parenteral artesunate is not available, then is given quinine 10 mg salt/kg BW diluted in 10ml of 5% or 10% Glucose per kg body weight to run for 4 hours in IV perfusion. Then run IV glucose 5 or 10% for 4 hours as maintenance drip (every 8 h); infusion rate should not exceed 5 mg salt/ kg BW per hour.
- Give parenteral antimalarials in the treatment of severe malaria for a minimum of 24h, once started (irrespective of the patient's ability to tolerate oral medication earlier), and, thereafter, complete treatment by giving a complete course of:
  – artemether plus lumefantrine per os twice a day for three days.
- For cerebral malaria, administer the first dose of antibiotics:
  - For children: Ampicillin 50 mg/kg body weight per dose, four times a day accompanied by chloramphenicol 25 mg/ kg body weight per dose, four times a day.
  - for adults: Ampicillin 1.5 g four times a day and chloramphenicol 1 g four times a day ;
- In case of hypovolaemia (severe anemia, rapid breathing, coma or systolic BP < 80 mm Hg), start with normal saline or Ringer's lactate infusion in a dose of 20 ml/kg to run for 30 minutes to move the patient out of shock.
- For malnourished children (kwashiorkor or marasmas), give the loading dose of quinine in IV perfusion without fluid replenishment (as it is difficult to asses hypovolaemia and dehydration increases the risk of circulatory overload).
- The administration of intravenous infusion is preferable in cases of signs of vital distress (repeated convulsions, coma, respiratory distress, cardio-vascular shock). In the case where it has been impossible to establish an intravenous line to administer intravenously artesunate, use intramuscular artesunate or intra-rectal quinine

Note: The intramuscular use of Quinine is prohibited in all health facilities in Rwanda.

5.3.2. Supportive treatment

If the temperature is higher or equal to 38°C:

- Do tepid sponging ;
- Give Paracetamol 15 mg /kg body weight by oral route or suppository form, or any other antipyretic that may be indicated.

To prevent hypoglycemia (characterized by lack of consciousness, severe weakness):

- Give 20-50 ml of 50% hypertonic serum by intravenous injection administered over 5-10 minutes in adults; and for children 3 ml/kg body weight of 10% glucose or if not available 1 ml/kg of 50% glucose;
- Or administration of water with 10% sugar per mouth or with nasogastric tube, at a rate of 5 ml/kg for children and 50 -100 ml for the adults;

Water with 10% sugar is readily prepared in the following way: take 100 ml of boiled clean water and add 10 g of sugar or measure of 2 coffee spoons.

In case of convulsions:

- Administer Diazepam 0.5 mg/kg body weight Intra-rectal for children and 10 mg IV slow for adults; and
- If convulsions persist, give Phenobarbital 10-15 mg/kg IM;
- Treat or prevent hypoglycaemia;
- Treat the fever if necessary.

Refer the patient to the nearest district hospital or national reference hospital.

5.3.3. Treatment of the severe malaria in the hospital

Criteria required for a health facility to do clinical management of severe malaria
The minimum requirements are:

- Qualified staff, trained in the clinical management of malaria by Malaria Division ;
- The existence of a continuous system of 24 hours clinical and paraclinical follow-up of patients;
- A laboratory with the capacity to at least do:
  - peripheral blood smear,
  - rapid diagnostic tests
  - hemoglobin and hematocrit,
  - blood sugar and
  - proteinuria;
- Capacity to do a lumbar puncture, (recommended in cerebral malaria form);
- Possibility to transfuse in case of severe anaemia;
- Possibility to provide oxygen;
- Availability of the drugs and consumables required for the treatment of severe malaria (IV Artesunate, IV quinine, 50% and 5% glucose, phenobarbital, diazepam, antipyretic and furosemide).

5.3.4.1. Mode of administration of antimalarial drugs

For all patients, artesunate 2.4 mg/kg BW IV or IM given on admission (time = 0), then at 12h and 24h, then once a day is the recommended treatment for a maximum of 7days, until the patient is able to take oral medication.

Artesunate powder is diluted in 1 ml 5% sodium bicarbonate (provided in the package), and then further diluted 9ml of 5% dextrose or 0.9% normal saline to a total volume of 10 ml, giving a final concentration of 6 mg/ml.

Quinine, is an acceptable alternative if parenteral artesunate is not available: Administer a loading dose of 20 mg/kg body weight of quinine dihydrochloride (do not exceed 1200 mg) diluted in an isotonic solution or 5 or 10% glucose on the basis of 5 to 10 ml/kg body weight to run for 4 hours in IV perfusion. Then run IV glucose 5 or 10% for 4 hours as maintenance drip. Thereafter, i.e. 8 hours after the beginning of the administration of the loading dose or 4 hours after the beginning of the maintenance drip, administer a maintenance dose of 10 mg/kg body weight of quinine dihydrochloride, to run for 4 hours. This maintenance dose of quinine will be repeated every 8 hours until the patient can swallow, at the most within 48 hours.

After 48 hours, if the patient's state does not permit the patient to take quinine orally, one may continue the drip of quinine by reducing the doses to 7 mg/kg every 8 hours to run for 4 hours.

Give parenteral antimalarials in the treatment of severe malaria for a minimum of 24h, once started (irrespective of the patient's ability to tolerate oral medication earlier), and, thereafter, complete treatment by giving a complete course of:

– Oral Artemether 20 mg + Lumefantrine 120 mg, as recommended for the treatment **of** simple malaria.

Change to oral quinine 10 mg/kg of quinine sulphate every 8 hours as soon as the patient can swallow; to complete the 7 days of treatment in case of contraindication in artemesinin derivates.

NB:

- For the patient with over 60kg bodyweight give the loading dose, and decrease the dose from 1200mg to 800mg after divided in two doses not to exceed 2000mg per day,
- The loading dose of quinine is not administered if the patient received quinine the past 12 hours or Mefloquine in the 7 past days.
- Never exceed 2 g of daily dose of quinine.
- For the cerebral form of severe malaria (cerebral malaria or neurological malaria), , the association of IV antibiotherapy is recommended
    - Children: (Ampicillin 50 mg/kg /dose 4 times a day plus Chloramphenicol 25 mg/kg/dose 4 times a day)
    - Adults: (Ampicillin 1.5 g 4 times a day plus Chloramphenicol 1g 4 times day)

- For the anaemic form of severe malaria antibiotherapy is not indicated.
- The recommended dose for oral quinine is 10 mg Quinine salt per kg body weight every 8 hours for 7 days;

Note: Syrup Quinine is not recommended

Table 3: Dosing scheme for oral quinine

Body weight of patient in kg	**Number of tablets of quinine 300 mg per dose**
Weight ≤10 kg	¼ tablet
10 kg < weight ≤ 15 kg	½ tablet
15 kg < weight ≤ 21 kg	¾ tablet
21 kg < weight ≤ 31 kg	1 tablet
31 kg < weight ≤ 36 kg	1+ ¼ tablet
36 kg < weight ≤ 47 kg	1+ ½ tablet
Weight > 48 kg	2 tablets

5.3.4.2. The management of severe malaria complications

5.3.4.2.1. Hypovolaemia

In the presence of hypovolaemia, (rapid breathing, coma or systolic BP < 80 mmHg), do replenishment with normal saline or Ringer's lactate 20 ml/kg to run for 30 minutes to stabilize the patient. For malnourished children (kwashiorkor or marasmus), give normal saline or Ringer's lactate 10 ml/kg plus 5 ml/kg of 5% glucose solution. This solution is given over an hour.

5.3.4.2.2. Hyperthermia

Administer oral Paracetamol 15 mg/kg body weight, 4 times per day or any other available antipyretic. Physical means, such as tepid sponging, ventilation and wearing of light clothing are also recommended.

5.3.4.2.3. Convulsions

For children with cerebral malaria, diazepam 0.5 mg/kg is recommended. For repeated convulsions, intramuscular Phenobarbital at a dose of 15 mg/kg for infants, 10 mg/kg for children and 5 mg/kg for adults is recommended. The maintenance dose of Phenobarbital is 5 mg/kg for children, 48 hours after the loading dose. Diazepam is administered as slow Intravenous dose or IntraRectal, 10 mg for adults. Because of its side effects, strict monitoring of the respiration is required during the administration of this drug.

5.3.4.2.4. Severe anaemia

Transfusion must be considered if the haematocrit of a patient who is normally hydrated falls below 18 % or the concentration of haemoglobin is < 6 g/dl or in presence of the clinical signs of cardio respiratory distress (pallor, tachypnoea, and tachycardia). Transfusion with packed cells is recommended, 10 ml/kg body weight to run for 2 hours for children. The height of the stand should be raised to increase the speed of flow. In case of lack of packed cells, transfuse with whole blood at a rate of 20 ml/kg body weight. For children with severe malnutrition, whole blood is preferable to correct anaemia, administered as 10 ml/kg body weight and it is recommended to prolong the transfusion for at least 3 hours.

For the regulating of the speed of flow, 1 ml of whole blood corresponds to 20 drops and 1 ml of the concentrated globules corresponds to 15 drops.
If signs of respiratory distress appear during the transfusion, stop the transfusion and administer Frusemide slowly at the rate of 1mg per kg body weight in children and 40 mg in adults.

After transfusion, continue to monitor the appearance of any signs of anaemia (that may signify continued haemolysis).

5.3.4.2.5. Hypoglycaemia

Hypoglycaemia must be ruled out in all patients with severe malaria. It is defined as levels of blood sugar (< 2.5 mmol/l or 45 mg/dl) in a well fed child and < 40 mg/dl in adult: severe hypoglycaemia).

When measuring blood sugar is not possible, for children it is recommended to give 3 ml/kg of 10 % glucose or if not available, 1 ml/kg of 50 % glucose IV slow (over 5 minutes)

For adults in coma, a test dose of 20 ml of 50% dextrose by intravenous injection is administered over 5 minutes. Monitoring of the clinical status and blood sugar must continue even when the hypoglycaemia is corrected.
In order to prevent hypoglycaemia in children, it is advisable to maintain a drip of 5 ml/kg of 5% glucose or 3-4 ml/kg body weight of 10%, (between the two doses of quinine infusion).

10 % glucose is obtained from the solutions of 50 % glucose and 5 % (i.e. 56 ml of Glucose 50 % + 444 ml of Glucose 5 % = 500 ml of Glucose 10%). Or from 50 % glucose and distilled water (i.e. 1 volume 50 % glucose + 4 volume of distilled water: 100 ml of 50 % glucose+400 ml of water distilled = 500 ml of glucose 10 %)...

5.3.4.2.6. Respiratory distress

In cases of respiratory distress, undertake the following measures:

- Clear the respiratory tract;
- Administer oxygen, 5 litres per minute continuously until the patient's respiratory status improves;
- Verify the level of hemoglobin and treat anaemia if necessary. Treat possible cardiac insufficiency or pulmonary oedema;
- If the respiratory distress persists despite a good replenishment, think about an associated infection, then it may necessitate to administer antibiotics:
    - If renal function is normal (urea and creatinine are normal) administer Ampicillin IV 75 mg/kg/dose 3x/day and IM Gentamycine, 7,5mg/kg body weight, once a day for 5 days;
    - If renal function is unknown, administer penicillin G IV 50 mg/kg/dose, 4 times a day and chloramphenicol 25 mg/kg/dose, 4 times a day for 5 days.

- In the immune-compromised adult with HIV whose respiratory distress persists, think about a lung infection due to Pneumocystis jiroveci (opportunistic infection) or pulmonary tuberculosis.

5.3.4.2.7 Coma

- Clear the respiratory airways;
- Put the patient in lateral decubitus position;
- Systematically administer quinine and antibiotics systematically;
- If the peripheral blood smears (BS) and the rapid diagnostic test (RDT) are negative or if the coma persists after 48 hours, a lumbar puncture must be done again;
- For monitoring of a comatose patient:
    - Evaluate the level of coma regularly, at least twice a day;
    - Monitor blood sugar and treat accordingly;
    - Monitor temperature and treat accordingly;
    - Treat convulsions if any;
    - Put the patient in the lateral decubitus position;
    - Aspirate if necessary;
    - Monitor the quantity of inputs and outputs (fluids);
    - Change the position at least 4 times in 24 hours;
    - Mark all these elements on the patient' s monitoring card/chart

5.3.4.2.7. Renal Insufficiency

It is important to monitor the daily diuresis in order to detect possible renal insufficiency in time. For children, the diuresis in this case is lower than 12ml / kg/24 hours. For the adults, it is lower than 400 ml/24 hours; blood creatinine is > 265 µmols (3mg/dl)
It is recommended that this complication be managed in a national referral hospital.

5.4. MANAGEMENT OF MALARIA IN PREGNANT WOMEN

5.4.1. At the family level

Strengthen IEC on:

- Knowledge of the mode of transmission of malaria
- Utilisation of long lasting insecticide treated mosquito nets as principle means of prevention and other preventive measures
- Membership to the community health insurance schemes (mutuelle) as a way of ensuring better access to care
- Recognition of the signs of simple malaria, simple malaria with minor digestive symptoms and severe malaria by the family members;
- Seeking timely care from the community health care worker or the nearest health facility after lowering fever, if any, using tepid sponging.

5.4.2. At the Community level (Community Health Workers)

The role of the community health worker is to educate the pregnant woman on:

- The mode of transmission of malaria (mosquito bites);
- The effects of malaria on pregnancy (on the mother and the baby)
- Recognition of the signs of the simple malaria, malaria with minor digestive symptoms and severe malaria, and the ill effects of fever during pregnancy;
- The benefits of sleeping under long lasting insecticide treated nets
- Larval source management
- Seeking health care from the health facility as soon as they feel signs of malaria
- The importance of taking all the drugs as prescribed by the health worker;
- The benefits of 4 antenatal care (ANC) visits

5.4.3. At the level of the Health center

To educate the pregnant woman on the preventive measures of malaria in pregnancy during the antenatal consultations:

- What causes malaria and its transmission;
- The effects of malaria on the mother and the baby;
- The advantages of sleeping under long lasting insecticide treated mosquito nets;
- The danger signs of severe malaria;
- The importance of seeking medical care when the symptoms of malaria occur ;
- The importance of taking a complete dose of antimalarials when sick,
- The benefits of 4 ANC visits.

5.4.3.1. Antenatal care

During antenatal care, the health facility staff must do the following to the pregnant woman:

- Give her a long lasting insecticide treated mosquito net;
- Give other components of antenatal care : vaccination, iron and folic acid, vitamin A and Mebendazole;
- Discuss with her the program of the ANC visits;
- Record on the ANC card, her ANC appointment card and the register all the drugs prescribed and given as well as LLINs;
- Register all illness relate to the pregnancy in the ANC register.
- RDTs in case of signs and symptoms

5.4.3.2. Mode of administration of antimalarials

It is indicated to administer antimalarial treatment only after obtaining a positive blood smear or positive rapid diagnostic test.

5.4.3.2.1. Simple malaria

Because malaria during pregnancy can aggravate latent anaemia, it is recommended to do a complete clinical exam.

- The first line treatment of malaria in pregnancy is quinine sulphate per os 10 mg/kg/dose, 3 times a day for 7 days during the first trimester of pregnancy.
  AL is indicated during the 2nd and 3rd trimesters of pregnancy as is the case for the non pregnant adults;

NB:

- In case of fever, administer paracetamol tablets, 500 mg three times per day;
- Directly observe the woman as she swallows the first dose of antimalarials;
- Record all the information on the ANC card, ANC register and the hospitalization file;
- Give advice on the prevention of the malaria and the necessity to consult in time in case of illness;
- Recommend to the pregnant woman to come back any time if the symptoms persist and/or she develops signs of severe malaria.

5.4.3.2.2. Simple malaria with minor digestive symptoms

The symptomatology of this type of malaria is similar to the one described earlier in children and adults. The alteration of the general status can be accentuated by the vomiting and other symptoms related to the pregnancy.

5.4.3.2.2.1. Curative treatment

First trimester:

Administer Quinine dihydrochloride (salt) in intravenous infusion: 10 mg/kg/dose diluted in 10 ml of 5% or 10% glucose, to run for 4 hours in IV perfusion. Then run IV glucose 5 or 10% for 4 hours as maintenance drip for a total of eight hours until patient is able to take drugs orally making sure the treatment does not exceed 24 hours. Once the patient can take orally, complete the remaining quinine 3 X10 mg/kg/day to make 7 days by oral route of drug administration.

Second and third trimester

Depending on the general status and level of hydration of the patient, drugs may be administered as follows:

1. **Artesunate by IV injection** : administered as dose of:
   Artesunate 2.4 mg/kg BW IV or IM given then at 12h and 24h,
   If the patient's condition does not improve within 24 hours of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.

2. **Quinine dihydrochloride (salt) intravenous administration**:

Administered as 10 mg per kg body weight per dose, diluted in 5 to 10 ml of 5% or 10% glucose, every eight hours. If the patient's condition does not improve within 24 hours of treatment, refer patient to the nearest district hospital. If the patient's condition improves, change to oral Arthemether-Lumefantrine, twice a day for three consecutive days, or to oral quinine in case of contraindications to Arthemether-Lumefantrine. .

NB: Whatever the medicine and the mode of administration used, (IV/IM artesunate, IR/IV perfusion quinine), if the state of health of the patient doesn't improve in 24 hours, do a rapid diagnostic test or blood smear and refer the patient with the referral note or treatment file, giving detailed information on the treatment provided so far, to the nearest hospital.

In this case of transfer after quinine, the loading dose won't be administered at hospital.

5.4.3.2.2.2. Supportive treatment

In case of diarrhoea or vomiting:
- Evaluate and monitor the state of hydration;
- Rehydrate with ORS or other available liquids and even introduce nasogastric tube if necessary ;
- **Anti-emetics are not recommended**.

In case of fever, administer paracetamol 15 mg/kg orally or any other antipyretic that may be indicated.

5.4.3.2.3. Severe malaria in the pregnant woman

At the health centre

- Severe malaria in the pregnant woman is characterized by the same signs as those described earlier for adults and children.

- While organizing an emergency transfer, administer loading dose by intravenous infusion of quinine 20 mg/kg body weight in 10 ml of 5% or 10 % dextrose to run for 4 hours (without exceeding 1200 mg);

- Artesunate 2.4 mg/kg BW IV or IM given will be administered as a single dose before transferring the patient.

- Then refer the patient to the nearest district hospital.

If there is a contra indication to artemesinine derivates and depending on the general condition of the patient:

Use Quinine

- It is important to do a complete clinical examination of the woman and to regularly check the vitality of the fœtus.

Supportive treatment

If the axillary temperature is ≥ 38°C, give paracetamol 500 mg 3 times per day if able to swallow, or any other antipyretic as may be indicated.
For the prevention of hypoglycaemia that may manifest as loss of consciousness, severe asthenia):

- Give 20-50 ml of 50 % of dextrose by intravenous injection to run for 5-10 minutes; or administer water with 10 % sugar orally or by NGT (50 -100 ml).
  Preparation of water with 10% sugar: To make 100 ml of water with 10% sugar: you take 100 ml of clean water and add to it 10 g (also equivalent to 2 teaspoons) of sugar.

In case of convulsions:

- Administer diazepam, 10 mg IV slow; and if convulsions persist, administer diazepam, 10 mg in 500 ml of 5 % glucose to run slowly.
- Treat or prevent hypoglycaemia;
- Treat the fever if necessary;
- Fill in the transfer card correctly and clearly,
- Record all the necessary information in the register and the ANC card;
- Refer the patient immediately to the nearest district or national reference hospital.

At the hospital

The treatment of severe malaria in pregnant women at the hospital level is the same as in others adults. Some complications are more frequent in pregnant women and require a particularly close monitoring. These include hypoglycaemia, respiratory distress (APO) and severe anaemia.

NB: It is important to do close obstetrical follow-up in general and monitoring of the fatal vitality in particular.

6. CHEMOPROPHYLAXIS

6.1. Indications

It is intended for:

- Travellers coming from malaria free zones;
- Expatriates and other nationals coming from non malaria endemic countries;
- Splenectomised patients;
- Patients with Sickle cell disease.

For these people it is necessary to begin the chemoprophylaxis at least one week before the journey, maintain it for all their period of stay in the endemic zone of malaria, and to continue it for 4 weeks after having left the zone (international travellers).
The recommended medicines are the following below:

6.2. Recommended drugs

Mefloquine 250 mg

The recommended prophylactic dose is 250 mg per week for adults and 5 mg/kg for children of more than 5 kg. In case of intolerance to Mefloquine and if the intended period of stay is short, Doxycline is prescribed. Mefloquine is also recommended for treatment of splenomegaly (of malaria origin) at the same dose and preferably in an institution where a haematological follow-up is possible

.

Table: Dosing scheme for prophylaxis using mefloquine

Body weight of patient in kg	**Number of tablets of mefloquine 250 mg**
< 5 kg	Contraindicated
5 kg ≤ weight < 12 kg	¼ tablet
13 kg ≤ weight < 24 kg	½ tablet
25 kg ≤ weight < 35 kg	¾ tablet
≥ 36 kg	1 tablet

Doxycycline

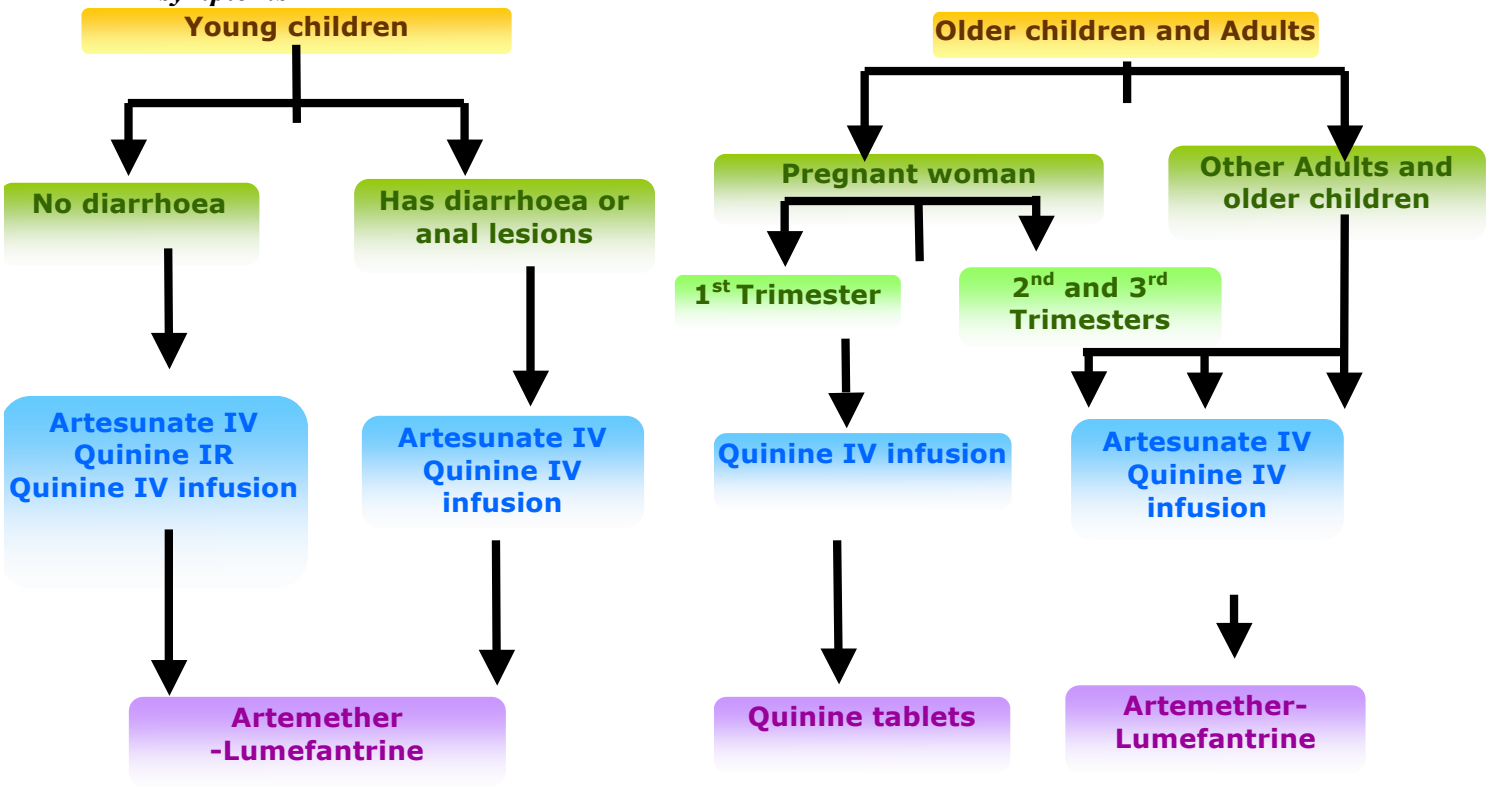
The adult prophylactic dose is 100 mg per day (or 1.5 mg per kg body weight). It is contraindicated for people weighing below 25 kg (or below 8 years), pregnant and breastfeeding mothers.

Table: Dosing scheme for prophylactic Doxycycline

Body weight of the patient in kg	**Number of tablets of Doxycycline 100 mg**
< 25 kg	Contraindicated
25 kg ≤ weight < 35 kg	½ tablet
36 kg ≤ weight < 50 kg	¾ tablet
≥ 50 kg	1 tablet

ANNEXES

Annexe 1: Choice of antimalarial drugs for the treatment of simple malaria with minor digestive symptoms



Annex 2: Schematic diagram showing dosage of intravenous quinine in the treatment of severe malaria.

Start of treatment: **Loading dose QNN 20 mg per kg during 4 hours**	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 10 mg per kg over 4 hours**	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 10 mg per kg over 4 hours**	**Maintenance period** (With of without G 5% - G 10% infusion) **WITHOUT QNN**	End of first 24 hours of treatment
ex: 10 h	**14 h**	**18h**	**22h**	**02 h**	**06h**	
QNN 10 mg per kg over 4 hours	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 10 mg per kg over 4 hours**	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 10 mg per kg over 4 hours**	**Maintenance period** (With of without G 5% - G 10% infusion) **WITHOUT QNN**	End of 48 hours of treatment
10 h	**14 h**	**18h**	**22h**	**02 h**	**06h**	
QNN 7 mg per kg over 4 hours	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 7 mg per kg over 4 hours**	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	**QNN 7 mg per kg over 4 hours**	**Maintenance period** (With or without G 5% - G 10% infusion) **WITHOUT QNN**	End of 72 hours of treatment
10 h	**14 h**	**18h**	**22h**	**02 h**	**06h**	

G: Glucose **QNN: Quinine**

Artesunate dosing Chart

Weight (Kg)	Dose (ml)	Weight (Kg)	Dose (ml)	Weight (Kg)	Dose (ml)
2-3	1	29-31	12	57	23
4-6	2	32	13	58	23
7	3	33	13	59-61	24
8	3	34-36	14	62	25
9-11	4	37	15	63	25
12	5	38	15	64-66	26
13	5	39-41	16	67	27
14-16	6	42	17	68	27
17	7	43	17	69-71	28
18	7	44-46	18	72	29
19-21	8	47	19	73	29
22	9	48	19	74-76	30
23	9	49-51	20	77	31
24-26	10	52	21	78	31
27	11	53	21	79-80 And above	32
28	11	54-56	22		

Annex 3: Score for the evaluation of coma due to cerebral malaria

Score for the assessment of coma due to cerebral malaria in adults using the "Glasgow Coma Scale" and for the children using the "Blantyre coma scale" developed by M. Molyneux.

Adults	Children
Eye opening • Spontaneous, voluntary…….4 • To command ……..3 • To pain ……..2 • No response ……1 **Verbal response** • Oriented ……..……5 • Confused …… 4 • Raving patient ……..…….. 3 • Unintelligible ……..2 • No response……..…1 **Motor response** (lower extremities) • To command …….. ……..6 • To pain ……..…5 • Retraction……... 4 • Flexion……..3 • Maladjusted extension …..…2 • No response ……..1	**Ocular movements** • Well adapted ……1 (e.g. follows mother's face) • Non adapted ……0 **Verbal response** • Screaming ……..…2 • Moaning or screaming……...1 • No response ……..0 **Motor response** • Localises pain stimulus * ……....2 • Extension of legs due to pain **……1 • No response ……..0
Total Score : minimum 3, maximum 15 Normal or nearly normal =……13-15 Obnubilation Stage I =……..8-12 Coma Stage II =…….....6-7 Coma Stage III =……....4-5 Coma Stage IV =.....3	**Total Score : minimum 0, maximum 5** Normal = ……..... 5 Obnubilation =….....4 Coma Stage II = ……..…. ……....3-2 Coma Stage III = ……...……..1 Coma Stage IV = ...0

* Rubbing the finger joint on patient's sternum.

** Firm pressure on patient's nails with a pencil placed horizontally.

Annex 4: List of members of the technical committee for the revision of the national Guidelines for the management of malaria in Rwanda

N°	Names	Institutions
1	Dr Bosco Ahoranayezu	MCHIP/JHPiego
2	Dr Corine Karema	RBC/Malaria and OPD Division
3	Dr Noella Umulisa	RBC/Malaria and OPD Division
4	Dr Fidele Sebahungu	RBC/Malaria and OPD Division
5	Dr Aline Uwimana	RBC/Malaria and OPD Division
6	Dr Irenee Umulisa	RBC/Malaria and OPD Division
7	Dr Monique Murindahabi	RBC/Malaria and OPD Division
8	Mme Nathalie Ngabo	RBC/Malaria and OPD Division
9	Mr Jean Pierre Habimana	RBC/Malaria and OPD Division
10	Mr Dunia Munyakanage	RBC/Malaria and OPD Division
11	Mr Christophe Habiyambere	RBC/Malaria and OPD Division
12	Dr Olivier Manzi	Medecine Interne/CHUK
13	Dr Lisine Tuyisenge	Pediatrie /CHUK
14	Dr Pascal Bihizimana	Medecine Interne/CHUB
15	Dr Josette Mazimpaka	Pediatrie /CHUB
16	Mme Josee Ngalula	Rwamagana District Hospital

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