

PREVENTION AND CONTROL OF MALARIA IN PREGNANCY

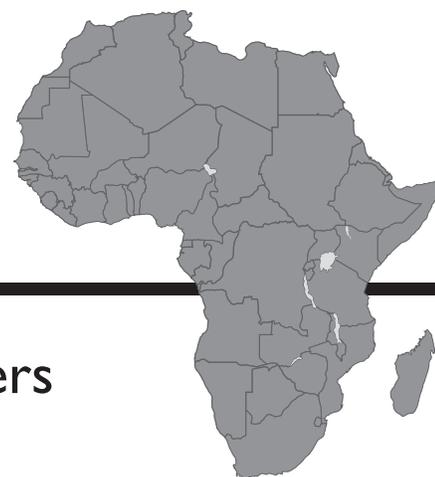


Reference Manual for Health Care Providers

Second Edition



PREVENTION AND CONTROL OF MALARIA IN PREGNANCY



Reference Manual for Health Care Providers

Second Edition



USAID
FROM THE AMERICAN PEOPLE

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Access to clinical and community
maternal, neonatal and women's health services

innovating to save lives

Jhpiego

an affiliate of Johns Hopkins University

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For information:

Jhpiego
1615 Thames Street
Baltimore, MD 21231-3492, USA
Tel.: 410-537.1800
www.jhpiego.org

The ACCESS Program is the U.S. Agency for International Development's global program to improve maternal and newborn health. The ACCESS Program works to expand coverage, access and use of key maternal and newborn health services across a continuum of care from the household to the hospital—with the aim of making quality health services accessible as close to the home as possible. Jhpiego implements the program in partnership with Save the Children, Constella Futures, the Academy for Educational Development, the American College of Nurse-Midwives and IMA World Health.
www.accesstohealth.org

Jhpiego is an international, non-profit health organization affiliated with The Johns Hopkins University. For nearly 40 years, Jhpiego has empowered front-line health workers by designing and implementing effective, low-cost, hands-on solutions to strengthen the delivery of health care services for women and their families. By putting evidence-based health innovations into everyday practice, Jhpiego works to break down barriers to high-quality health care for the world's most vulnerable populations.

Technical editors: Frances Ganges and Patricia Gomez

Editorial assistance: Dana Lewison

Desktop publishing: Trudy Conley

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Kwame Asamoah, Centers for Disease Control and Prevention
William Brieger, Jhpiego Baltimore
Annett H. Cotte, Centers for Disease Control and Prevention
Aimee Dickerson, Jhpiego Baltimore
Rebecca Dineen, Jhpiego Baltimore
Scott Filler, Centers for Disease Control and Prevention
Tiba Gaudiosa, Jhpiego Tanzania
Robert Newman, Centers for Disease Control and Prevention
Emmanuel Otolorin, Jhpiego Nigeria
Harshad Sanghvi, Jhpiego Baltimore
Emmanuel Rwamushaija, Jhpiego Tanzania
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ABBREVIATIONS AND ACRONYMS

ACT	Artemisinin-based combination therapy
AFASS	Acceptable, feasible, affordable, sustainable and safe
AIDS	Acquired immunodeficiency syndrome
ANC	Antenatal care
AQ	Amodiaquine
CQ	Chloroquine
DOT	Directly observed treatment
EDD	Estimated date of delivery
FHR	Fetal heart rate
HIV	Human immunodeficiency virus
IPT	Intermittent preventive treatment
IPTi	Intermittent preventive treatment, infants
IPTp	Intermittent preventive treatment, pregnancy
IRS	Indoor residual spraying
ITN	Insecticide-treated net
LBW	Low birth weight
LLIN	Long-lasting insecticide-treated net
MIP	Malaria in pregnancy
PMI	President's Malaria Initiative
PMTCT	Prevention of mother-to-child transmission (of HIV)
PPH	Postpartum hemorrhage
RBM	Roll Back Malaria (World Health Organization)
RDT	Rapid diagnostic test
SP	Sulfadoxine-pyrimethamine
STI	Sexually transmitted infection
TT	Tetanus toxoid
USAID	United States Agency for International Development
WHO	World Health Organization

INTRODUCTION

With 250 million cases each year worldwide (WHO 2008), malaria causes five times more illness than TB, AIDS, measles and leprosy combined. Ninety percent of these malaria cases occur in Africa, where at least 25 million women become pregnant in malarious areas every year. Pregnant women are particularly vulnerable because pregnancy reduces a woman's immunity to malaria, making her more susceptible to malaria infection and increasing the risk of illness, severe anemia and death. For the unborn child, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery and low birth weight. The presence of HIV results in a poorer response to both prevention and treatment of malaria during pregnancy.

At the Abuja Summit on Roll Back Malaria (RBM) in April 2000, regional leaders outlined their commitment to reduce the incidence of malaria especially to those most at risk: children, pregnant women and persons with HIV/AIDS. Since that time, significant research, political commitment and programmatic efforts have produced promising strategies and tools to address this major public health problem. The international community has also joined in its commitment to reduce malaria's burden. Examples include:

- **The President's Malaria Initiative.** The President's Malaria Initiative (PMI) was announced in the U.S. in June 2005. A five-year program, PMI challenges the private sector to join the U.S. Government in combating malaria in 15 of the hardest-hit African countries. The first White House Summit on Malaria was held in December 2006.
- **Global Fund for AIDS, TB and Malaria (GFATM).** The Global Fund for AIDS, TB and Malaria was created by the United Nations in 2002 to dramatically increase resources to fight three of the world's most devastating diseases and to direct those resources to areas of greatest need.

Progress toward the Abuja targets was assessed at the 2005 RBM summit in Yaoundé, Cameroon. The leaders at Yaoundé acknowledged that many countries had not met the objectives set in 2000, and were alarmed to realize that global spending on malaria was only about 20% of projected need. They urgently recommended priority actions and other key initiatives outlined in the RBM Global Strategic Plan 2005–2015 (RBM Partnership 2005). Updated targets in this plan focus on efforts within the most vulnerable groups. One major target is that 80% of pregnant women in areas of stable transmission receive **intermittent preventive treatment (IPTp)** by 2010. The strategy is primarily aimed at intensifying the implementation and scale-up of proven treatment and prevention interventions.

Introduction

This reference manual, an update of the manual published in 2003, is one component of a learning package for use in teaching health care providers these proven interventions so that they can prevent, recognize and treat malaria in pregnancy. This updated edition is based on the WHO strategic framework for malaria in pregnancy (MIP) (WHO 2004d) as well as the most recent treatment guidelines put forth by WHO in 2006 (WHO 2006b). It presents up-to-date, evidence-based information addressing the three elements of MIP recommended by WHO:

- Use of insecticide-treated nets (ITNs)
- IPTp with sulfadoxine-pyrimethamine (SP)
- Early diagnosis and prompt case management

Since the aim is to deliver these services as part of routine antenatal care (ANC), this manual recommends focused ANC as the main platform for them. The high level of antenatal clinic attendance in Africa provides a unique opportunity to deliver effective prevention and treatment and protect the millions of women and their babies at risk for malaria. Malaria prevention and treatment are integrated as part of the individualized interventions carried out in this focused care.

This reference manual provides updated information on malaria transmission, prevention and treatment. Because new evidence-based information unfolds constantly, Internet resources are highlighted to help providers stay current on new research and international recommendations. As always, providers are urged to comply with local policies and guidelines since many treatment regimens are country- or region-specific.

Throughout the manual, the following symbols are used to:

	Indicate the learning objectives for each chapter
	Alert the learner to important information
	Suggest Internet resources for important information and updates

ONE

FOCUSED ANTENATAL CARE



LEARNING OBJECTIVES

Overall, antenatal care coverage is high in Africa, with about 70% of pregnant women attending at least once during pregnancy (WHO 2005). In some countries, attendance is 90% or more (UNICEF 2005). This presents a unique opportunity to integrate services aimed at prevention and treatment of MIP, such as intermittent preventive treatment (IPTp). This chapter describes the components of focused antenatal care (ANC) and outlines how it can be organized and delivered most effectively. After completing this chapter, learners will be able to:

- Explain the differences between basic, additional and initial specialized care.
- Describe the four main goals of focused ANC.
- Describe the essential elements of a birth/complication readiness plan.
- Discuss the frequency and timing of focused ANC visits.
- Describe components of record keeping for focused ANC.

BACKGROUND

The care a woman receives throughout her pregnancy helps ensure that she and her newborn survive pregnancy, childbirth and the postpartum/postnatal periods in good health. A new approach, called **focused** ANC, is a very effective way to deliver antenatal services. Focused ANC relies on evidence-based interventions that are “focused” on the individual woman (i.e., her needs and concerns) and that are appropriate to the gestational age of the pregnancy.

While the traditional ANC approach assumes that more visits result in better care for pregnant women, focused care emphasizes quality of visits and individualized care rather than quantity of visits. This approach, based on WHO research (WHO 2002) recognizes that:

- Frequent visits do not necessarily improve pregnancy outcomes. WHO recommends at least four antenatal visits for women experiencing normal pregnancies.
- Many women identified as “high risk” never develop complications, while “low risk” women often do. Focused care is based on the premise that every pregnant woman is at risk for complications, and that all women should therefore receive the same basic care—including monitoring for complications.



Important World Health Organization Documents:

ANC in developing countries and the WHO ANC study

http://www.who.int/reproductive-health/docs/antenatal_care.pdf

http://www.who.int/reproductive-health/publications/RHR_01_30/antenatal_care_randomized_trial.pdf

Focused care also saves time and money compared with traditional care because women receive only the care they need. For example, some previously routine measures and risk indicators (e.g., assessing maternal height, ankle edema or fetal position before 36 weeks) are eliminated because, like frequent visits, they have not proved effective in improving pregnancy outcomes.

The majority of women in Africa attend ANC at least once, which represents an opportunity for health care providers to address not only issues affecting maternal-perinatal health, but other health care needs. Focused ANC is designed to be a platform for the delivery of integrated services appropriate to the needs of the woman. It can also be an effective link to interventions such as IPTp. Women will receive not only education about the disease, but evidence-based care for prevention and treatment. Integrating malaria prevention and treatment into focused ANC is key to improved outcomes for mothers and newborns in malaria-endemic areas.

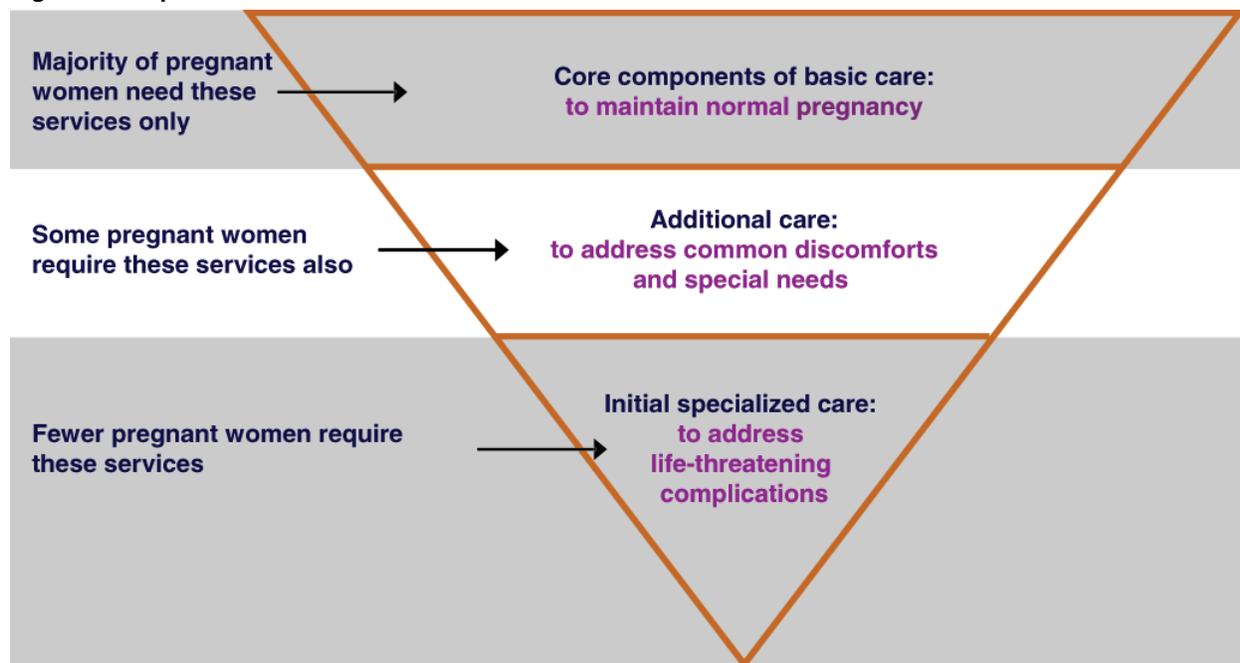
Another important component of focused ANC is care by a skilled provider. Each visit should be conducted by a midwife, doctor, nurse or other qualified health care provider—one who has the knowledge, skills and attitudes required to work effectively toward accomplishing the goals of ANC, as described below.¹

SCOPE OF FOCUSED ANTENATAL CARE

Every pregnant woman wants a normal pregnancy resulting in a healthy outcome for herself and her baby. It is the reason many seek ANC. The scope of antenatal services includes basic care, care for additional needs and initial specialized care (see **Figure 1**). The skilled provider will be able to confidently give services to pregnant women needing any or all aspects of care.

¹ According to WHO, the term “skilled attendant” refers to “an accredited health professional—such as a midwife, doctor or nurse—who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns” (WHO 2006b).

Figure 1. Scope of Focused Antenatal Care



Basic care includes the services that **all** women should receive to ensure, support and maintain a normal childbearing cycle. Basic care should include, but is not limited to, the following:

- Early detection of complications, chronic conditions and other problems/potential problems
- Health promotion to facilitate healthy practices
- Nutritional support
- Help for the woman and family in preparing for birth and possible complications
- Testing and counseling for HIV infection (unless the client “opts out”)
- Immunizations and other preventive measures

Some women will need **additional care** to address their concerns such as common discomforts in pregnancy (e.g., back pain, breast tenderness, ankle edema) or special needs. Special needs are conditions or personal/social factors that should be considered when planning and implementing care. Examples of additional care include interventions such as counseling on specific health topics, addressing the needs of pregnant adolescents or caring for women who are HIV-infected.

A few pregnant women will need initial **specialized care**, including additional ANC visits and/or referral for more serious problems or complications such as severe malaria, anemia or antenatal hemorrhage. This aspect of care does not include management of the problem, but stabilization and preparation for referral to a higher level of care.

GOALS OF BASIC CARE

The ultimate goal of ANC is a healthy outcome for the mother and her newborn. In focused ANC, this is accomplished through the following goal-directed interventions:

- Identification and treatment of existing health conditions
- Early detection of complications and/or diseases arising during pregnancy
- Birth preparedness and complication readiness
- Health promotion and disease prevention

An important goal of basic care is the early detection and treatment of problems that can complicate the woman's pregnancy. This includes providing (or facilitating) appropriate treatment. Focused ANC promotes targeted assessment, during which the skilled provider interviews, examines and tests the woman to detect signs/symptoms of conditions that are common in the population being served as well as pregnancy-related complications. The following are examples of complications of pregnancy that can significantly affect maternal and newborn health:

- Severe anemia
- Hypertension
- Malaria
- Syphilis and other sexually transmitted infections (STIs)
- HIV/AIDS

As will be discussed later, malaria's effects on pregnant women will differ according to levels of transmission and immunity. For example, where malaria is most prevalent, pregnant women will be largely asymptomatic. However, when transmission levels are low, women will develop clinical illness and are more likely to have severe malaria. It is crucial for providers to recognize that the different levels of transmission occur on a continuum and that diverse conditions can occur within a country or region. Since the women attending ANC may come from these different settings, care must be individualized accordingly.

EARLY DETECTION OF COMPLICATIONS AND DISEASES

Another component of targeted assessment is detection of signs and symptoms of maternal complications. The skilled provider also manages these complications or provides initial management and stabilization, including life-saving measures as needed. Facilitating management or referral to a higher level of care is also an important role of the focused ANC provider. The following complications are major causes of maternal and newborn mortality:

- Hemorrhage
- Obstructed labor
- Pre-eclampsia/eclampsia
- Sepsis/infection

BIRTH PREPAREDNESS AND COMPLICATION READINESS

If a woman is well-prepared for normal childbirth and possible complications, she is more likely to receive the timely care from a skilled provider needed to protect her overall health and possibly save the lives of herself and her newborn. As part of focused ANC, the skilled provider assists the woman and her family in developing a **birth plan** to ensure that necessary preparations for normal childbirth are made well in advance of the estimated delivery date. And since every woman and her family must be prepared to respond appropriately in an emergency, the birth plan should also include arrangements for **complication readiness**. The main components of a birth plan are described below.

Skilled Provider

Assist the woman in making arrangements for a skilled provider to attend the birth; this person should be trained in supporting normal labor/childbirth and managing complications if they arise.

Make sure that the woman knows how to contact the skilled provider or health care facility at the appropriate time.

Place of Birth

Assist the woman in making arrangements for place of birth—whether at the district hospital, primary health care center, community health post or home.

Depending on her individual needs, you may have to recommend a specific level of health care facility as the place of birth, or simply support the woman in giving birth where she chooses.

Transportation/Emergency Transportation

Make sure that she knows the transportation systems and that she has made specific arrangements for:

- Transportation to the place of birth (if not the home), and
- Emergency transportation to an appropriate health care facility if she experiences danger signs.

Funds/Emergency Funds

Ensure that she has personal savings or other funds that she can access when needed to pay for care during normal birth and/or emergency care.

If relevant, discuss emergency funds that are available through the community and/or facility.

Decision-Making

Discuss who usually makes decisions in the family and decide:

- How decisions will be made when labor begins or if danger signs arise (who is the key decision-maker?), and
- Who else can make decisions if that person is not present.

Support

Assist the woman in deciding on/making arrangements for necessary support, including:

- A companion of her choice to stay with her during labor and childbirth, and accompany her during transport, if needed; and
- Someone to care for her house and children during her absence.

Blood Donor

Ensure that the woman has identified an appropriate blood donor and that this person will be accessible in case of emergency.

Items Needed for a Clean and Safe Birth and the Newborn

Make sure that the woman has gathered necessary items for a clean and safe birth. Discuss the importance of keeping items together for easy retrieval when needed.

- For the birth: perineal pads/cloths, soap, clean bed clothes, placenta receptacle, new, unused razor blade, waterproof/plastic cover, cord ties, etc.
- For the newborn: blankets, diapers, clothes, etc.

Note: Items needed depend on the individual requirements of the intended place of birth, whether in a facility or in the home.

Danger Signs and Signs of Labor

Ensure that the woman knows the danger signs, which indicate that the complication readiness plan must be put into action:

- Vaginal bleeding
- Difficulty breathing
- Fever*
- Severe abdominal pain
- Severe headache*/blurred vision
- Convulsions*/loss of consciousness
- Labor pains before 37 weeks

** These can also be signs of malaria. Headache and convulsions (fits) can indicate severe malaria.*

Finally, ensure that the woman knows the following signs of labor, as well as when and how to contact the skilled provider:

- Regular, progressively painful contractions
- Lower back pain radiating from the fundus
- Bloody show (passage of blood with cervical mucus)
- Rupture of membranes

HEALTH PROMOTION AND DISEASE PREVENTION

Focused ANC promotes setting aside time during each visit to discuss important health issues. The skilled provider should ensure that the woman and her family have the information they need to make healthy decisions during pregnancy, childbirth and the postpartum/newborn period—as well as sufficient guidance in applying that information in their particular situation.

In areas with a malaria risk, pregnant women and their families should receive health messages and counseling on the following topics:

- IPTp (where applicable): How it works to protect against malaria and its complications; importance of returning for continued ANC to receive all recommended doses.
- ITNs: Where to find them and how to use them effectively, how they work, and their benefits and safety for the pregnant woman and fetus.

Focused Antenatal Care

- Early diagnosis of malaria and prompt case management: early reporting to a health facility when malaria is suspected and compliance with treatment regime.
- Malaria prevention: what the woman and her family can do to minimize mosquito breeding and bites.

Other important issues to be discussed include:

- Nutrition
- Care for common discomforts
- Avoiding use of potentially harmful substances
- Hygiene
- Rest and activity
- Sexual relations and safer sex
- Early and exclusive breastfeeding
- Testing and counseling for HIV infection (if the woman does not “opt out”)
- Family planning/healthy timing and spacing of pregnancies
- Along with health messages, another important aspect of health promotion is the provision of safe and cost-effective interventions to prevent certain conditions. Some key interventions that have proven effective in reducing maternal and newborn morbidity and mortality include:
 - Prevention of tetanus and anemia:
 - Tetanus toxoid (TT) immunization
 - Iron/folate supplementation
 - Preventive treatment for hookworm infection
 - Prevention of any endemic diseases/deficiencies:
 - Vitamin A supplementation:
 - Helps prevent night blindness and supports fetal growth and development
 - Iodine supplementation:
 - Iodine deficiency is the main cause of preventable mental retardation and brain damage, especially in the developing fetus and young children. During pregnancy, it also increases the chance of spontaneous abortion and stillbirth.
 - Prevention of mother-to-child transmission of HIV (PMTCT):
 - Follow local guidelines.

SCHEDULING OF VISITS

Appropriate scheduling depends on the gestational age of the pregnancy and also the woman's individual needs. For women whose pregnancies are progressing normally, WHO recommends the following schedule for a minimum of four ANC visits (WHO 2002). These visits may take place at or around the times listed:

First visit: Before 16 weeks (by the end of 4 months). Ideally, this visit should take place in the first trimester (by 12 weeks) or when the woman first thinks she is pregnant.

Second visit: Between 24–28 weeks (6–7 months) or at least once during the second trimester.

Third visit: Around 32 weeks (8 months).

Fourth visit: Around 36 weeks (9 months), for a total of two visits during the third trimester.

Women with danger signs, special needs, conditions that lie beyond the scope of basic care (such as antenatal bleeding, elevated blood pressure or sickle cell disease), or other problems may require additional visits. In addition, the woman should always be encouraged to access the health care system between visits whenever she has a problem or concern. (See **Table 1** for the components of focused ANC visits.)

Table 1. Components of Focused Antenatal Care Visits

ACTIVITY	FIRST VISIT (16 WEEKS*)	SECOND VISIT (24–28 WEEKS)	THIRD VISIT (32 WEEKS)	FOURTH VISIT (36 WEEKS)
ASSESSMENT In order to: <ul style="list-style-type: none"> • Detect signs/symptoms of malaria and other complications or diseases • Calculate EDD/gestational age • Determine if progress is normal Conduct a thorough assessment: <ul style="list-style-type: none"> • Quick check: Ask about problems/danger signs • History: Menstrual and contraceptive history, present pregnancy, obstetric history, medical history • Physical examination: General well-being; blood pressure; breasts, abdomen, genitals • Testing: Hemoglobin levels, RPR (for syphilis), HIV (unless she “opts out”) 	In order to: <ul style="list-style-type: none"> • Detect signs/symptoms of malaria and other complications or diseases • Confirm EDD and normal progress Conduct a targeted assessment: <ul style="list-style-type: none"> • Quick check: Ask about problems/danger signs • History: Problems/changes since last visit • Physical examination: General well-being, blood pressure, abdomen (including FHR), other elements as indicated • Testing: As indicated 	In order to: <ul style="list-style-type: none"> • Detect signs/symptoms of malaria and other complications or diseases • Confirm EDD and normal progress Conduct a targeted assessment: <ul style="list-style-type: none"> • Quick check: Ask about problems/danger signs • History: Problems/changes since last visit • Physical examination: General well-being, blood pressure, abdomen (including FHR), other elements as indicated • Testing: As indicated 	In order to: <ul style="list-style-type: none"> • Detect signs/symptoms of malaria and other complications or diseases • Confirm EDD and normal progress • Identify malpresentation Conduct a targeted assessment: <ul style="list-style-type: none"> • Quick check: Ask about problems/danger signs • History: Problems/changes since last visit • Physical examination: General well-being, blood pressure, abdomen (including FHR and fetal presentation), other elements as indicated • Testing: As indicated 	
CARE PROVISION Appropriate care/referral for problems identified Testing and counseling for HIV Development of birth plan (including review of danger signs and complication readiness) Initiation of IPTp: <ul style="list-style-type: none"> – If this visit takes place after quickening, give 1st dose of IPTp – First dose of TT – Iron/folate – Health messages/counseling on issues such as malaria prevention through IPTp and ITNs, nutrition, common discomforts 	Continuation or revision (if appropriate) of plan of care Appropriate care/referral for problems identified Further development/review of birth plan Continuation of preventive measures: <ul style="list-style-type: none"> – If no prior IPTp, give 1st dose; give 2nd dose now if 1st dose was at least 4 weeks ago – Give 2nd dose of TT if it has been given and it is at least 4 weeks since 1st dose; if no prior TT, give 1st dose – Give iron/folate as appropriate – Health messages/counseling continued as needed 	Continuation or revision (if appropriate) of plan of care Appropriate care/referral for problems identified Further development/review of birth plan Continuation of preventive measures: <ul style="list-style-type: none"> – If no prior IPTp, give 1st dose; give 2nd dose now if 1st dose was at least 4 weeks ago – If HIV-infected, give 3rd dose of IPTp if at least 4 weeks have passed since 2nd dose – If no TT this pregnancy, give 1st dose; give 2nd dose now if 4 weeks since 1st dose – Iron/folate as appropriate – Health messages/counseling continued as needed 	Continuation or revision (if appropriate) of plan of care Appropriate care/referral for problems identified Finalization of birth plan Continuation of preventive measures: <ul style="list-style-type: none"> – If no IPTp this pregnancy, give 1st dose; give 2nd dose now if it has been at least 4 weeks since 1st dose – TT and iron/folate if appropriate – Health messages/counseling continued on issues such as malaria prevention through IPTp and ITNs, family planning, newborn care, signs of labor 	
RECORD	Before each visit, review records from the last ANC visit if available. During the visit, record findings, care provided, and date of next ANC visit.			

* Or when the woman thinks she is pregnant.

Abbreviations used: EDD = estimated date of delivery; FHR = fetal heart rate; TT = tetanus toxoid

RECORD KEEPING FOR ANTENATAL VISITS AND MALARIA PREVENTION ACTIVITIES

Record keeping is an important tool in the provision of ANC. Accurate record keeping is necessary to adequately monitor the woman's condition, to provide continuity of care (over time and among health care providers), to plan and evaluate care, and to communicate effectively among health care providers and among sites in the event that referral is necessary. A health care facility should establish and maintain a record for every woman and newborn who receives care. The provider gathers information, records it, refers to it and updates it at the time of each visit.

Keep in mind that the information you record does not have to be lengthy, but must be accurate. It should also be written clearly enough so that other providers can easily understand what you have documented. The following list outlines what should be included on the antenatal record.

First Visit

- History
- Physical examination
- Care provision, including provision of IPTp, if appropriate
- Include other preventive treatment such as tetanus toxoid and iron/folate
- Gestational age-appropriate health messages discussed, such as birth/complication readiness plan and use of ITNs or long-lasting insecticide-treated bed nets (LLINs), if available (where to access and how to use them), other malaria prevention measures and danger signs (including signs/symptoms of malaria) and appropriate response
- Malaria and other testing as appropriate
- Include HIV testing or documentation if client “opts out”
- Date of next ANC visit

Subsequent Visits

- Interim history
- Targeted physical exam
- Care provision, including provision of IPTp if appropriate
- Gestational age-appropriate health messages, including review or revision of birth/complication readiness plan and use of ITNs (and relevant information on how client obtained, can obtain or has used ITN)

Focused Antenatal Care

- Counseling and testing for HIV if it has not been carried out in previous visits or if the woman requests it
- Date of next ANC visit

Focused Antenatal Care in Tema, Ghana

Women often waited at least 4–6 hours for ANC at Tema General Hospital in Ghana. First there was a queue to have blood pressure measured, another for height and weight, and yet another for history-taking. Sitting through group health education was often uninteresting for the women because they were tired, bored and anxious to see the midwife—that is, until focused ANC was implemented.

Four cubicles were built and a midwife was permanently assigned to each one. When women register for ANC, they are now assigned to one of the four midwives and see the same midwife for each visit throughout their pregnancy. This midwife is responsible for all of their care: history and physical exam, counseling/health education, preventive measures, and detection and treatment of complications. IPTp of malaria is also provided. The women get to know their midwives and develop a relationship with them. They also see the same midwife for their postpartum clinic visits. Now, when walking through the antenatal clinic at Tema, one sees happy faces because waiting time has been reduced to 2½ hours on average. Many mothers now even enjoy the group education sessions. The midwives also report that focused ANC has resulted in improved quality of care.

TWO

TRANSMISSION OF MALARIA



LEARNING OBJECTIVES

This chapter summarizes what malaria is, how it is transmitted and what its effects are, especially on pregnant women. After completing this chapter, learners will be able to:

- Define malaria and how it is transmitted.
- Describe the extent of malaria in Africa in general, and in their own countries specifically.
- Compare the effects of malaria in areas of stable and unstable transmission.
- List the effects of malaria on pregnant women and their unborn babies.
- Describe the effects of malaria on pregnant women with HIV/AIDS.

BACKGROUND

Malaria is a disease caused by a group of parasites called *Plasmodium*. A parasite is a very small organism (living thing) that cannot be seen with the naked eye. It cannot live on its own; it has to feed off other organisms to reproduce and live. Many types of *Plasmodium* exist, and they cause malaria in animals as well as people. The four types of *Plasmodium* parasites that affect humans are:

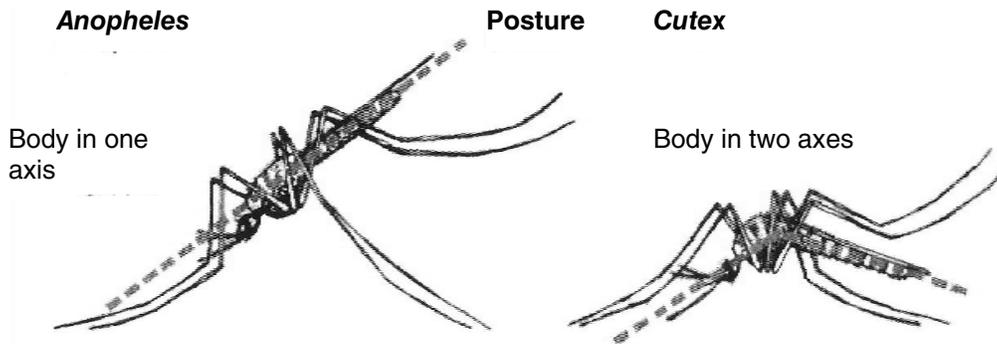
- *Plasmodium falciparum*
- *Plasmodium vivax*
- *Plasmodium ovale*
- *Plasmodium malariae*

Of these four types only one, *Plasmodium falciparum*, is of primary importance in most of Africa, as it is the most common. The most severe disease is caused by *P. falciparum*.

Malaria cannot be passed (transmitted) directly from one human being to another. Malaria is spread by mosquitoes that are infected with malaria parasites. The mosquito can get these parasites by biting an infected person. However, not all mosquitoes can transmit malaria. Female mosquitoes from the *Anopheles* family spread the malaria parasite. As shown in **Figure 2**, the *Anopheles* mosquito is different from a mosquito that does not transmit malaria in the way it positions its body while sitting on any object.

Transmission of Malaria

Figure 2. Difference between *Anopheles* Mosquitoes and Other Mosquitoes



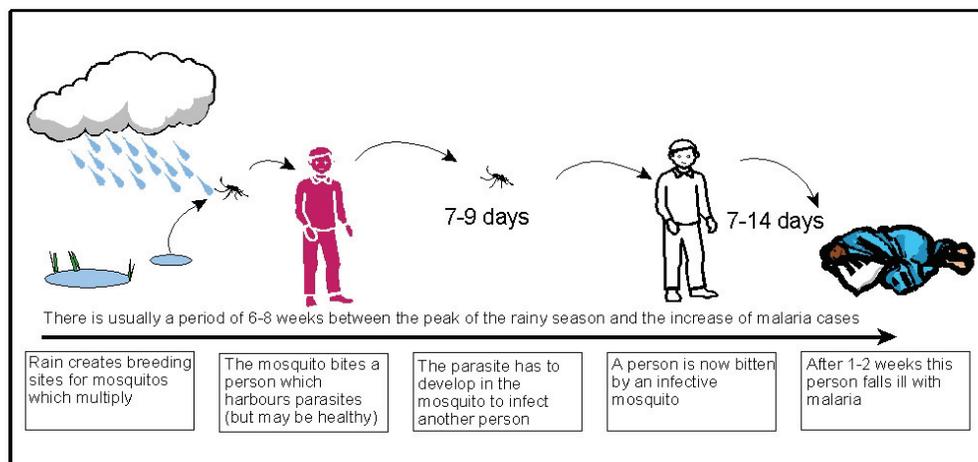
Note: The body of the *Anopheles* points up in the air in one line, but in other mosquitoes, the rear end is bent and points down.

HOW MALARIA IS TRANSMITTED

A person becomes infected after being bitten by an infected female *Anopheles* mosquito. A mosquito sucks blood to nourish its eggs. When the mosquito bites, it injects saliva that contains parasites into the person's blood stream. The parasites then travel quickly to the liver cells where they hide from the immune system and begin to multiply.

About 1 to 2 weeks after a person is bitten, the multiplying parasites cause infected liver cells to burst, and new parasites enter the bloodstream (Figure 3).

Figure 3. How Malaria Is Transmitted



The parasites then attack red blood cells and begin consuming hemoglobin, the part of the blood that carries oxygen. The loss of these red blood cells causes anemia. While in the red blood cells, the parasites multiply and eventually cause the blood cells to burst, spilling parasites into the blood again. When this happens, the person usually begins to

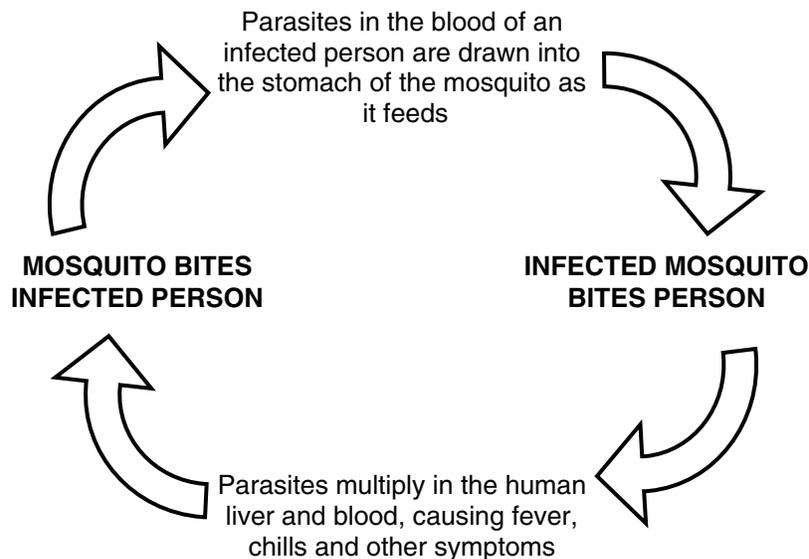
show signs of malaria. Common symptoms include fever, chills, sweats and headache.

The person may feel well briefly until more red blood cells burst (about every 2 to 3 days) and s/he becomes sick again. This cycle continues over and over until the immune system or medicine stops the infection, or the person dies.

Because *Anopheles* mosquitoes are active only at night, efforts to prevent malaria are most effective from dusk to dawn. However, because mosquitoes can transmit other diseases, it is best to prevent being bitten at all times. It is important to note that although mosquitoes can carry many other diseases, they cannot transmit HIV.

As long as a person is exposed to mosquitoes, the malaria cycle of infection can occur again, as illustrated in **Figure 4**. Sometimes, a few parasites remain in the liver, and can be released even months or years later.

Figure 4. The Malaria Cycle of Infection



The following four factors affect malaria transmission and illness. The more factors present in a community, the higher the malaria rate.

- Breeding sites: Mosquitoes need stagnant or slow-flowing bodies of water to use as breeding sites to lay their eggs. These sites, which may increase during the rainy season, include:
 - Small ponds, ditches, pits and canals
 - Swamps, reservoirs and rice fields
 - Pools of water after rain
 - Uncovered water tanks

Transmission of Malaria

- Streams with slow-flowing water along banks
- Water-filled animal hoof prints
- Objects that collect water, such as empty tins and containers
- **Parasites:** Enough parasites must exist in the human population to infect the mosquito.
- **Climate:** The temperature must be an average of at least 18–20° C and humidity above 60% for the mosquito to survive and for the parasite to develop and become infective. The warmer the weather, the faster the development of the parasite.
- **Population:** In Africa, *Anopheles* mosquitoes do not fly farther than about 1–2 km from their breeding sites. People must be near or within a short distance away from breeding sites in order to be bitten by an infected mosquito.

POPULATIONS MOST AFFECTED BY MALARIA

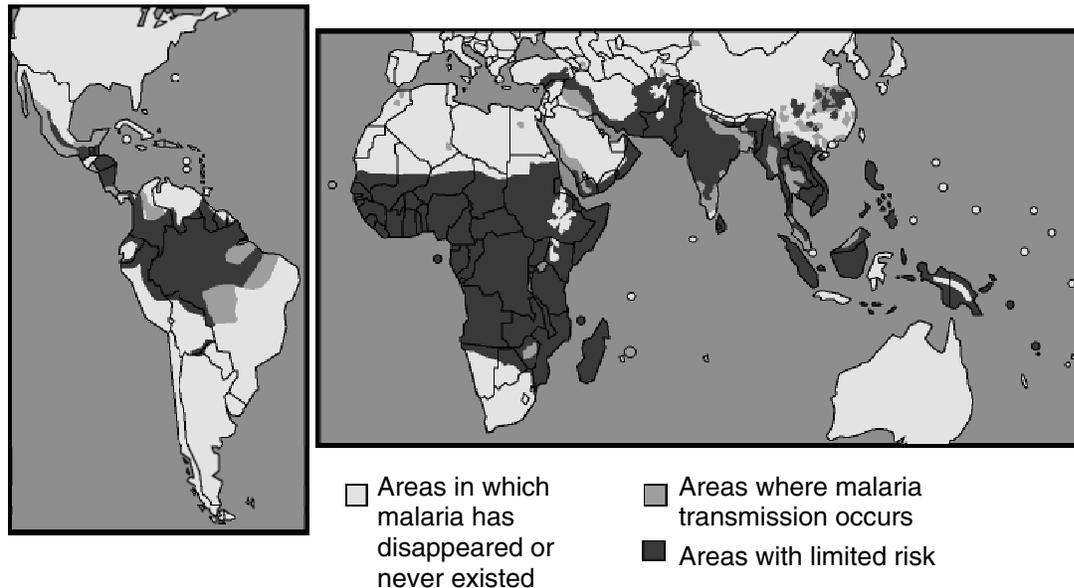
Malaria is a public health problem throughout the world. Of the estimated 250 million cases each year worldwide (WHO 2008), more than 86% occur in sub-Saharan Africa (see **Figure 5**). Young children and pregnant women are the two groups of people most at risk for infection. Millions of pregnancies occur among women living in malaria-endemic regions of Africa, yet only a fraction of these women have access to effective interventions.



- Every 10 seconds, a person in Africa dies from malaria.
- About 70% of malaria deaths are among children under 5.
- Pregnant women are more likely to become infected compared with non-pregnant women.
- Women in their first or second pregnancies are more at risk.

Others who are at greater risk of malaria infection include persons from areas with low or no malaria transmission (such as immigrants and refugees) who come to visit or live in high malaria transmission areas, and people with HIV/AIDS.

Figure 5. Map of Malaria-Endemic Areas Worldwide



Source: World Health Organization 1997.



Malaria affects nearly five times as many people as AIDS, leprosy, measles and tuberculosis combined.

Transmission Levels

Areas of “stable” or high-moderate transmission are places where populations are continuously exposed to a fairly constant rate of malaria. In these areas, immunity is developed during childhood. Adolescents and adults are partially immune, although they may have a few parasites in their blood. Immunity is reduced in pregnancy and can be lost when individuals move out of the high transmission area for a long time. Children and pregnant women in areas of stable transmission have the highest risk of becoming ill from malaria.

In areas of “unstable” or low transmission, the population is not exposed to malaria very often. Malaria can sometimes be seasonal in these areas (such as in the rainy season). Due to these low levels of malaria infection, the population develops little or no immunity. As a result, children, adults, pregnant women and non-pregnant women are equally susceptible to malaria infections. Therefore, in unstable transmission areas, malaria can be very serious during pregnancy and complications may occur in a short time.

Often, different levels of transmission can occur within a country or region. Within a malarious region (such as in Southern Africa) there can also be malaria-free areas (Southern Africa Malaria Control 2006). Factors that affect transmission include temperature, humidity and altitude. For

Transmission of Malaria

example, the life of the mosquito is increased with high humidity, while cold weather (below 16° C) slows the development of the malaria parasite.

EFFECTS OF MALARIA ON PREGNANT WOMEN

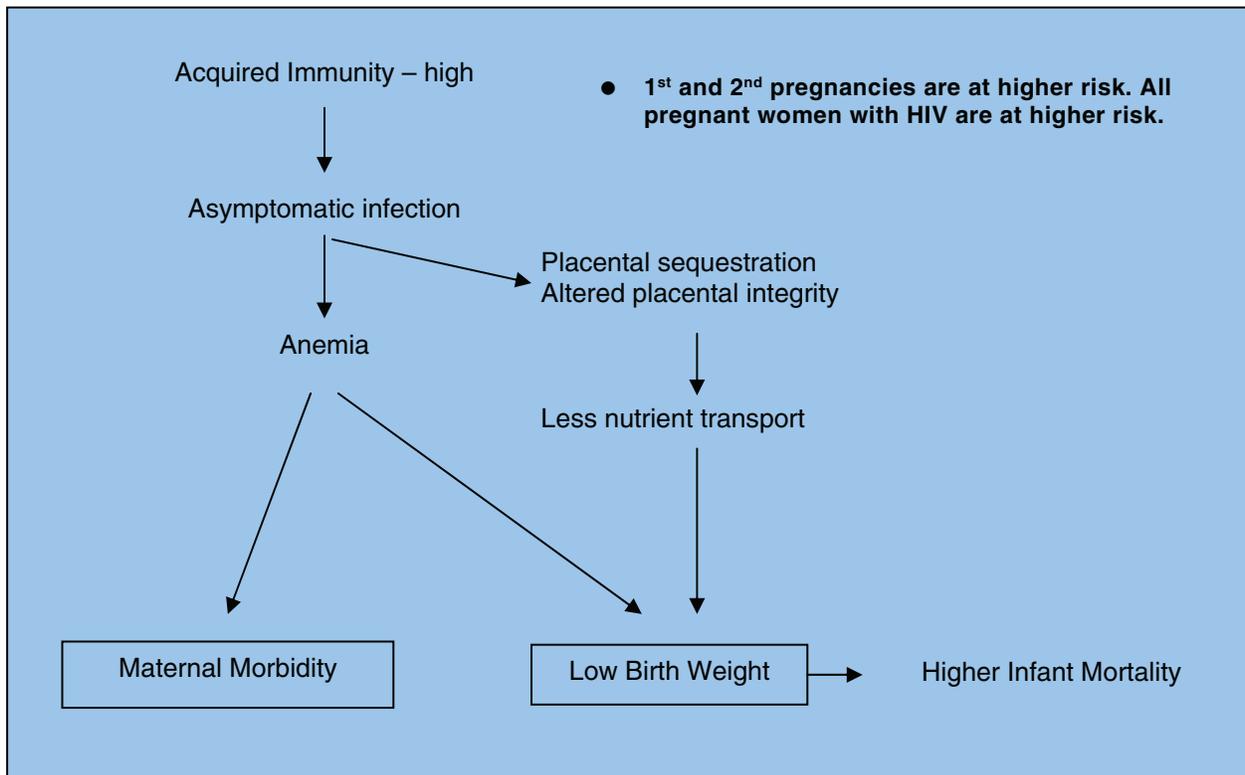
The effects of malaria infection on the pregnant woman can range from mild to severe, depending on the level of malaria transmission in a particular setting and the pregnant woman's level of immunity (WHO 2004d). The level of immunity depends on several factors:

- Intensity of malaria transmission
- Number of previous pregnancies
- Presence of other conditions, such as HIV, which can lower immune response during pregnancy

Pregnancy in Areas of Stable Transmission

Even though there are more malaria infections in these areas, many pregnant women with malaria parasites do not have symptoms (no fever or clinical signs of illness). This is because women in stable areas (see **Figure 6**) have some immunity, which decreases the chance of severe malaria illness. However, the lack of clinical symptoms does not mean that the woman's health is not affected. The major complication of malaria among pregnant women in stable areas is anemia, which can eventually cause death in severe cases. Women who are pregnant for the first or second time are most at risk for such complications.

Figure 6. Malaria in Pregnancy in Areas of Stable Transmission



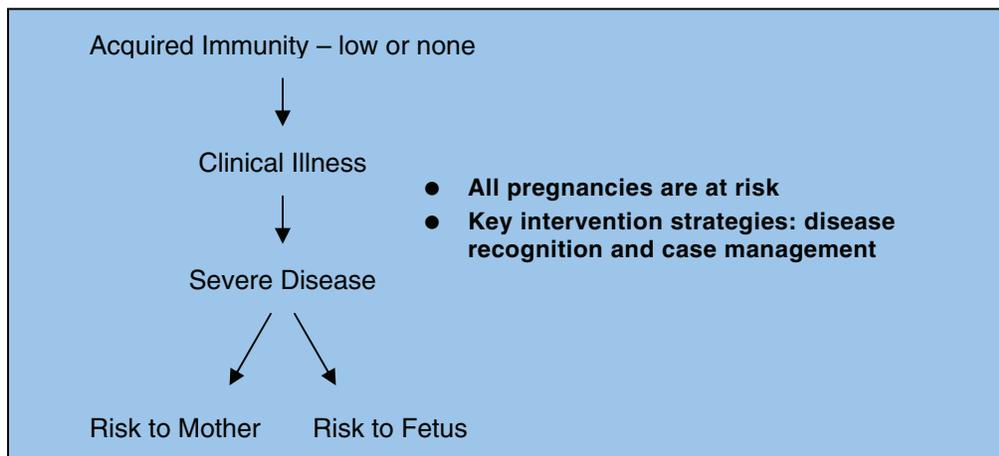
Adapted from: World Health Organization (WHO). 2004d. *A Strategic Framework for Malaria Prevention and Control during Pregnancy in the African Region*. WHO/Regional Office for Africa: Brazzaville.

Pregnancy in Areas of Unstable Transmission

All pregnant women are at similar risk for malaria infection in places where transmission is low or unstable (see **Figure 7**) (WHO 2004d). These women usually present with clinical signs/symptoms and sometimes severe malaria, which is life-threatening. Spontaneous abortions, stillbirths and low birth weight are also common outcomes of malaria infection in regions of unstable transmission. The figure below illustrates the potential risks to all pregnant women in these areas.

Transmission of Malaria

Figure 7. Malaria in Pregnancy in Areas of Unstable Transmission



Adapted from: World Health Organization (WHO). 2004d. A Strategic Framework for Malaria Prevention and Control during Pregnancy in the African Region. WHO/Regional Office for Africa: Brazzaville.

Pregnant women are at a higher risk of malaria infection if they are:

- ✓ ● In their first or second pregnancy
- Immigrants/visitors from areas of low malaria transmission
- Infected with HIV/AIDS
- Adolescents

Table 2 on the next page summarizes the WHO strategy for malaria in pregnancy by level of transmission.

Table 2. WHO Strategy for Malaria in Pregnancy by Level of Transmission

	CASE MANAGEMENT	INTERMITTENT PREVENTIVE TREATMENT	INSECTICIDE-TREATED NETS (ITNS)
High/medium transmission—perennial (stable)*	<p>Risk of febrile illness and severe malaria limited.</p> <p>Screen and treat anaemia with recommended antimalarial drug and iron supplement.</p> <p>Promptly recognize and treat all potential malaria illness with an effective drug.</p>	<p>Provide pregnant women a standard IPT¹ dose at the first regularly scheduled antenatal clinic visit after quickening. At the next routine visit,² provide an IPT dose, with a minimum of two doses given at not less than a one-month interval.³</p>	<p>Begin use early in pregnancy and continue postpartum.</p> <p>Emphasize young children sleeping under ITNs.</p>
High/medium transmission—seasonal (stable)*	<p>Risk for febrile illness and severe malaria limited.</p> <p>Screen and treat anaemia with recommended antimalarial drug and iron supplement.</p> <p>Promptly recognize and treat all potential malaria illness with an effective drug.</p> <p>Risk for febrile illness and anaemia high.</p>	<p>Provide pregnant women a standard IPT¹ dose at the first regularly scheduled antenatal clinic visit after quickening. At the next routine visit,² provide an IPT dose, with a minimum of two doses given at not less than one-month intervals.³</p>	<p>Begin use early in pregnancy and continue postpartum.</p> <p>Emphasize young children sleeping under ITNs.</p>
Low transmission (unstable)**	<p>Risk for severe malaria illness high.</p> <p>Promptly recognize² and treat all malaria illness with an effective drug.</p> <p>Screen and treat anaemia with recommended antimalarial drug and iron supplement.</p> <p>Consider <i>P. vivax</i> infection in east Africa.⁴</p>	<p>Based on present evidence, IPT cannot be recommended in these areas.</p>	<p>Begin use early in pregnancy and continue postpartum.</p> <p>Emphasize young children sleeping under ITNs.</p>
<p>* Adult women have a high level of acquired antimalarial immunity; first and second pregnancies are at higher risk of adverse consequences of malaria.</p> <p>** Adult women have no or very low level of acquired antimalarial immunity; all pregnancies are at risk of adverse consequences of malaria.</p> <p>¹ Presently the most effective drug for IPT is sulfadoxine-pyrimethamine.</p> <p>² WHO recommends an ideal schedule of three antenatal clinic visits after quickening.</p> <p>³ In areas where HIV prevalence among pregnant women is > 10%, a third dose should be administered at the last scheduled visit. If the pregnant woman had received only one dose at the time of the third visit, a second dose should be administered at the fourth visit.</p> <p>⁴ CQ chemoprophylaxis to decrease the burden of <i>P. Vivax</i> in pregnancy may be considered, but no evidence on effectiveness of this strategy is presently available.</p>			

Source: World Health Organization (WHO). 2004d. *A Strategic Framework for Malaria Prevention and Control during Pregnancy in the African Region*. WHO/Regional Office for Africa: Brazzaville.

INTERACTION OF HIV/AIDS AND MALARIA DURING PREGNANCY

Currently there are more than 29 million people with HIV/AIDS in Africa alone. The presence of HIV results in a poorer response to both prevention and treatment of malaria in pregnancy (WHO 2004c). Studies have shown that HIV/AIDS infection during pregnancy:

- Reduces a woman's resistance to malaria
- Increases the likelihood of a woman's developing clinical malaria
- Causes malaria treatment to be less effective
- Causes increased risk of malaria-related problems in pregnancy
- Increases risk of intrauterine growth restriction leading to low birth weight
- Increases the risk of preterm birth
- Increases the risk of maternal anemia

Research has also shown that HIV-infected women can infect their newborns with HIV during pregnancy, during childbirth or through breastfeeding. In newborns, the risk of HIV infection may be lowered if the newborn receives only breast milk rather than a combination of breast milk and breast milk substitutes during the first 6 months of life. Some HIV-infected mothers may prefer to use breast milk substitutes if certain criteria—acceptability, feasibility, affordability, sustainability and safety (AFASS)—can be met. (See description of AFASS criteria on the next page.)



During antenatal counseling of HIV-infected women, provide information about the risks and benefits of both breastfeeding and breast milk substitutes.

Pregnant women who are co-infected with HIV and malaria are at a very high risk for anemia and malaria infection of the placenta. Their newborns are therefore more likely to have low birth weight and die during infancy (WHO 2004b). More research is needed to determine the relationship of MIP and the risk of mother-to-child transmission of HIV.

Description of the AFASS Criteria

Acceptable: The mother perceives no barrier to replacement feeding. Barriers may have cultural or social reasons, or be due to fear of stigma or discrimination. According to this concept the mother is under no social or cultural pressure not to use replacement feeding, and she is supported by family and community in opting for replacement feeding, or she will be able to cope with pressure from family and friends to breastfeed, and she can deal with possible stigma attached to being seen with replacement food.

Feasible: The mother (or family) has adequate time, knowledge, skills and other resources to prepare the replacement food and feed the infant up to 12 times in 24 hours. According to this concept the mother can understand and follow the instructions for preparing infant formula and with support from the family can prepare enough replacement feeds correctly every day, and at night, despite disruptions to preparation of family food or other work.

Affordable: The mother and family, with community or health-system support if necessary, can pay the cost of purchasing/producing, preparing and using replacement feeding, including all ingredients, fuel, clean water, soap and equipment, without compromising the health and nutrition of the family. This concept also includes access to medical care if necessary for diarrhea and the cost of such care.

Sustainable: Availability of a continuous and uninterrupted supply and dependable system of distribution for all ingredients and products needed for safe replacement feeding, for as long as the infant needs it, up to one year of age or longer. According to this concept there is little risk that formula will ever be unavailable or inaccessible, and another person is available to feed the child in the mother's absence, and can prepare and give replacement feeds.

Safe: Replacement foods are correctly and hygienically prepared and stored, and fed in nutritionally adequate quantities, with clean hands and using clean utensils, preferably by cup. This concept means that the mother or caregiver:

- has access to a reliable supply of safe water (from a piped or protected-well source)
- prepares replacement feeds that are nutritionally sound and free of pathogens
- is able to wash hands and utensils thoroughly with soap, and to regularly boil the utensils to sterilize them
- can boil water for preparing each of the baby's feeds
- can store unprepared feeds in clean, covered containers and protect them from rodents, insects and other animals

Source: World Health Organization (WHO). 2004f. *What Are the Options? Using Formative Research to Adapt Global Recommendations on HIV and Infant Feeding to the Local Context*. WHO: Geneva.

WHO Recommendations for Integrating Malaria and HIV Services²

1. Because people living with HIV/AIDS in areas of malaria transmission are particularly vulnerable to malaria, their protection by ITNs is of high priority.
2. In addition to ITNs, HIV-infected women at risk of malaria should (according to the stage of HIV infection) receive either IPTp with SP (at least three doses spaced at least 1 month apart or according to

² Source: World Health Organization (WHO). 2004b. *Malaria and HIV/AIDS Interactions and Implications: Conclusions of a Technical Consultation Convened by WHO, 23–25 June, 2004*. (flyer). WHO: Geneva. At: http://www.who.int/malaria/malaria_HIV/malaria_hiv_flyer.pdf.

- country guidelines) or daily cotrimoxazole prophylaxis. **DO NOT** give SP to clients on daily cotrimoxazole prophylaxis (see below).
3. Collaboration of reproductive health programs with HIV and malaria control programs should occur to ensure integrated service delivery. This means that during every ANC visit, women should receive counseling and care directed at preventing and treating both malaria and HIV. Appropriate diagnostic tools for both diseases, antiretrovirals and antimalarial medications should be available at all levels of the health care system.
 4. Additional research on interactions between antiretroviral and antimalarial drugs is urgently needed.

Cotrimoxazole and Its Effects on Malaria

In HIV-infected adults, daily prophylaxis with cotrimoxazole has shown promise in preventing some infections, including malaria (Anglaret et al. 1999). Some programs are already using this approach. However, because cotrimoxazole and SP have similar properties (both contain sulfamides), there is concern about possible severe adverse reactions to sulfa drugs in HIV patients on daily cotrimoxazole. WHO therefore recommends that persons on daily cotrimoxazole should not be given SP (WHO 2004c). Since SP is still the first-line drug for malaria treatment and for IPTp in many parts of Africa, the impact of cotrimoxazole use on the efficacy of SP is still being investigated (Laufer and Plowe 2006; Malamba et al. 2006).

MALARIA AND SICKLE CELL ANEMIA

Sickle cell anemia is a genetic condition due to a hemoglobin disorder. It is particularly common among people of African, Mediterranean, Saudi Arabian and Indian ancestry. A person has sickle cell trait when he/she carries one sickle hemoglobin-producing gene inherited from a parent and one normal hemoglobin gene. Those with the trait (often called “carriers”) will not get sickle cell disease.

It is not known exactly why those with sickle cell trait have some resistance to falciparum malaria, especially in early childhood. Though they may have protection (WHO 2006a), it is still important that those with sickle cell trait take IPTp and use ITNs and other preventive measures.

EFFECTS OF MALARIA ON UNBORN BABIES

During pregnancy, malaria parasites hide in the placenta and interfere with the transfer of oxygen and nutrients (food) from the mother to the unborn baby. Combined with anemia, this increases the risk of spontaneous abortion and stillbirth. In the second half of pregnancy, it can hinder fetal weight gain, causing low birth weight and preterm births. About 5–14% of



all low birth weight babies are born to mothers infected with malaria, and an estimated 3–5% of all infant deaths can be traced to malaria infection in mothers. In some cases, malaria parasites can cross from the placenta into the baby's blood and cause anemia in the baby.

Babies born to mothers with malaria are more likely to have low birth weight—the single greatest risk factor for death during the first month of life.

EFFECTS OF MALARIA ON COMMUNITIES

- Causes sick individuals to miss work (and wages)
- Causes sick children to miss school
- May cause chronic anemia in children, inhibiting growth and intellectual development and affecting future productivity in the community
- Uses scarce resources:
 - Funds (treatment is more costly than prevention)
 - Drugs
 - Staff time
- Causes preventable deaths, especially among children and pregnant women

HEALTH EDUCATION AND COUNSELING POINTS

- Malaria is transmitted through mosquito bites.
- Pregnant women and children are particularly at risk for malaria.
- Pregnant women infected with malaria may have no symptoms.
- Women with HIV/AIDS have a higher risk of malaria infection.
- Malaria can lead to severe anemia, spontaneous abortion and low birth weight newborns.
- Malaria is preventable.
- Malaria is treatable.

General Malaria Information, Facts and FAQs



<http://www.cdc.gov/malaria>
<http://www.who.int/topics/malaria/en/>

Transmission of Malaria

THREE

PREVENTION OF MALARIA



LEARNING OBJECTIVES

This chapter outlines the WHO strategy for malaria prevention and control. It also includes counseling points about malaria prevention for pregnant women and their families. After completing this chapter, learners will be able to:

- List the three elements of malaria prevention and control according to the WHO MIP strategy.
- List the elements of counseling women about the use of ITNs, IPTp and other means of malaria prevention.
- Describe the use of SP for IPTp, including dosage, timing and contraindications.

MALARIA PREVENTION STRATEGY

The Africa Regional Office of WHO has developed an evidence-based strategy for the prevention and control of MIP in the region (WHO 2004d). The strategy was designed to be appropriate for most African settings, but has guidance on adapting it to local situations. Since most sub-Saharan Africans live in areas of stable transmission, WHO recommends three interventions as the basis for this strategy:

- Insecticide-treated nets (ITNs)
- Intermittent preventive treatment in pregnancy (IPTp)
- Case management of malaria illness and anemia

As shown in **Table 2 (Chapter Two)**, WHO does not recommend IPTp for pregnant women living in unstable transmission areas. However, case management for malaria illness and ITNs are recommended for all.

Note on Drug Information

At the time of publication of this manual, the drug of choice for IPTp is SP. However, since research for alternative drugs is ongoing, countries should be in regular contact with WHO for new information on recommendations for malaria prevention.

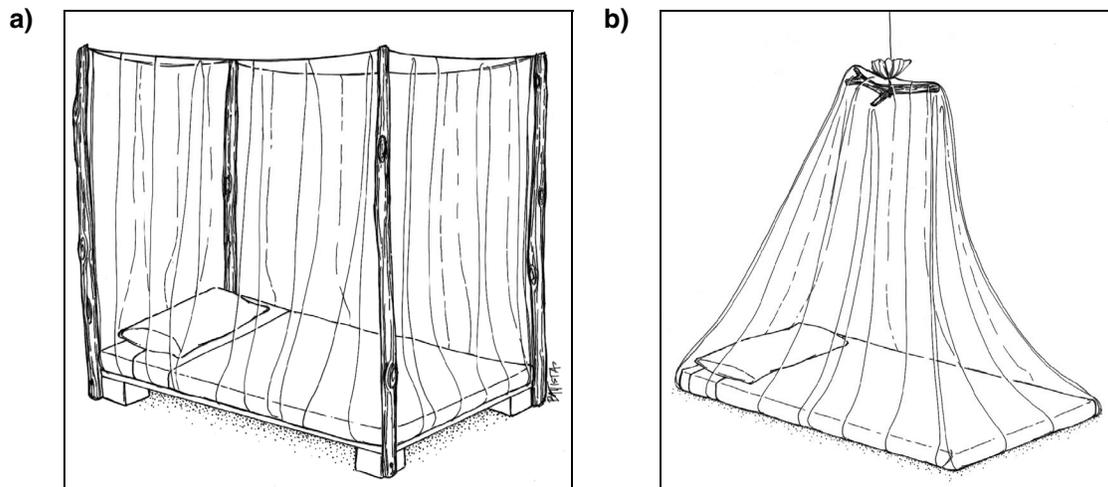
The high level of ANC attendance in much of Africa is an ideal platform to implement each component of this strategy. While each setting will be different, national reproductive health and malaria control programs should collaborate to formulate and disseminate strategies and guidelines.

The health care system, the community, the private sector and nongovernmental organizations should work together to ensure high-quality services with adequate drugs and supplies. For example, collaboration with community-based groups to make ITNs available at several locations will help increase ITN usage.

INSECTICIDE-TREATED NETS

Of all the methods of preventing mosquito bites, sleeping under an ITN (**Figure 8**) is probably the most effective because mosquitoes bite at night when the pregnant woman is asleep. ITNs reduce human contact with mosquitoes by killing them if they land on the net or by repelling them, thus driving them away from where people are sleeping.

Figure 8. Insecticide-Treated Net Tucked under a Bed (a) and Tucked under a Mat (b)



Many studies have demonstrated the effectiveness of ITNs in reducing the risk of low birth weight and maternal anemia. Numerous programs have contributed to making ITNs accessible by reducing costs and increasing availability. Unfortunately, many mothers do not use ITNs, even when they can afford them. Some reasons for this may include:

- People are not in the habit of using nets, so they hesitate to buy them.
- People need to be convinced of their usefulness and safety.
- The need to re-treat the nets periodically is inconvenient or not affordable.
- Other family members may not like sleeping under nets, discouraging the woman from doing so. This often results from lack of knowledge about the benefits of ITNs for pregnant women and children.

Some Frequently Asked Questions and Facts about ITNs

Are untreated nets just as effective as insecticide-treated nets?

Although untreated mosquito nets can also protect against mosquitoes, they are less effective than treated nets. **Table 3** compares nets that are not treated with insecticide with those that are treated.

Table 3. Comparison of Untreated Nets and Insecticide-Treated Nets

UNTREATED NETS	INSECTICIDE-TREATED NETS
Provide some protection against malaria	Provide a high level of protection against malaria
Do not kill or repel mosquitoes that touch the net	Kill or repel mosquitoes that touch the net
Do not reduce number of mosquitoes	Reduce number of mosquitoes both inside and outside the net
Do not repel/kill other insects like lice, ticks and bedbugs	Repel and/or kill other insects like lice, ticks and bedbugs (Lindsay et al. 1989)
Are safe for use by pregnant women, children and infants	Are safe for use by pregnant women, children and infants

What are the benefits of using ITNs?

For pregnant women, ITNs protect against malaria and therefore reduce the risk of anemia and maternal death.

For newborns, ITNs help by:

- Decreasing the incidence of low birth weight
- Lowering the incidence of newborn anemia
- Reducing the risk of newborn death
- Promoting growth and development during pregnancy and the first few weeks of life

ITNs help the community because:

- They cost less than treating malaria infection.
- They reduce the number of people getting sick from malaria and the number of people dying from severe malaria.
- By helping to prevent illness in children, they can help children grow to be healthy.
- By helping to prevent illness in adults, ITNs help people spend more time at work, thereby improving productivity and their economic status.

Are ITNs safe?

WHO has recommended insecticides that should be used to treat ITNs. They are safe for human beings and are being used in many countries throughout the world. The quantities of insecticides used in ITNs are diluted and are too little to have any effect on humans, including newborns.

Where can ITNs be found?

- Antenatal clinics
- General merchandise shops
- Drug shops or pharmacies
- Markets
- Public and private health facilities
- Nongovernmental organizations and community-based groups, such as African Medical Research Foundation (AMREF)
- With community health workers

How are ITNs used?

For an ITN to effectively reduce the number of mosquitoes in the house, it must be used and cared for correctly. The following are tips for using an ITN:

- Hang the net so that it covers the entire bed or sleeping mat, and tuck it under the mattress or mat as shown in **Figure 8**.
- Use the net every night and all year, not just when mosquitoes are bothering you.
- Handle the net gently so that it does not tear. During the day, tie it up and out of the way to avoid damage.
- Regularly inspect the net for holes and repair them (although treated nets that are torn still offer some protection).
- Refer to local guidelines for instructions on when to re-treat nets.
- Do not smoke or use fire near the net; it may easily catch fire.

How are mosquito nets treated with insecticides?

To treat a net with insecticide, follow the instructions below.

- Materials needed:
 - Washed and dried net
 - Insecticide treatment kit
 - Mixing container (plastic basin, bucket or large plastic bag)

- Protective gloves
- Water
- Soda or beer bottles for measuring water
- A plastic sheet for drying the net after treatment

Steps for Treating a Mosquito Net with Insecticide

1. Select a well-ventilated space or area for treatment.
2. Ensure that the net is clean, dry and not folded.
3. Put protective gloves on both hands.
4. Mix the insecticide (liquid or tablet) with water in a basin according to the manufacturer's instructions. Avoid getting insecticide on your face.
5. Place the net in the basin with the solution and stir until the material is thoroughly wet. Alternatively, put the net in a leak-proof plastic bag, pour the prepared insecticide solution into it, and knead it gently for at least 2 minutes or until the entire net is soaked thoroughly.
6. Lift the net and, if necessary, gently squeeze excess insecticide solution into the basin. Remember to keep wet nets away from children.
7. Allow the net to dry flat on a clean surface out of direct sunlight (e.g., on a plastic sheet, flat bed, mattress or mat). Remember that direct sunlight may reduce the effectiveness of the insecticide.
8. Dispose of excess insecticide into a pit latrine. Do not pour excess insecticide into rivers or ponds because the contents are highly toxic to fish and also to bees.

Long-Lasting Insecticide-Treated Nets

A long-lasting insecticide-treated net (LLIN) is a pre-treated, ready-to-use net that lasts between 3 and 5 years (depending on the type) and does not require re-treatment during that time. LLINs have several advantages. Compared with ITNs, long-lasting nets:

- Usually have a one-time cost
- Do not require additional treatments
- Save money because there are no additional costs associated with re-treatment or re-treatment campaigns and additional insecticides

Demand for LLINs has increased rapidly since 2004. Many government and NGO programs prefer LLINs to conventional nets. This high demand may cause a delay in availability, but providers are encouraged to promote regular ITNs when LLINs are not available. Because of variations in quality, it is advised that only WHO-recommended LLINs be used until

further testing is done. Long-lasting nets currently approved by WHO are Olyset® and Permanet®.

INDOOR RESIDUAL SPRAYING (IRS)

The main purpose of indoor residual spraying is to lower malaria transmission by reducing the survival of mosquitoes entering houses or sleeping areas.

Indoor residual spraying is an effective intervention only when the following conditions are met:

- A large number of the structures in an area have enough surfaces that can be sprayed
- A majority of the vector population rests indoors:
 - Most malaria vectors in Africa are indoor-resting, which is why IRS can be an effective malaria control measure.
- The vector is susceptible to the insecticide in use:
 - As an example, Zambia plans to alternate effective insecticides yearly to avoid creating resistant strains of mosquitoes.

Currently, IRS is being used by some country programs (e.g., Angola, Zambia) to increase malaria prevention. Most IRS programs have specially trained staff to do the spraying. Providers should keep updated about any local IRS programs in their areas and educate clients accordingly.

INTERMITTENT PREVENTIVE TREATMENT

Intermittent preventive treatment (IPTp) of malaria during pregnancy is based on the assumption that every pregnant woman living in areas of high malaria transmission has malaria parasites in her blood or placenta, whether or not she has symptoms of malaria. Therefore, WHO recommends that all pregnant women be given at least two doses of SP. The first dose should be given after quickening (first fetal movement) and no earlier than the 16th week of pregnancy, and the second at least 1 month (4 weeks) later. Preventing parasites from attacking the placenta helps the fetus develop normally and avoid low birth weight.

Who should receive IPTp?

IPTp should be given to all pregnant women (after 16 weeks gestation) who live in areas of stable transmission, whether or not they have symptoms of malaria.

How should IPTp be given?

- At least two doses of IPTp, 1 month apart, should be given to all pregnant women after quickening. A single dose is three tablets of sulfadoxine 500 mg + pyrimethamine 25 mg. For women presenting in late pregnancy, even one dose of IPTp is beneficial.
- Preferably, the first dose should be given at the first ANC visit after quickening and the second dose on the next visit if at least 1 month has elapsed. To avoid accumulation of high levels of SP in the woman's blood, do **not** give SP to a woman who has taken it within the previous month.
- Give the woman safe drinking water in a clean a cup, and directly observe her swallowing the tablets.
- Record the IPTp on the ANC card and clinic card.
- Tell the woman when to return for her next visit. Advise her to return sooner if signs of malaria or danger signs appear.
- Reinforce the use of ITNs.



IPTp is important because many pregnant women with malaria have no symptoms.

Why should IPTp be given at a particular time?

Because the presence of parasites in the placenta interferes with the transfer of nutrients to the fetus, it is important to ensure that the placenta is free of malaria parasites when fetal growth is fastest. The fetal growth rate is relatively slow in the first half of pregnancy, but increases rapidly after 20 weeks. IPTp is best given when the fetal growth rate is at its highest in order to reduce placental parasitemia and resulting fetal growth restriction.

Other Important Considerations about IPTp

- If a woman presents for her first antenatal visit in late pregnancy, she can still receive two doses of IPTp, provided that the doses are taken 1 month apart.
- WHO recommends that pregnant women receive no more than three doses of IPTp.

Prevention of Malaria

- Provide iron and folic acid supplements to help prevent severe anemia during pregnancy, and educate the woman about locally available foods rich in these nutrients. Be sure to follow local guidelines about the use of folate during and after IPTp or during and after SP for malaria treatment.

Some evidence suggests that high doses (≥ 5 mg) of folate supplementation may reduce the effectiveness of SP for treatment of malaria (Ouma et al. 2006). Use of low doses (0.4 mg) of folate does not seem to reduce SP effectiveness. For this reason, some programs using higher folate doses instruct pregnant women not to take folate for 14 days after use of SP. Providers should follow local protocols.

Commonly Asked Questions about Giving IPTp

What do you do if the client vomits?

- If vomiting occurs within 30 minutes of taking SP, the client should repeat the dose of SP because she may have vomited the drug before it could be absorbed.
- Advise the woman to drink plenty of fluids to avoid dehydration.

When should you avoid giving SP?

- Ask the woman about any allergies to sulfa drugs, including SP, before giving SP. If she is allergic to sulfa drugs, do not give SP; instead, emphasize ITNs and other preventive measures and, as with other clients, make sure that the client knows the danger signs of pregnancy, the signs/symptoms of malaria and the appropriate response to these signs and symptoms.
- SP should not be given to women less than 16 weeks (4 months) pregnant.
- Women who are taking cotrimoxazole to treat other infections (e.g., women with HIV) should not take SP.
- Do not give SP when the client has had it within the last month.

What if the client is also taking some other sulfa drugs?

If the client is taking any other sulfa-based drugs (such as cotrimoxazole) for infections other than HIV, consider other antibiotics, such as amoxicillin or erythromycin, to replace the sulfa drugs. You should consult with the provider who prescribed the sulfa drug before changing the prescription.

Intermittent Preventive Treatment in Infants (IPTi)

Recent research has shown that IPT for infants, consisting of a single dose of SP given at 2, 3 and 9 months at the time of routine EPI immunizations, can significantly reduce clinical malaria, anemia and hospital admissions during the first year of life. A partnership of 27 research institutions based in Africa, Europe and the U.S., plus WHO and UNICEF, has formed the IPTi Consortium. A coordinated research program in 10 African countries is now in progress to generate additional evidence on efficacy and safety. Thus far, trials in Tanzania and Ghana have produced promising results but no international guidelines have been formulated yet about IPTi.

For more information, visit the IPTi Consortium Web site:
<http://www.ipti-malaria.org>.

OTHER WAYS TO PREVENT MALARIA

Pregnant women are twice as likely to get bitten as non-pregnant women (Lindsay et al. 2000), perhaps because the abdominal skin of pregnant women is slightly warmer than that of non-pregnant women. Although ITNs and IPTp are the most effective ways to prevent malaria in pregnant women, other means of preventing infection are also available. It is important to educate pregnant women to prevent malaria by taking the following additional actions, as appropriate, to minimize contact with mosquitoes:

- Cover doors and windows with wire or nylon mesh/nets to prevent mosquitoes from entering the house.
- Avoid going outside after dark. When out in the evening:
 - Wear protective clothing that covers the arms and legs.
 - Apply chemical mosquito repellent cream on exposed skin surfaces.
 - Use mosquito coils (particularly when sitting outdoors) that release smoke. The smoke keeps mosquitoes away or kills them when they fly through it.
- Spray rooms with insecticide before going to bed every evening. Because the sprays are effective for only a few hours, this method should be used in combination with other measures, such as putting screens on doors and windows.
- Physically kill mosquitoes in the house by swatting them.

HEALTH EDUCATION AND COUNSELING POINTS

- There are many ways of preventing bites and reducing mosquito breeding sites.
- Sleep under ITNs. Where available, LLINs are preferred because they last longer and do not require re-treatment.
- Use of IPTp prevents parasites from attacking the placenta.
- IPTp helps prevent malaria and, in turn, reduces the incidence of maternal anemia, spontaneous abortions, preterm birth, stillbirth and low birth weight.
- IRS programs (where applicable) can be effective in reducing the number of mosquitoes that transmit malaria. They are not a replacement for ITNs and IPTp, but support and enhance these efforts.

FOUR

DIAGNOSIS AND TREATMENT OF MALARIA



LEARNING OBJECTIVES

This chapter outlines how to recognize both uncomplicated and severe malaria, how to treat uncomplicated malaria and how to refer severe malaria cases. After completing this chapter, learners will be able to:

1. Explain why self-diagnosis/treatment may lead to treatment failure or recurring infection.
2. Describe the types of diagnostic tests available for malaria and their advantages and disadvantages.
3. Identify other causes of fever during pregnancy.
4. List the signs and symptoms of uncomplicated and severe malaria in pregnancy.
5. Describe the treatment for uncomplicated malaria in pregnancy.
6. Explain the steps to appropriately refer a pregnant woman who has severe malaria.

MALARIA DIAGNOSIS

A diagnosis of malaria is usually based on signs and symptoms of the patient, clinical history and physical examination and, if available, laboratory confirmation of the malaria parasite. Prompt and accurate assessment will lead to improved differential diagnosis of fever during pregnancy and improved management of non-malarial illness as well as effective case management of malaria.

Self-Diagnosis

In malaria-endemic countries, where there is often limited access to health care, clients who experience symptoms that are usually associated with the disease often rely on self-diagnosis and treatment. But because the symptoms are similar to those of several other common ailments, misdiagnosis is possible. Thus, the client may not take the appropriate medication to address the cause of her illness. Or, she may take the right medicines but not in the correct dosage or for the recommended duration. Any of these scenarios could result in partially treated malaria, continuation of symptoms, development of severe malaria, which could prove fatal, and/or relapse. Correct diagnosis and proper treatment with appropriate drugs, dosage and duration will prevent treatment failures, while the use of ITNs will reduce recurrent infection. When a client who has self-treated presents with symptoms of malaria or reports that symptoms have worsened or recurred, it is possible that she:

Diagnosis and Treatment of Malaria

- Has self-treated with the wrong drug or dosage
- Has not completed the treatment
- May have been given incorrect treatment instructions (or did not understand the instructions)
- Has received a poor-quality or counterfeit drug (this can happen even at health facilities)
- Does not have malaria

Often, clients can purchase drugs without a prescription or verification of diagnosis at pharmacies, local shops, roadside kiosks and other easily accessible locations.

Some clients may present for care before they start treatment. Examples include:

- A pregnant woman who has questions or concerns about self-treatment or how it affects her unborn baby
- A client who wants to be sure of the diagnosis before beginning treatment because of the unpleasant side effects and/or cost of some anti-malaria drugs

Providers have an important role in recognizing the need for malaria detection and/or treatment regardless of the reason the client seeks care. Health messages to emphasize the dangers of incorrect or inadequate treatment for malaria will help to educate the community. Finally, encouraging all clients to seek care from a skilled provider whenever they suspect malaria or experience any danger signs can help prevent problems from self-treatment.

Diagnostic Testing

The introduction of artemisinin-based combination therapy (ACT) for malaria treatment has made it important to ensure the correct diagnosis of malaria, given that the drugs are expensive. Parasitological diagnosis has several major advantages, including:

- Prevents wastage of drugs through unnecessary treatment, resulting in cost savings
- Improves care in parasite-positive patients due to greater certainty of malaria diagnosis
- Prevents unnecessary exposure to malaria drugs
- Confirms treatment failure

The two common methods of diagnostic or parasitological testing for malaria are light microscopy and rapid diagnostic tests (RDTs). Once the woman presents with malaria symptoms and is tested, the results should be

available within a short time (less than 2 hours). When this is not possible, she must be treated on the basis of clinical diagnosis (WHO 2006b).

Microscopy

Malaria infection can be detected by microscope examination of the client's blood, spread out as a thick or thin "blood smear" on a microscopic slide. This blood test, if available, will confirm the presence of malaria parasite and therefore the diagnosis of malaria, and is also useful when a client has vague symptoms. Microscopic examination remains the "gold standard" for laboratory confirmation of malaria. However, where resources are limited, laboratory services may not always be available for microscopic diagnosis due to lack of laboratory personnel, proper equipment or reagents.

- The **thin blood film** is often preferred for routine identification of the parasite because the organisms are easier to see and count. However, the process and small quantity of blood needed for this type of film make it inadequate when the parasite density is low.
- The **thick blood film** concentrates the layers of red blood cells on the slide, using about two to three times more blood than the thin film. It is better than the thin film in detecting low levels of parasites and reappearance of circulating parasites during infection relapses. However, it requires an experienced technician because the process of scanning for parasites among white blood cells and platelets can be difficult.

If facilities for blood testing are not available or negative lab results are received, malaria is considered the most likely diagnosis in a pregnant woman who has recently been exposed to mosquito bites and has symptoms of malaria. The most common symptoms of malaria are fever, chills, headaches, and muscle or joint pains.

Malaria's Incubation Period

The incubation period for malaria is usually between 9 and 30 days, depending on the infecting species (shortest for *P. falciparum*, longer for *P. malariae*). In some strains of *P. vivax*, the incubation period may last some 89 days.

Falciparum malaria, which can be fatal, must always be suspected if fever, with or without other symptoms, develops at any time between 1 week after the first possible exposure to malaria and 2 months (or even longer in exceptional cases) after the last possible exposure.

Adapted from: World Health Organization (WHO). 2004a. Frequently asked questions about malaria. WHO/ Global Malaria Programme: Geneva. At: <http://www.who.int/malaria/faq.html#incubation>.

Rapid Diagnostic Tests

Misdiagnosis of malaria can be a problem when lab testing is not available and may result in complications, incorrect treatment or even death. A promising alternative in the form of Rapid Diagnostic Tests (RDTs) has been developed to provide quick, accurate and accessible malaria diagnosis without the need for laboratory facilities.

RDTs exist in three different formats. Many providers prefer the dipstick, which is less costly than the other formats and easy to use. In countries where ACT has been introduced as first-line treatment for malaria, the use of RDTs can reduce the cost of treatment with ACTs by eliminating unnecessary treatment. However, in some situations, the cost-effectiveness still needs to be evaluated, especially in areas of high malaria transmission. Successful RDT programs also require a “cool chain” for transport and storage, training for providers and a clear policy on action for results (WHO/WPRO 2005).

When is RDT useful?

When used correctly, malaria RDTs can provide a helpful guide to the presence of clinically significant malaria infection, particularly when good quality, microscopy-based diagnosis is unavailable. However, management decisions should not be based on the RDT result alone.

Potential uses for malaria RDTs include³:

- Diagnosis by health workers distant from good microscopy services
- Remote diagnosis for organized workforces in malaria-endemic areas, e.g., military or mining companies
- Outbreak investigation and malaria prevalence surveys
- Self-diagnosis by trained individuals or groups
- “After-hours” diagnosis in hospital labs or clinics
- Diagnosis in suspected drug-resistant or unresponsive malaria

Interpreting RDT results

When using RDTs, remember that a **negative result** does not always exclude malaria because:

- There may be insufficient parasites to register a positive result.
- The RDT may have been damaged, reducing its sensitivity.
- Illness may be caused by another species of malaria parasite that the RDT is not designed to detect.

³ Adapted from: World Health Organization (WHO). 2004e. *The Use of Malaria Diagnostic Tests*. WHO: Geneva. At: www.who.int/tdr/diseases/malaria/files/wpro_guidelines.pdf.

A **positive result** does not always signify malaria illness because:

- The antigen may sometimes be detected after the infecting parasites have died (i.e., after treatment) or due to the persistence of malaria gametocytes that do not cause illness.
- The presence of other substances in the blood may sometimes produce a false-positive result.
- The presence of parasites does not always signify malaria illness in individuals with high immunity because there may be other causes of fever, as described in “Fever during Pregnancy” below.

Maintaining a “cool chain”

Storage between 2° C and 30° C is recommended by RDT manufacturers. Expiry dates are generally set according to these conditions. If storage temperatures exceed these recommended limits, it is likely that the shelf life of the RDTs will be reduced and sensitivity lost before the expiration date.

The development of a “cool chain” starts before shipping from the manufacturer:

- The shipper or air carrier is notified of temperature storage requirements by the manufacturer in writing and in clear markings on cartons and documents.
- The manufacturer initiates shipment only after the consignee confirms that the shipping notice is received.
- Consignees then must arrange to have someone receive the materials so that shipments can be moved immediately to temperature storage of less than 30° C. Personnel should also ensure that shipments are not left on airport tarmacs, in customs sheds or in vehicles.
 - Ground transportation:
 - Ground transportation during any stage of delivery should be carried out with attention to outside temperatures while the vehicle is moving and parked. Avoid leaving RDTs in vehicles parked in the sun.
 - Storage:
 - Storage at any stage before reaching the final destination should conform to manufacturers’ specifications, which is usually < 30° C.
 - Maximize the time RDTs are stored in centralized controlled conditions; minimize uncontrolled storage in remote areas.
 - Select a cool, peripheral storage location; thatch roofing may be cooler than iron; maximize shade.

Indications for diagnostic testing

- In pregnant women, a parasitological diagnosis is recommended prior to starting treatment.
 - Those who live in or have come from areas of unstable transmission are the most likely candidates for severe malaria, which can be life-threatening.
 - It is a test of cure in clients who have been treated for malaria but still have symptoms:
 - If treatment was adequate, clients may have been reinfected or have another problem causing similar symptoms (see section on fever during pregnancy below). Counterfeit or poor quality drugs may also be a cause of treatment failure.

Choosing between microscopy and RDTs

In the event that both RDTs and microscopy are available in a health facility, the decision to use one or the other depends on factors such as the client caseload, availability of skilled lab and clinical personnel, and the need to use microscopy services for other diseases in the local population. Other considerations are outlined in **Table 4**.

Table 4. Comparison of Microscopy and Rapid Diagnostic Testing

DIAGNOSTIC TOOL	SENSITIVITY/SPECIFICITY	COST	ADVANTAGES	DISADVANTAGES
Microscopy	High—when used by well-trained staff	Low (especially when caseload of febrile patients is high)	<ul style="list-style-type: none"> • Can specify and quantify parasites • Can identify other causes of fever • Prevents unnecessary exposure to antimalarials • Can be used to confirm treatment success and failure 	<ul style="list-style-type: none"> • Generally not available outside of health facilities • Requires skilled personnel • Requires lab supplies
RDT	Variable—depends on: <ul style="list-style-type: none"> • Species of parasite • Number of parasites • Condition of RDT • Correct technique • Correct interpretation by reader 	Variable; depends on type of RDT	<ul style="list-style-type: none"> • Can be used in remote settings, communities and homes, making malaria diagnosis more accessible • Can be used by trained individuals or groups • Prevents unnecessary exposure to antimalarials • Easy to use 	<ul style="list-style-type: none"> • Vulnerable to high temperatures and humidity • Requires special handling and storage (“cool chain”) • Can be expensive compared to microscopy • Not yet available in some areas • Practical experience and implementation limited, compared with microscopy • Cost can be high due to transport, storage, training and quality control

Clinical Diagnosis

Clinical diagnosis is based on the patient’s symptoms and on clinical findings at examination. The first symptoms of uncomplicated malaria (most often fever, chills, sweats, headaches, muscle pains, nausea and vomiting) and clinical findings are often not specific and are common to other diseases. Thus, in most cases the early symptoms and clinical findings in malaria are not typical and may need to be confirmed by a laboratory test.

In severe malaria (caused by *Plasmodium falciparum*), clinical findings (confusion, coma, neurologic focal signs, severe anemia, respiratory difficulties) are more striking and may increase the suspicion index for malaria.

The following are current WHO recommendations for clinical diagnosis:

- In general, where the **risk of malaria is low**, clinical diagnosis of uncomplicated malaria should be based on the degree of exposure to malaria and a history of fever in the previous 3 days, with no features of other severe diseases.
- In areas where the **risk of malaria is high**, clinical diagnosis should be based on a history of fever in the previous 24 hours and/or the presence of anemia.

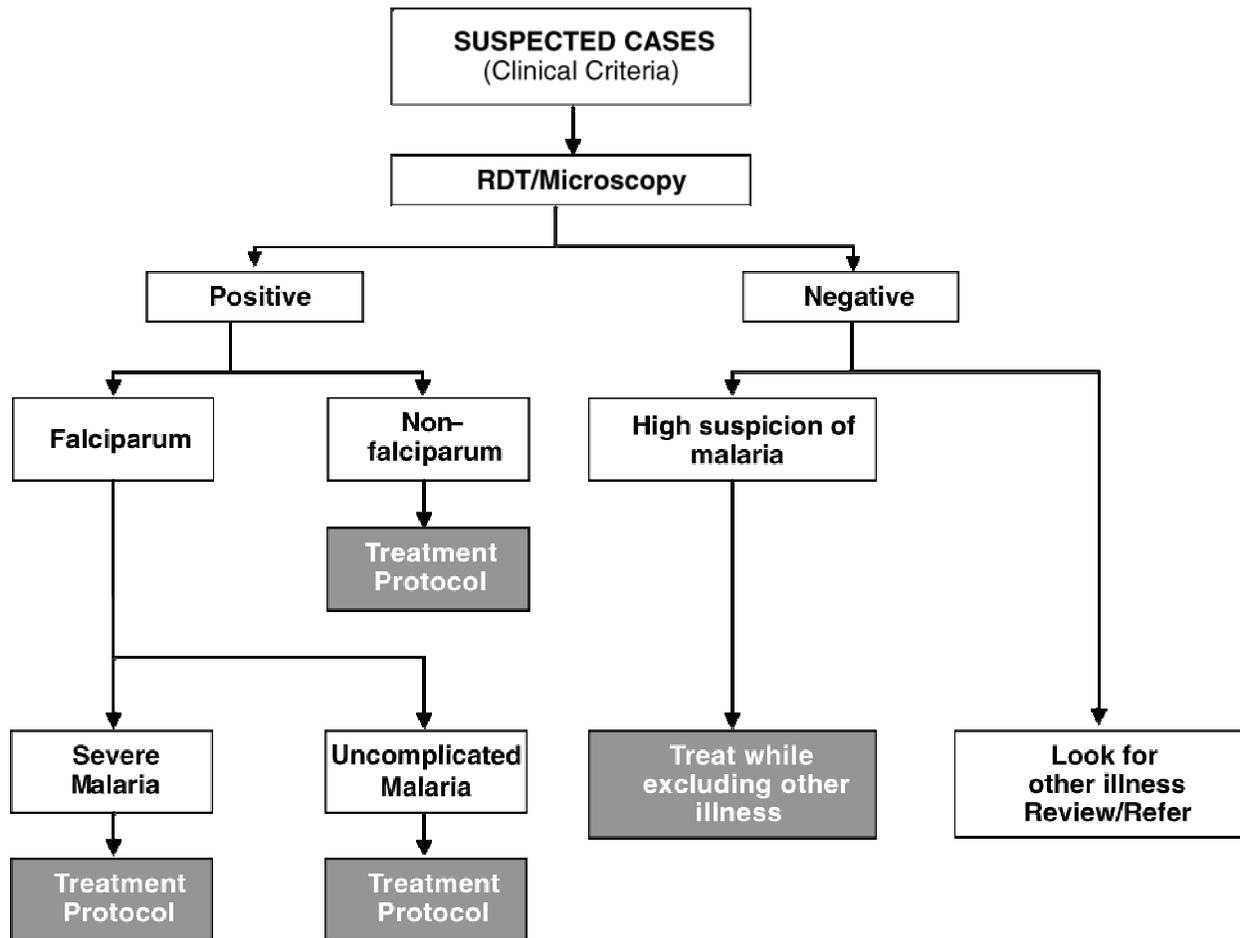
Presumptive Treatment

In highly endemic areas, the great prevalence of asymptomatic infections and lack of resources have led providers to rely on “presumptive treatment.” In other words, patients who suffer from a fever that does not have any obvious cause are presumed to have malaria and are treated for it, based only on clinical signs and physical exam, and without the benefit of laboratory confirmation. This practice is dictated by practical considerations and allows the treatment of a potentially fatal disease. But it can also frequently lead to incorrect diagnoses and unnecessary use of antimalarial drugs. This results in additional expense and increases the risk of developing drug-resistant parasites. In children and pregnant women, however, presumptive treatment may be the best option when diagnostic testing is not available.

Adapted from: Centers for Disease Control and Prevention. 2005. “Malaria: Diagnosis.”
At: http://www.cdc.gov/malaria/diagnosis_treatment/diagnosis.htm.

Figure 9 shows a decision chart for treating malaria based on results of malaria RDT or microscopy.

Figure 9. Sample Decision Chart for Treatment of Malaria in Remote Areas, Based on the Results of Malaria RDT or Microscopy



Source: World Health Organization (WHO) 2004e. *The Use of Rapid Diagnostic Tests*. WHO: Geneva. At: www.who.int/tdr/diseases/malaria/files/wpro_guidelines.pdf.

FEVER DURING PREGNANCY

Fever during pregnancy (a temperature of 38° C or above) can be a common symptom of malaria, especially in areas of unstable transmission if there has been exposure to mosquito bites. Other conditions, however, including bladder or kidney infections, pneumonia and uterine infections, can also cause fever during pregnancy. You may also need to rule out tropical diseases such as typhoid, and dengue or yellow fever, all of which have fever as a primary symptom.

Since fever is also a danger sign in pregnancy, you must quickly ascertain:

- The type, duration and/or degree of fever, and the actual temperature reading

Diagnosis and Treatment of Malaria

- Whether the woman has or has had:
 - Chills/rigors
 - Episodes of a spiking fever
 - Fits/convulsions

In addition to finding out whether the woman has a fever, it is essential that the provider gather as much information as possible from the woman and/or her family to rule out other causes before malaria can be diagnosed. Ask her about or examine her for:

- Use of any drugs for fever or malaria
- Any fluid leaking from the vagina/rupture of membranes
- Foul-smelling, watery discharge from the vagina
- Tender or painful uterus or abdomen
- Headache
- Muscle/joint pain
- Dry or productive cough
- Chest pain and/or difficulty breathing
- Pain or burning when passing urine; urinary frequency, urgency or flank pain
- Other danger signs

Always listen carefully to the client's complaints and concerns. It is also important to remember that the client's history is not limited to her complaints. Additional symptoms may be revealed when the health care provider asks specific questions. Once the history has been obtained, other information is gathered via physical examination and, sometimes, lab tests.

RECOGNIZING MALARIA IN PREGNANT WOMEN

Malaria may be uncomplicated or severe. Although uncomplicated malaria is easily treated, severe malaria may be life-threatening and therefore must be promptly recognized and treated. **Table 5** summarizes the signs and symptoms of uncomplicated and severe malaria. **If you suspect anything other than uncomplicated malaria, give pre-referral treatment/management and refer the woman immediately (see pre-referral and referral guidelines below).**

Table 5. Signs and Symptoms of Uncomplicated and Severe Malaria

TYPE OF MALARIA	SIGNS AND SYMPTOMS USUALLY PRESENT	SIGNS AND SYMPTOMS SOMETIMES PRESENT
UNCOMPLICATED	<ul style="list-style-type: none"> • Fever • Shivering/chills/rigors • Headache • Muscle/joint pains • Loss of appetite • Nausea and vomiting • False labor pains (uterine contractions) 	<ul style="list-style-type: none"> • Enlarged spleen
SEVERE	<p>Symptoms and signs of uncomplicated malaria, plus one or more of the following:</p> <ul style="list-style-type: none"> • Confusion, drowsiness, coma • Fast breathing/breathlessness/difficulty breathing • Vomiting at every feed or unable to feed • Pale inner eyelids, inside of mouth, tongue and palms • Jaundice 	<ul style="list-style-type: none"> • Convulsions • Severe jaundice • Signs of severe dehydration, especially if woman has been vomiting repeatedly: <ul style="list-style-type: none"> – Sudden weight loss – Sunken eyes – Loose skin – Dry mouth • Reduced amount of urine or no urine at all • Spontaneous bleeding from the gums, skin and vein puncture sites

CASE MANAGEMENT OF MALARIA DURING PREGNANCY

Despite preventive measures, some pregnant women will still become infected with malaria. The goal of malaria treatment in pregnancy is to completely eliminate the infection because any amount of parasites in the blood can affect the mother or cause placental infection and thus affect the fetus. After first determining whether the infection is severe or uncomplicated, the provider selects treatment based on the gestational age of the pregnancy and available drugs (i.e., drugs that are approved for malaria treatment in accordance with national guidelines).

Although uncomplicated malaria can easily be treated, severe malaria is more difficult to manage and therefore requires immediate referral. Women may be referred to a higher level of care within the facility or to the nearest location where they can receive appropriate care as quickly as possible.

According to the most recent WHO guidelines on malaria treatment (WHO 2006b), the antimalarials considered safe in the first trimester of pregnancy are quinine, chloroquine (CQ), proguanil and pyrimethamine. Clindamycin is also safe, but must be used in combination with an artesunate drug (see below). Of these, quinine is the drug of choice because it is the most effective and can be used in all trimesters of pregnancy. Other drugs (especially CQ and SP) may be ineffective due to increasing resistance. Drugs that should **never** be given in pregnancy include tetracycline, doxycycline, primaquine and halofantrine.

Treatment with Combination Therapy

In many parts of Africa and worldwide, *plasmodium falciparum* malaria has become resistant to single-drug therapy, resulting in ineffective treatment and increased morbidity and mortality. For this reason, WHO now recommends that countries use a combination of drugs to fight malaria. A major advantage of combination therapy is that drug resistance is far less likely than with single-drug treatments.

Artemisinin-based combination therapy

The simultaneous use of drugs including a derivative of artemisinin (from a plant called *Artemisia annua*), along with another antimalarial drug, is called artemisinin-based combination therapy (ACT). This combination is currently the most effective treatment for malaria.

Overall, ACTs are about 95% effective in curing malaria and are well tolerated by most patients. There is also evidence that ACTs reduce the transmission of *P. falciparum*. For these reasons, nearly 60 countries (half of them in Africa) have changed national policy and adopted ACTs as their first line of treatment, although many have not yet implemented the new policy. One barrier may be the cost of ACTs, which is much higher than that of conventional malaria drugs.

Despite the promising news about ACTs, there are yet some issues that require more research regarding safety in pregnancy (especially the first trimester), drug interactions and strategies for treatment. Some governments want to use combination therapy before malaria becomes resistant to traditional drugs like SP. Then SP will still be effective and reserved for use in IPTp. Other countries are dealing with patient compliance, drug intolerance in some clients and a general lack of clinical experience with combination therapy.

It is important to follow country or regional guidelines regarding which combination therapies to use (if any) and how to use them. For uncomplicated malaria in the first trimester and for severe malaria in any trimester, quinine is the drug of choice. If ACTs are the only effective treatment available, they can be used in the first trimester.

For second and third trimesters, ACTs should be the first-line treatment. If these are not available, give a combination of artesunate and clindamycin or quinine and clindamycin as outlined below.

A pregnant woman who has been treated with ACTs for malaria illness should wait for 2 weeks after completing this treatment before receiving her scheduled dose of IPTp (Newman 2007).

Non-artemisinin-based combination therapy (WHO 2006b)

Non-artemisinin combinations (non-ACTs) include sulfadoxine-pyrimethamine with chloroquine (SP + CQ) or amodiaquine (SP + AQ). However, due to the high levels of CQ resistance and lack of evidence that SP + CQ provides any additional benefit over SP, the SP + CQ combination is **not** recommended. The combination of SP + AQ can be more effective than either drug alone, but needs to be considered in comparison with ACTs. Current treatment guidelines advise that if more effective ACTs are not available, and both SP and AQ are effective (efficacy is greater than 80%), then SP + AQ can be used as an interim measure.

Clients receiving non-ACTs containing SP for treatment of malaria may continue to take IPTp but should wait at least 1 month after completing treatment. Providers should follow local guidelines for details (Newman 2007).

There have been few major side effects associated with combined malaria drugs. Reported side effects are usually minor or not sufficient to cause withdrawal of treatment or medical intervention (Denis et al. 2006; Jima et al. 2005; Mohamed et al. 2006; Tagbor et al. 2006). Pruritis and fatigue, for example, were frequent side effects of amodiaquine in one study (Fanello et al. 2006). Because these are new drug combinations in most settings, possible side effects may not yet be fully known. It is important therefore to carefully monitor patients for any side effects or problems and report them to appropriate authorities in your country. Remember also to counsel women to report any of these problems promptly.

RECOMMENDATIONS FOR TREATMENT OF UNCOMPLICATED MALARIA IN PREGNANCY

WHO recommends the following for treatment of uncomplicated MIP (WHO 2006b). Refer to your country-specific guidelines for what is approved for use in your setting and instructions on usage.

First trimester

- Quinine 10 mg salt/kg body weight three times daily + clindamycin 10 mg/kg body weight twice daily for 7 days:
 - If clindamycin is not available, use quinine only.
- ACT should be used if it is the only effective treatment available.

Second and third trimesters

- Use the ACT known to be effective in the country/region, **OR**
- Use artesunate + clindamycin (10 mg/kg body weight twice daily) for 7 days, **OR**
- Use quinine + clindamycin for 7 days.
- Additional recommendations based on expert opinion:
 - Delay IPTp until 2 weeks after completing ACT.
 - Continue IPTp as scheduled if combination therapy contains SP:
 - Be sure to wait 1 month before resuming IPTp after treatment with therapies containing SP.

Remember: Malaria is not the only cause of fever. If a woman's condition does not improve within 48 hours after starting treatment and/or after starting the second-line drug therapy, suspect other causes of fever during pregnancy.

Management of Elevated Body Temperature

Teach the woman and her caregivers how to control her body temperature by sponging her body with lukewarm water. Also, give paracetamol 500 mg two tablets every 6 hours until her body temperature has returned to normal.

Follow-Up after Treatment of Uncomplicated Malaria

If possible, arrange for a health care provider or community health worker to visit the client's home 2–3 days after treatment has started to check on her progress. Ensure that the client knows the danger signs and when to return to the facility, if needed. If home visits are not available, advise the woman to return to the facility for a follow-up visit after treatment is complete or if her condition worsens.

Most clients will respond to malaria treatment and begin to feel better within 1 or 2 days after starting treatment. If, however, the client's condition does not improve, or worsens, give second-line treatment for uncomplicated malaria following country-specific treatment guidelines.

If the woman's condition still does not improve, refer her immediately to a higher level of care within the facility or to the nearest location where she can receive care as soon as possible.

Severe Malaria

Stabilize and refer the woman immediately if she has any symptoms that suggest severe malaria.

If a pregnant woman presents with convulsions, it is necessary to determine whether they are due to malaria or eclampsia. Gather the following information (**Table 6**) to determine the cause of convulsions/fits:

Table 6. Determining the Cause of Convulsions in Pregnancy

SIGNS/SYMPTOMS	SEVERE MALARIA	ECLAMPSIA
Recent history of fever, chills (from patient or family)	Yes	No
Temperature	≥ 38° C	< 38° C
Blood pressure	Diastolic < 90 mm Hg	Diastolic ≥ 90 mm Hg
Enlarged spleen	Yes	No
Jaundice	Yes	No

- **If eclampsia is suspected**, stabilize and treat with magnesium sulfate per national guidelines and refer.
- **If severe malaria is suspected**, stabilize and treat with quinine and diazepam per national guidelines and refer.

PRE-REFERRAL TREATMENT FOR SEVERE MALARIA⁴

The risk of death from severe malaria is greatest in the first 24 hours. Delaying the start of appropriate antimalarial treatment can result in worsening of the patient’s condition or even death. Treatment should therefore be started immediately, and pregnant women should be given the full dose of parenteral antimalarials before referral. Quinine is the drug of choice in the first trimester, but artesunate is also an option. For the second and third trimesters, IM or IV artesunate is the first and artemether the second option. Rectal administration of artesunate or artemether may be given if injections are not possible.

If referral is necessary, follow these steps:

- Explain the situation to the client and her family.
- Give pre-referral treatment according to local protocols.
- Help arrange transport to the other facility, if possible.
- Include the following information in your referral note:

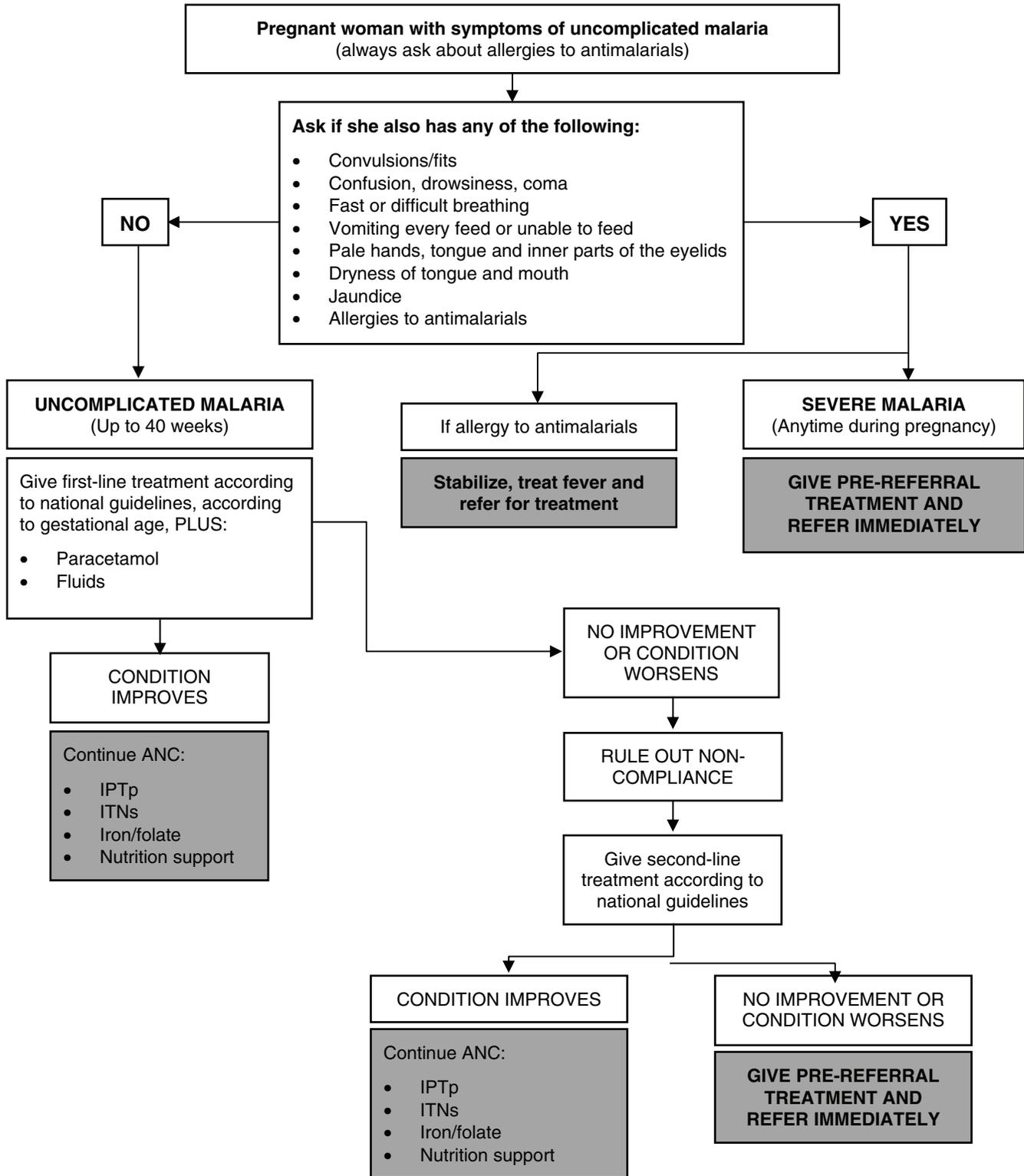
⁴ Adapted from: World Health Organization (WHO). 2004d. *A Strategic Framework for Malaria Prevention and Control during Pregnancy in the Africa Region*. WHO/Regional Office for Africa: Brazzaville. At: www.afro.who.int/malaria/publications/malaria_in_pregnancy_092004.pdf.

Diagnosis and Treatment of Malaria

- Brief history of client's condition
- Details of any treatment provided
- Reason for referral
- Any significant findings from history, physical exam, or lab
- Highlights of any important details of current pregnancy
- Copy of client's ANC record, if possible
- Contact information in case the referral facility or provider has any questions
- Accompany the woman during transport, if possible, and be sure to have sufficient medication available.
- Record information on the ANC card and clinic record.

Case management of malaria during pregnancy is summarized in **Figure 10**.

Figure 10. Case Management of Malaria in Pregnancy



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