CHAPTER 7
INFECTIONS

Prevention Practices
Postpartum Infection
Septic Shock
Malaria
HIV/AIDS
Tuberculosis

Attention: This chapter recommends the use of several drugs that with repeated exposure may cause an allergic reaction or anaphylaxis in some individuals. The management of anaphylaxis is described in Appendix 1.

PREVENTION PRACTICES

Learning Objectives
By the end of this section, the participant will:

1. Explain routine infection prevention practices.
2. Differentiate the different methods of disinfection.

Routine Infection Prevention Practices

The most important and frequent mode of spread of infections is by direct or indirect contact transmission. There are three practices that prevent the spread of infection:
1. Hand washing
2. Practicing universal precautions
3. Ensuring safe handling of sharps

Hand washing is the single most important measure for the prevention of infection. It removes contamination and decreases the natural bacterial load.

When to wash hands

- Before and after contact with patients, bodily substances or specimens, contaminated or soiled items (i.e. waste, linen, countertops, etc.)
- Between "clean" and "dirty" procedures on the same patient
- After removing gloves
- Before and after performing invasive procedures
- After using the washroom
- When hands are visibly soiled

How to wash hands

For routine hand washing, hands should be thoroughly covered with soap and vigorously rubbed together for 15 seconds, covering all surfaces of hands and fingers. Hands should then be rinsed well with running water, and dried with a clean towel or air-dried.

1. Wash hands and up to two inches above wrists thoroughly.
2. Clean under nails.
3. Nails should be short enough to allow thorough cleaning underneath and not cause glove tears.
4. Rinse off soap and dry hands well.

Practicing Universal Precautions

- **Every patient is potentially infected with HIV or Hepatitis B.**

Universal precautions acknowledge that blood and certain body fluids can be infected and can transmit blood-borne pathogens (e.g. hepatitis B, HIV). Refer to Appendix 2 for details regarding "Universal Precautions to Prevent Transmission of Infection with HIV when Assisting at Childbirth".

- **Gloves protect health care personnel and patients**

Gloves should be worn for any contact with patients or contaminated articles when direct exposure to blood, body fluids, mucous membranes, non-intact skin, or undiagnosed rashes is anticipated. Non-sterile gloves should be readily available in patient care areas and utility rooms for routine use. Sterile gloves should be used when the situation demands, e.g. invasive procedures. Where possible, gloves should be used once and discarded after each patient and/or procedure. Hands should be washed after glove removal.

- **Gloves do not replace hand washing**

Additional protective wear such as gowns, plastic aprons, masks, and eye shields are necessary when secretions, blood, or body fluids are likely to soil skin, eyes, mouth, or the clothing of the worker.

*Note***:** *In the health care setting, blood-borne infections are usually transmitted by sharp injuries. Most injuries happen after use, before or during disposal. The following practices will minimize the risk of sharp injuries:*

  - **Do not recap needles. If recapping is necessary, use a one-handed method of recapping.**
  - **Persons using a sharp must dispose of it themselves.**

Cleaning, Disinfection and Sterilization

Disinfectant solutions are used to inactivate any infectious agents that may be present in blood or other body fluids. They must always be available for cleaning working surfaces, equipment that cannot be autoclaved, and non-disposable items, and for dealing with any spillages involving pathological specimens or other known infectious material.

Cleaning of instruments

Instruments should routinely be soaked in a chemical disinfectant for 30 minutes before cleaning. Disinfection decreases the viral and bacterial burden of an instrument, but does not clean debris from the instrument or confer sterility. The purpose of disinfection is to reduce the risk to those who have to handle the instruments during further cleaning.

Disinfection must be performed before cleaning with detergent. Thus after disinfection, the instrument can be cleaned with normal detergent and water to remove the inactivated material and the used disinfectant.

Factors that interfere with sterilization and disinfection include:
- Organic material, such as mucus, blood, pus, feces, saliva, etc.
- Nature of the microbial contamination and the number of organisms present
- Incorrect dilution (improper mixing) of the disinfectant
- Inadequate exposure (contact) time between instruments and sterilant or disinfectant
- In-use dilution of the disinfectant (e.g. addition of wet instruments)
- Loss of strength due to expired date
- Inadequate penetration of the sterilant or disinfectant into the instrument
- Incorrect pH or temperature of the disinfectant
- Water hardness
- Incompatible detergents
- Presence of materials such as rubber and plastic

Disinfection

Disinfection is a relative term. The microbial burden of an instrument is reduced, but not entirely eliminated, by a disinfection process with either heat or chemical agents. The extent of this reduction depends on the intrinsic power of the disinfection process and the innate resistance of the microbial forms present.

Microbes ranked in order of increasing resistance to destruction

- vegetative bacteria (e.g. *Staphylococcus*, *Pseudomonas*)
- lipid or medium-sized virus (e.g. herpes, HIV, hepatitis B, hepatitis C)
- fungi (e.g. *Candida*, *Aspergillus*)
- non-lipid or small viruses (e.g. polio virus, coxsackie virus)
- mycobacteria (e.g. *Mycobacterium tuberculosis*)
- bacterial spores

Disinfection procedures

Disinfection procedures can be divided into three levels: high-level, intermediate-level, and low-level disinfection.

High-level disinfection

Those instruments that are considered to be semi-critical items require high-level disinfection as a minimum requirement. The procedure is effective for all microbial forms, but may not be able to kill large numbers of bacterial spores. The following two types of procedures may be used.

1. **Boiling:** Boiling offers a cheap and readily accessible form of high-level disinfection. It can be accomplished by using a "hot water disinfector" that lowers a trivet of instruments into boiling water. Plain tap water can be used; if scale develops, a descaling agent can be added. It is essential that the contact time be at least 20 minutes after boiling has started.

   Important points include:
   - Change water at least daily.
   - Keep the water level full during the day.
   - Ensure all parts of the instruments are in contact with boiling water (i.e. open scissors and forceps).
   - Wash and dry the boiling vessel at the end of each day.

2. **Chemicals:** High-level disinfection with chemicals has been referred to as "cold sterilization." High-level chemical disinfectants have a demonstrated level of activity against bacterial spores and all other forms of micro-organisms. The capability of killing a bacterial spore is an assurance of the relative power and activity spectrum of the germicide. Thus, if the contact time is long enough, as long as 24 hours, it can be used as a sterilant.

    Some examples of high-level disinfectants are:
    *   glutaraldehyde preparations
    *   hydrogen peroxide
    *   sodium hypochlorite

    Note: Sodium Hypochlorite (1:50 dilution): Chlorine compounds, such as sodium hypochlorite (household bleach), require a contact time of 20 or more minutes. The compounds are very corrosive to stainless steel. A1:50 dilution of household bleach, 1 teaspoon in 1 cup of water (5ml of bleach in 240 ml of water), provides 1000 ppm of available chlorine, and is a high-level disinfectant. After disinfection, instruments must be thoroughly rinsed with sterile water and then air-dried or dried using a sterile cloth. Sodium hypochlorite solutions should be prepared weekly and stored at room temperature in an opaque container to ensure the concentration is maintained.

Antiseptics

An antiseptic is a chemical agent intended for use on skin or tissue. It reduces the less resistant, non-spore forming micro-organisms on the skin and mucous membranes.

What are antiseptics for?

*   patient skin preparation
*   skin wound cleanser
*   hand-washing agent and surgical scrub

Remember that for the antiseptic to be effective, it must be applied for at least 30 seconds and allowed to dry. Some preparations are used as both antiseptics and disinfectants (e.g. alcohol), but they are produced in different formulations and are therefore not interchangeable for these two tasks.

The following agents are commercially available as antiseptic agents:

*   isopropyl alcohol (70–90%)
*   chlorhexidine gluconate (4%, 2% detergent base, 0.5% tincture)
*   iodine and iodophor (10%, 7.5%, 2%, 0.5%)

Routines for Disinfection of Work Areas

*   General housekeeping routines involve cleaning and disinfecting surfaces and objects with a low-level disinfectant. Cleaning of body fluid spills requires special consideration.
*   **Do not use antiseptics as cleaning agents for surfaces or instruments; they are not disinfectants.**

Cleaning materials and practices

The following detergent disinfectants are suggested for use in the daily cleaning and disinfection of all surfaces:

- phenol
- iodophor
- quaternary ammonium compounds
- sodium hypochlorite (1:100 dilution prepared weekly)—a disinfectant that can be used for some environmental cleaning as outlined below.

Always have a bottle of appropriately diluted disinfectant available. Sodium hypochlorite solutions should be prepared weekly and stored at room temperature in an opaque container to ensure the concentration is maintained.

Can the detergent be used on everything?

Yes, it can be used on:
- baby scales
- table tops
- floors
- sinks
- toilets

Note: Uncovered examination tables should be cleaned between patients. For covered tables, table covers, linen, paper, plastic, etc., should be changed between patients. If there is a body fluid spill, clean and disinfect the table after removing the cover, otherwise clean the table daily.

Spot cleaning of body fluid spills

- If possible, wear gloves while cleaning.
- Wipe up as much of the visible material as possible with cloth and dispose in a garbage container.
- Clean the spill area with the prepared disinfectant detergent. Rinse and dry with a clean cloth.

After the spills are wiped up and cleaned, disinfect the surface with the 1:100 dilution of bleach by putting a small amount of the solution on the area and wiping it with a clean towel.

Sterilization

Before sterilization, all equipment must be disinfected and then cleaned to remove debris. Sterilization is intended to kill living organisms, but is not a method of cleaning.

Table 1 – Classification of medical instruments

Class	Use	Reprocessing
Critical	Enters sterile body site or vascular system	Cleaning followed by sterilization
Semi-Critical	Comes in contact with intact mucous membranes or non-intact skin*	Cleaning followed by high-level disinfection
Non-Critical	Comes in contact with intact skin	Cleaning followed by low- or intermediate-level disinfection**

*Non-intact skin was not included in Spaulding's original description.**For some instruments, intermediate-level disinfection may suffice (e.g. thermometers, ear syringe nozzle).

Table 2 – Procedures for sterilizing instruments

Procedure	Exposure Time	Temperature
1. Steam Autoclave	According to user guide.	
Unwrapped instruments	20 minutes	121–132°C
Small wrapped packs	30 minutes	121–132°C

Note: Distilled water is recommended as the water source to prevent scale deposits on the instruments. Unwrapped instruments should be used immediately or aseptically placed in a sterile container. "Flash sterilization" or rapid steam sterilization is not an acceptable option for routine sterilization in the outpatient setting.

Procedure	Exposure Time	Temperature
2. Hot-Air Oven	1 hour	170°C

Note: *Only items that cannot be sterilized by autoclaving should be considered for hot-air oven sterilization.* Powders, oils, and creams are examples of items for which dry heat sterilization is recommended.

Key Messages

1. Each health care provider should be familiar with and routinely use universal precautions to protect themselves, the woman, and her family.
2. To prevent infections, routine preventative practices must be used in conjunction with the disinfection and sterilization of instruments, use of antiseptics, and disinfection of work area.

Resources:

- College of Physicians and Surgeons of Ontario. *Infection Control in the Physician's Office*. January 1999.
- WHO. *Guidelines on Sterilization and High Level Disinfection Methods Effective Against Human Immunodeficiency Virus (HIV)*. WHO AIDS Series, No. 2. 1989.
- WHO Library cataloguing-in-Publication data. *Surgical Care at the District Hospital, Chapter 2.* Malta: Interprint Limited; 2003.

POSTPARTUM INFECTION

This section has been adapted with permission of the author and publisher from the book, *Essential Management of Obstetric Emergencies* by Thomas F. Baskett.

Learning Objectives
By the end of this section, the participant will:

1. Describe the clinical features and management of each type of postpartum infection.
2. Identify the predisposing factors to postpartum infection.

Definition

Postpartum infection also known as **puerperal sepsis** is an infection of the genital tract occurring at any time between the onset of rupture of membranes or onset of labor and the 42nd day post partum. Fever of >38.5ºC plus one or more of the following must be present: pelvic pain, abnormal discharge (e.g. presence of pus), abnormal smell or foul odor of discharge, delay in the rate of reduction of size of uterus (<2 cm/day during first 8 days).

Incidence and Scope

Postpartum infection remains the second most frequent direct cause of maternal death. Puerperal sepsis is a significant threat in many developing countries. One out of 20 women giving birth develops an infection that needs prompt treatment so as not to become fatal or leave sequelae.[14] Puerperal sepsis leads to tubal occlusion and infertility in 450,000 women per year. Secondary infertility may result in loss of social status for the woman, who may be abandoned by her husband and family.

Postpartum infection occurs less frequently with vaginal births, and is more common among women delivered by caesarean section. It may be a result of unhygienic practices during delivery, excessive vaginal examinations, operative delivery (forceps or vacuum). It is associated with increased rates of STDs and HIV/AIDS. Serious puerperal infections are more likely to occur after prolonged or obstructed labor. The most serious complications include septic shock, pelvic abscesses, and septic pelvic thrombosis.

Pathophysiology

The normal flora of the female lower genital tract contains many potential pathogens. It is this endogenous source that provides the causative organisms for most cases of puerperal pelvic infection. Group A beta-hemolytic streptococci spread from exogenous sources during labour remains significant.

Bacteria

Most infections are polymicrobial, including a mixture of aerobic and anaerobic bacteria in the woman's lower genital tract. The most commonly involved organisms are anaerobic streptococci, *Escherichia coli, Klebsiella, Proteus,* and *Bacteroides fragilis*. Other less common ones include *Clostridium, Staphylococcus aureus, and Pseudomonas*. Group B beta-hemolytic streptococci are more likely to cause neonatal sepsis, but can also cause puerperal pelvic infection.

Factors that protect against infection

- Amniotic fluid (bactericidal)
- Number and activity of white blood cells that increase during labour and in the early puerperium

Predisposing factors to puerperal sepsis

- Trauma and tissue necrosis of the lower genital tract following delivery allow access and provide a culture medium for ascending infection.
- Cesarean section is the most important predisposing factor. The suturing and ischaemic necrosis of the infected tissue along with the uterine incision provides an ideal environment for sepsis.
- Prolonged labour and ruptured membranes leading to chorioamnionitis.
- Trauma and tissue necrosis associated with vaginal delivery. The following factors have been incriminated as increasing the risk, though by no means consistently:
  - Forceps delivery
  - Episiotomy
  - Manual removal of placenta
  - Repeated vaginal examinations during labour
  - Intrauterine manipulation (e.g. internal version)
  - Internal monitoring of the fetal heart and uterine contractions
  - Prolonging the second labour
    - Infection of the reproductive tract
- Low socio-economic status that may be linked with poor nutrition and poor hygiene.

The initial infection, endomyometritis, is usually confined to the endometrium and myometrium. If not adequately treated, the infection may spread directly or via the lymphatics to cause parametritis, salpingo-oophoritis, pelvic peritonitis, septic pelvic thrombophlebitis, pelvic abscess, generalized peritonitis, and intra-abdominal abscesses with associated bacteremia and septicemia.

Clinical Features

Puerperal pelvic infection can present with varying degrees of symptoms and signs. Mild endometritis usually presents 2–3 days after delivery with a low-grade temperature, lower abdominal pain, and slight uterine tenderness. Cases of severe endomyometritis present with a high temperature (>38.5° C), general malaise, anorexia, foul lochia, abdominal pain, uterine tenderness, and subinvolution. As the infection spreads beyond the uterus, parametrial tenderness and signs of pelvic and generalized peritonitis may develop.

With appropriate treatment, it is rare for a pelvic abscess to develop. This should be suspected if the woman is ill with spiking temperature, vomiting with lower abdominal pain and ileus, and a tender mass in the pelvis. The latter can be hard to feel and ultrasound examination may be of help in localizing an abscess.

Puerperal sepsis due to group A beta-hemolytic streptococci may run a fulminant course with a rapidly progressive pelvic cellulitis, peritonitis, and septicemia. If group A beta-hemolytic streptococci is cultured, health care facility personnel must be screened to try and identify the source.

Diagnosis

When a recently delivered woman develops a temperature, a careful clinical appraisal should consider the following sites of infection:

1. Endomyometritis
2. Urinary tract
3. Episiotomy site
4. Abdominal incision
5. Pulmonary—if general anesthesia used
6. Epidural site
7. Breast

8.   Thrombophlebitis: legs, pelvis, intravenous site
9.   Appendicitis
10. Other: upper respiratory infection

Low-resource setting

Where laboratory services are limited, the health care provider will need to rely on their clinical judgement by taking a good history, completing a thorough clinical examination, and using their clinical skills to make a diagnosis and develop a management plan. Once a differential diagnosis is made, constant monitoring and reassessment is necessary to ensure that the treatment is effective. If the woman's condition does not improve, her diagnosis should be re-evaluated and treatment adjusted until she improves. In these situations consultation and review of specific cases with other members of the health care team is highly valuable. Referral to a setting with increased access to laboratory services may be advised.

Higher-resource setting

If the clinical picture suggests endomyometritis, the following cultures should be taken:

- Vaginal and cervical cultures are of value to seek the acquired organisms—C*hlamydia*, gonococci, and group A beta-hemolytic streptococci, as well as the endogenous group B beta-hemolytic streptococci.
- Intrauterine aerobic and anaerobic cultures are the ideal but hard to get. If the cervix is cleansed, a soft catheter can be passed and the uterine contents aspirated with a sterile syringe.
- Blood, urine, and incision sites may also be cultured if clinically indicated.

At the time of cesarean section in high-risk cases, it is advisable to take intrauterine aerobic and anaerobic cultures.

Prevention of Postpartum Infection

Although most of the causative organisms are endogenous, this should not be an excuse for poor technique. The value of correct aseptic technique, limiting of pelvic examinations during labour, and minimizing trauma to the tissues during operative delivery should not be underestimated.[1]

Over the last 15 years, the use of prophylactic antibiotics at the time of cesarean section has consistently been shown to reduce postoperative febrile morbidity and the duration of the hospital stay.[2,3] Women who have a cesarean section in labour should be given 1 gram of intravenous ampicillin when the cord is clamped and two further doses at 6-hour intervals.

A single dose of prophylaxis can also be effective. However, for women with a prolonged rupture of membranes during labour and with risk factors for infection, antibiotic prophylaxis may be indicated. It seems illogical that antibiotic prophylaxis that is effective only against aerobes should be so effective in preventing sepsis known to have anaerobic involvement in the majority of cases. However, it is likely that the reduction of aerobic bacterial infection cuts down the tissue destruction and pus formation that provide the conditions necessary for the anaerobic bacteria to multiply. This allows the normal host defenses to cope with the anaerobes.

Treatment of Postpartum Infection

Most cases of endomyometritis are caused by mixed infection with both aerobes and anaerobes. The choice of antibiotics will depend on their availability and expense, as well as knowledge of local organisms and their sensitivity. Treatment is usually based on the medical history of the woman and the most likely bacteria involved.

Even in settings where cultures are available, treatment usually must be started before the results are available. Development of broad-spectrum cephalosporin and new penicillin treatment options allows patients to be treated with a single, less toxic antibiotic dose. In practice, the following guidelines are appropriate:

- Mild cases of endomyometritis following vaginal delivery will usually respond to a single, broad-spectrum antibiotic such as ampicillin 1 gram 4–6 hourly by IV
- Mild cases of endomyometritis following caesarean delivery should be given intravenous antibiotics in the form of:

  - Flagyl 500 mg 3 times a day
  - Cefoxitin 2 g 6 hourly
  OR
  - Aminoglycosides (gentamicin or tobramicin) 60–100 mg 8 hourly, plus clindamycin 900 mg 8 hourly
  - Some countries use the penicillin-gentamicin combination
  OR
  - Ampicillin-clindamycin-gentamicin

If the fever lasts 48–72 hours after initiation of treatment, an infection by an organism resistant to the chosen antibiotics should be suspected. If there is no uterine infection, the antibiotics will have to be changed, depending on culture test results if carried out, and if not, on the basis of probability. Thus, for women who were initially treated with an aminoglycoside-clindamycin combination therapy, penicillin may be added (5 million units 6 hourly) to cover enterococci, which is the responsible organism most resistant to aminoglycoside-clindamycin. Women who started with Cefoxitin may switch to the clindamycin-aminoglycoside-penicillin combination.

Treatment with intravenous antibiotics must continue for 48 hours after fever and symptoms have disappeared. Oral antibiotics should be instituted for 5 days.

The more antibiotics used, the greater the risk of maternal toxic effects, particularly necrotizing colitis. For this reason, the first option is using a single antibiotic or a double antibiotic therapy, which in most cases is adequate.

Antibiotics will appear in breast milk in small amounts. In most instances, this is probably of no clinical significance. However, it must be remembered that the neonate with immature enzyme systems may not excrete the antibiotic efficiently and thus get a cumulative effect.

Management of Potential Complications of Postpartum Infection

Episiotomy infection

If recognized early, the episiotomy would usually successfully treated by antibiotics, sitz baths, and heat lamp. If there is any discharge or pus, removal of sutures to allow drainage is required. This is usually all that is needed; even quite large gaping areas will granulate and heal well in the ensuing weeks. Debridement and re-suturing are rarely necessary, and must be delayed until all infection is eradicated.[4]

Necrotizing fascitis

This is a very rare, but serious condition with a high mortality that may follow vaginal delivery and episiotomy. The organisms involved are usually mixed aerobes and anaerobes. The clinical picture is one of rapid progression of local inflammation and edema followed by gangrene and necrosis of the skin and underlying fascia. The woman is toxic and febrile. High-dose antibiotics in a manner similar to that for septic shock should be given. The most important part of treatment is early and extensive surgical debridement.

Puerperal mastitis

This infection may occur on a sporadic or epidemic basis. The offending organism is usually *Staphylococcus aureus*, which is often penicillin-resistant. Other organisms less commonly incriminated are *Streptococcus pyogenes, Staphylococcus albus* and *Escherichia coli*. The source of infection is the baby, the mother, or the health professional. Nipple fissures, milk stasis, poor hygiene, and poor technique are predisposing factors. The onset of mastitis is usually between 1 and 3 weeks post partum, but can be any time during lactation. The clinical presentation is fever, chills, and pains, along with local tenderness, swelling, and redness in the breast—often the upper outer quadrant.

The following treatment for mastitis
- The mother should be treated with penicillin G or penicillinase-resistant penicillin, such as methicillin or cloxacillin.
- Breastfeeding should not be discontinued. The breast should be thoroughly emptied by feeding and manual expression. The importance of emptying the breasts and avoiding stasis cannot be overemphasized.

Most cases will resolve rapidly with the above treatment, although the antibiotics should be continued for 7 to 10 days.

If a breast abscess develops, it should be drained. Antibiotics should also be given as above.

Prevention of mastitis includes:
- Good latch and positioning of baby at the breast
- Frequent nursing and proper care of blocked ducts—breast massage and the application of warm compresses (clean clothes soaked in very warm water and applied to the area that is red and/or sore)
- Education of women about signs and symptoms of blocked ducts and mastitis so that they know when to seek help or learn how to prevent this from happening.

Traditional birth attendants and other local healers may have methods of treating mastitis that are easy to use and low cost. For instance, women in North America are frequently advised to use cabbage leaves as a compress. Other remedies that have been reported as effective include application of grated raw potato covered with a cloth over the inflamed area. Similar remedies may be part of local health practices, and should be encouraged.

Septic pelvic thrombophlebitis

This infection is more likely to be associated with anaerobic sepsis. The incidence of this condition has fallen with earlier recognition and better treatment of anaerobic infections. The diagnosis is usually made in a woman already on adequate antibiotic coverage, without evidence of a pelvic abscess, in whom a high spiking fever persists. On rare occasions, there may be septic pulmonary emboli. Usually, the diagnosis is impossible to confirm absolutely and is one of exclusion. The treatment is intravenous heparin infusion, which reduces the risk of embolization and also seems to improve the woman's response to the pelvic infection. If the diagnosis is correct, the response is usually dramatic, with resolution of the fever within 24 to 72 hours of initiation of heparin treatment.

Key Messages

1. Know the predisposing risk factors to infection in order to prevent infection during the postpartum period whenever possible.
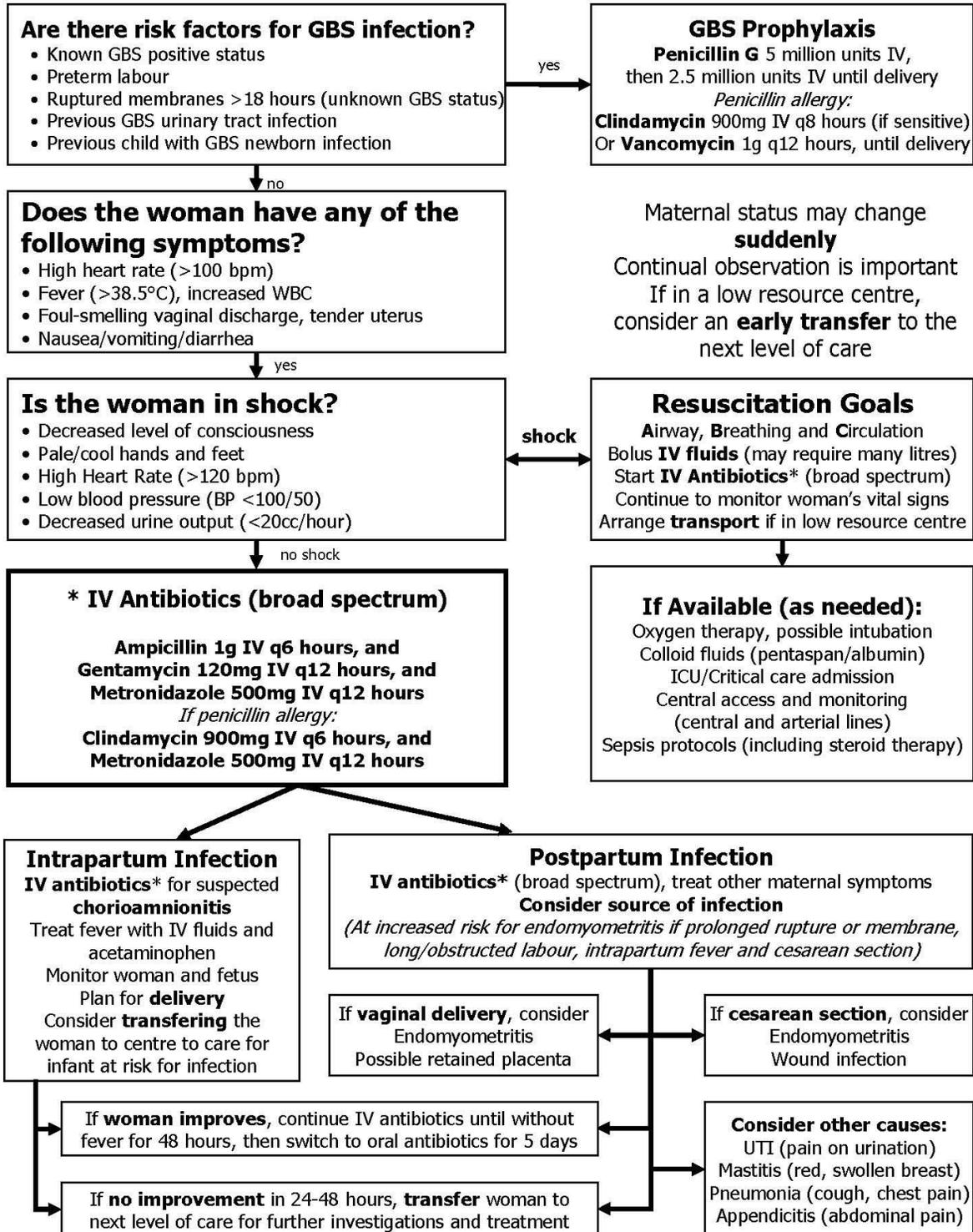2. Educate women about the signs and symptoms of postpartum infection so they know when to seek care.

Resource:
- Baskett TF. *Essential Management of Obstetric Emergencies*. 4th Ed. Bristol: Clinical Press Ltd; 2004: pp 231-236.

Intrapartum and Postpartum Infection Management

www.sogc.org

Are there risk factors for GBS infection?
- Known GBS positive status
- Preterm labour
- Ruptured membranes >18 hours (unknown GBS status)
- Previous GBS urinary tract infection
- Previous child with GBS newborn infection

yes →

GBS Prophylaxis
Penicillin G 5 million units IV,
then 2.5 million units IV until delivery
Penicillin allergy:
Clindamycin 900mg IV q8 hours (if sensitive)
Or **Vancomycin** 1g q12 hours, until delivery

↓ *no*

Does the woman have any of the following symptoms?
- High heart rate (>100 bpm)
- Fever (>38.5°C), increased WBC
- Foul-smelling vaginal discharge, tender uterus
- Nausea/vomiting/diarrhea

Maternal status may change
suddenly
Continual observation is important
If in a low resource centre,
consider an **early transfer** to the
next level of care

↓ *yes*

Is the woman in shock?
- Decreased level of consciousness
- Pale/cool hands and feet
- High Heart Rate (>120 bpm)
- Low blood pressure (BP <100/50)
- Decreased urine output (<20cc/hour)

← *shock* →

Resuscitation Goals
Airway, **B**reathing and **C**irculation
Bolus **IV fluids** (may require many litres)
Start **IV Antibiotics*** (broad spectrum)
Continue to monitor woman's vital signs
Arrange **transport** if in low resource centre

↓ *no shock*

* IV Antibiotics (broad spectrum)

**Ampicillin 1g IV q6 hours, and
Gentamycin 120mg IV q12 hours, and
Metronidazole 500mg IV q12 hours**
If penicillin allergy:
**Clindamycin 900mg IV q6 hours, and
Metronidazole 500mg IV q12 hours**

If Available (as needed):
Oxygen therapy, possible intubation
Colloid fluids (pentaspan/albumin)
ICU/Critical care admission
Central access and monitoring
(central and arterial lines)
Sepsis protocols (including steroid therapy)

Intrapartum Infection
IV antibiotics* for suspected
chorioamnionitis
Treat fever with IV fluids and
acetaminophen
Monitor woman and fetus
Plan for **delivery**
Consider **transfering** the
woman to centre to care for
infant at risk for infection

Postpartum Infection
IV antibiotics* (broad spectrum), treat other maternal symptoms
Consider source of infection
*(At increased risk for endomyometritis if prolonged rupture or membrane,
long/obstructed labour, intrapartum fever and cesarean section)*

If **vaginal delivery**, consider
Endomyometritis
Possible retained placenta

If **cesarean section**, consider
Endomyometritis
Wound infection

If **woman improves**, continue IV antibiotics until without
fever for 48 hours, then switch to oral antibiotics for 5 days

If **no improvement** in 24-48 hours, **transfer** woman to
next level of care for further investigations and treatment

Consider other causes:
UTI (pain on urination)
Mastitis (red, swollen breast)
Pneumonia (cough, chest pain)
Appendicitis (abdominal pain)

SEPTIC SHOCK

This section has been adapted with permission of the author and publisher from the book, *Essential Management of Obstetric Emergencies* by Thomas F. Baskett.

Learning Objective
By the end of this section, the participant will:

1.   Recognize the signs and symptoms of septic shock, and state the appropriate management.

Definition

Septic shock is may be present in a woman with a fever of 38.5°C 48 hours following an abortion, or a vaginal or operative delivery, with a uterine infection that appears toxic, and with hemodynamic and acid-based equilibrium changes. Clinically observable changes will include a blood pressure less than 90/60 combined with a pulse over 100.

Septic shock

Septic shock is a complication of abortions and may also occur following childbirth. It is associated with chorioamnionitis, puerperal endomyometritis, and pyelonephritis. In countries with modern maternity care practices and easy access to medically induced abortions, the incidence has fallen markedly in the past 20 years.

Septic abortion

This infection is defined as an abortion complicated by infection. Sepsis may result from infection if organisms rise from the lower genital tract following either spontaneous or unsafe abortion. Sepsis is more likely to occur if retained products of conception (all or parts of the placenta or membranes) and evacuation has been delayed. Sepsis is a frequent complication of unsafe abortion involving unsterilized instruments and procedures.

Etiological Agents

In the majority of cases, gram-negative bacteria are responsible, especially *Escherichia Coli* and species of *Klebsiella, Enterobacter, Proteus, Pseudomonas,* and *Bacteroides*. Gram-positive bacteria are incriminated less often, but staphylococci, anaerobic streptococci, and the clostridia can cause a similar picture.

Pathophysiology

The exact mechanisms involved in the pathophysiology of septic shock are not fully understood. It was thought to be a direct action of the endotoxin released from the cell wall of the gram-negative bacteria. It is now felt that the endotoxin exerts its effect indirectly by initiating a series of complex events involving the complement, coagulation, and fibrinolytic systems.

Through these systems and released chemical mediators such as prostaglandin, catecholamine, histamine, glucocorticoids, beta-endorphin, and lysosomal enzymes, profound cardiovascular changes occur.

Vasoconstriction, hypotension, and reduced tissue perfusion (cold phase) leading to hypoxia, metabolic acidosis, and cardiovascular collapse, following initial vasodilatation and increased capillary permeability (warm phase). The reduced tissue perfusion is manifested by oliguria, adult respiratory distress syndrome (shock lung), intractable hypotension, coma, and eventual death.

Clinical Features

The signs and symptoms of the associated cause: septic abortion, puerperal endomyometritis, pyelonephritis, for example, will be present.

- Warm shock phase: In the initial stage of vasodilatation, the woman may be alert, tachycardiac, and hypotensive, but with warm peripheries.
- Cold shock phase: Later on as vasoconstriction supervenes, the woman becomes less alert, remains tachycardiac and hypotensive, but the peripheries are pale and clammy.
- In a woman with a septic abortion, hypotension develops that seems out of proportion to the blood loss, septic shock should be suspected. A rapid intravenous infusion of 500–1000ml normal saline or Ringer's should correct the hypotension if the shock is due to hypovolemia, but not if it is due to sepsis.
- Temperature is usually elevated (38°C to 41°C) initially, but the woman can become hypothermic or hyperthermic as the reduced tissue perfusion upsets the hypothalamic temperature regulating function.
- The white cell count may be normal or elevated, with the differential showing increased immature granulocytes.
- The end-organ sequelae of reduced-tissue perfusion, with increasing hypoxia and acidosis, are oliguria, adult respiratory distress syndrome, cardiac failure, peripheral circulatory collapse, and coma.

Management of Septic Shock

Just as the exact pathophysiology is uncertain, so the treatment of septic shock is controversial and still evolving. If at all possible, the assistance of appropriate expertise should be enlisted. The actions are the following:

1. Check vital signs

2. Ensure the women's airway is open. If woman is unstable and oxygen available, give oxygen 6–8 L by mask or nasal cannula.

3. Ensure circulation AND tissue perfusion.
   - Give IV fluids if woman becomes unstable (Ringer's lactate or isotonic saline solution) at a rate of 1 L in 15 to 20 minutes or faster. If in septic shock, the rapid administration of several litres to restore fluids balance may be required.

4. Treat with intravenous antibiotics. The initial antibiotic combination must cover all likely causative organisms and sensitivities. This, and the availability of antibiotics, will vary in different locations. A suitable routine involves three antibiotics.
   - Penicillin G: 5 million units 4 hourly or ampicillin 1 g 4 hourly.
   - An aminoglycoside (gentamicin or tobramycin): 1.0–1.5 mg/kg 8 hourly. Care must be taken due to the potential ototoxicity of the aminoglycosides. In women with oliguria , dose adjustment based on drug serum levels is advisable.
   - Metronidazole: 500 mg 8 hourly.

   The combination of penicillin and the aminoglycoside will cover most of the probable pathogens except *Bacteroides fragilis* and some species of *Pseudomonas*. The metronidazole will cover the *Bacteroides*. Alternatives to metronidazole are clindamycin, cefoxitin. If *Pseudomonas* species are isolated, carbenicillin or ticarcillin may be necessary.

5. Proceed to removal of the septic focus.
   - Definitive treatment with sepsis requires prompt treatment that can be life-saving. Uterine evacuation by manual vacuum aspiration (MVA) is an essential part of the treatment. All sources of infection must be treated.

- MVA is the preferred method of evacuation of uterus (see Appendix 3 in Chapter 8, Post Abortal Care, for the MVA procedure).
- Evacuation by sharp curettage should only be done if MVA is not available.
- Evacuation of the uterus by dilatation and curettage or oxytocin is indicated.
- Exploratory laparotomy may be considered if the woman's condition does not improve.
- Hysterectomy may be required in women who do not respond to treatment following curettage, suggesting that the process has progressed to myometrial microabscess formation. Hysterectomy may also be required in women who have severe clostridial infections and extensive myometrial gas formation and have not responded to other treatments.

6. Give tetanus toxoid if vaccination history is uncertain or if the woman has been exposed to tetanus.

7. Consider the possibility of intra-abdominal injury, pelvic abscess, peritonitis, gas gangrene, or tetanus. If the woman has an intrauterine device in place, it should be removed after starting IV antibiotics.

8. After treating the cause of infection, continue checking the vital signs, urine output, and fluid replacement; adjust supportive treatment (oxygen, antibiotics, and other medication) as indicated by the condition of woman.

9. Laboratory investigations and X-rays: Depending on the severity of the woman's condition, the following investigations may be needed.
- Culture and Gram stain of the urine, blood, and septic site
- Haemoglobin, hematocrit, platelets, white cell count, and differential
- Coagulation profile
- Serum electrolytes, creatinine, and blood urea
- Arterial blood gases
- Urinalysis
- Chest X-ray
- Abdominal and pelvic X-ray looking for air under the diaphragm or a foreign body, either of which may indicate uterine perforation. In cases of suspected clostridial sepsis, there may be a myometrial gas pattern.

10. Maintain circulation and tissue perfusion: Monitor the woman's urinary output and mental state. In a high resource setting, these observations may be combined with central venous pressure (CVP) measurements, urinary output, and the woman's mental state. CVP will also allow guided transfusion of appropriate blood, colloid, or crystalloid solutions. In the critically ill woman, insertion of a Swan-Ganz catheter may be necessary.

The use of vasoactive drugs is controversial, and must be guided by experts. The beta-adrenergic properties of isoproterenol and dopamine may enhance peripheral tissue perfusion. Naloxone has been used to counteract beta-endorphin-induced hypotension. If congestive heart failure develops, the woman is digitalized. Corticosteroids are advocated by most authorities, but their use is still controversial. They are usually given in doses of 2 g of hydrocortisone intravenously every 4 hours (or equivalent dose of another corticosteroid).

Metabolic acidosis is corrected with intravenous sodium bicarbonate.

11. Respiratory support may be required with oxygen and mechanical ventilation monitored by arterial blood gases.

12. Disseminated intravascular coagulation may require specific treatment.

Key Message

1. Recognition of the clinical features and provision of appropriate treatment is important to prevent shock and death.

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MALARIA IN PREGNANCY

Learning Objectives
By the end of this section, the participant will:

1. Describe the epidemiology of malaria.
2. Recognize the effects of malaria on the mother and fetus.
3. Identify appropriate prevention and treatment strategies of malaria in pregnancy.

Definition

Malaria is a disease transmitted by the female *Anopheles* mosquito and caused by parasitic protozoa of the genus plasmodium. There are four different types of species, namely *Plasmodium falciparum*, *P. vivax*, *P. malariae,* and *P. ovale,* that infect human erythrocytes and insect hosts. The most virulent of these is *P..falciparum*.

Incidence

Malaria contributes to significant mortality and morbidity and imposes a great burden on health care systems worldwide. It is mainly a disease of the tropics that affects 300-500 million people yearly and causes more than 2 million deaths. Sub-Saharan Africa is the region mostly affected by malaria.

Globally, sub-Saharan Africa accounts for:
- 60% of malaria cases
- about 75% of global falciparum malaria cases
- more than 80% of malaria deaths

In high-transmission African countries, malaria accounts for:
- 25%−35% of all outpatient visits are malaria related cases
- 20%−45% of hospital admissions
- 15%−35% of hospital deaths

The most vulnerable age groups to malaria are children especially below the age of 5 years and pregnant women.

Effects of Malaria on Pregnancy

The effect of malaria on pregnancy is dependant on the level of transmission of malaria of an area. These areas are described as **"**high" or **"**low" areas of transmission.

High-transmission area

In these areas, malaria is endemic or stable. People from these areas have continual exposure to the parasite and tend to develop partial immunity to the disease. In these areas, it is children who are most at risk of severe malaria and death.

When a woman from these areas becomes pregnant her immunity to malaria becomes reduced, making her more susceptible to malaria infection and increasing the risk of illness, severe anemia and death. In a first pregnancy, a woman who has previously developed partial immunity may present like someone who is not immune to malaria, become very sick and have serious outcomes. However, in a subsequent pregnancy, the infection does not usually result in fever or any other of the usual clinical symptoms.

In areas of high transmission, malaria is associated with an increased risk of placental sequestration of infected red blood cells that result in high placental parasite densities whereas the peripheral blood may show no parasites.

Subsequently, this can lead to poor fetal nutrition that leads to intrauterine growth restriction, low birth weight, prematurity, and intrauterine fetal death. It also associated with increased risk of maternal anemia and frequent febrile illness.

Low-transmission area

In these areas, the incidence of malaria may be seasonal or fluctuates from year to year. People from these areas have not acquired immunity from the disease. All age groups are affected equally by the parasite.

In areas of low transmission, (non-endemic or unstable) malaria contributes to direct maternal death from severe malaria or indirect maternal death from malaria-related severe anemia. Severe malaria includes cerebral malaria, hypoglycemia, renal failure, adult respiratory distress syndrome, and for the baby, spontaneous abortion, neonatal death and preterm delivery with risk of congenital malaria.

Plasmodium vivax*, *Plasmodium ovale*, and *Plasmodium malariae

Outside Africa, *P. vivax* may be more of a problem. Despite the absence of sequestration of infected red cell in *P. vivax* infections, there is evidence of malaria causing reduced birth weight and maternal haemoglobin during pregnancy, even if these are not in the range of what is observed in *P.falciparum* infections.

Little is known of the effects of *P. ovale and P. malariae.*

HIV and malaria

The prevalence and intensity of malaria is higher in women who are HIV posititve than in women who are HIV negative. Woman living with HIV are less able to control P. falciparum infection, and thus are more likely to have symptomatic infections and an increased risk of malaria-associated adverse birth outcomes. Women who are HIV posititive should be targeted for the prevention and treatment of malaria during pregnancy to reduce transient increases in viral load and thus help to prevent mother-to-child transmission.

HIV/AIDS also increases in the incidence of febrile disease during pregnancy that is not malaria, thus creating difficulties in the symptom-based diagnosis of malaria.

Clinical Features

Pregnant women may present in two main forms: uncomplicated and/or complicated malaria.

Uncomplicated malaria

Symptoms appear after an incubation period of 8 to 20 days. One then develops a fever that may or may not exhibit one of the classical periodic pattern occurring every second day in tertian malaria (due to *P. falciparum*, *P. vivax*, *P. ovale*) and every third day in quartan malaria (*P. malariae*). The fever occurs when the schizonts rupture releasing phospholipid toxin to the circulation. Repeated cycle of growth occurs in the erythrocytes. Other symptoms are headache, asthenia, arthralgia, myalgia, and gastroenteritis.

Complicated malaria

Presents as severe malaria. Symptoms include:
- Unrousable coma
- Generalized convulsions
- Severe anemia (<60g/dl)

- Oliguria **(<400 ml/day)**
- Pulmonary edema
- Hypoglycemia (<2.2 mmol/l)
- Cardiovascular collapse
- Hemorrhagic syndrome
- Haemoglobinuria
- Acidosis **(pH <7.25)**

Diagnosis

The diagnosis of malaria is based on clinical criteria supplemented by the detection of parasites in the blood. It is recommended that parasitological testing should be used to supplement clinical criteria in diagnosis (in all people other than children in areas of high transmission).

Clinical diagnosis

Used alone, diagnosis by clinical signs and symptoms currently has a low specificity.
- It is not possible to apply any one set of clinical criteria to the diagnosis of all types of malaria in all patient populations.
- Clinical diagnostic criteria vary from area to area according to the intensity of transmission, the species of malaria parasite, and other prevailing causes of fever and the health service infrastructure.
- If no parasitological diagnosis is available, the decision to provide treatment is based on the prior probability of the illness being malaria.
- Signs and symptoms **are non-specific; they are based on fever or a history of fever.**

In settings where the risk of malaria is low
Clinical diagnosis should be based on degree of exposure to malaria AND a history of fever in the previous three days with no features of other severe diseases.
In settings 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

Parasitological diagnosis

By using a microscope or rapid diagnostic tests, (RDTs) the presence of parasites may be indentified in blood. These are useful tools that reduce unnecessary treatment and wasting relatively expensive drugs. The other benefit is that results are available within a short time (less than 2 hours). However, these tools should be accompanied by quality assurance. The deciding factor for the use of microscopy versus RDTs usually depends on the:

- Local circumstances (skills available)
- Use of microscopy for other diseases found in the area
- Case load **(in high case-load settings, microscopy is less expensive than RDTs)**

Microscopy

A microscopic examination of blood determines the degree of parasitaemia and species of plasmodium. A thin or a thick film is done. In the thin film 5 μL of blood is placed on a slide, dried, and stained with Field or Giemsa stain. It is recorded as the number of parasites seen per high power field:

Percentage of parasitaemia = <u>No. of parasites counted (total)</u> × 100
                                            No. of red blood cell counted (total)

In a thick film, the type of species and a more accurate parasite density can be obtained by counting using:

Parasites per µL of blood counted in relationship to a predetermined number of leucocytes (average of 8,000 leucocytes per µL).

No. of parasites × 8,000 = parasites per µL
No. of leucocytes

Note: Absence of parasites does not rule out malaria.

Advantages
Considered to be the gold standard
- Low cost in high case load setting
- Can be used for speciation and quantification of parasites
- High sensitivity and specificity when used by well-trained staff.

Disadvantages
Requires well trained-staff
- Requires electricity, difficult to use in community setting
- Initial set up cost

Rapid diagnostic tests

RDTs are an alternate way of quickly establishing the diagnosis of malaria infection; they detecting specific malaria antigens in a person's blood. A blood specimen is collected and is applied to the sample pad on the test card, dipstick or cassette along with certain reagents. After 15 minutes, the presence of specific bands in the test card window indicate whether the patient is infected with *Plasmodium falciparum* or one of the other three species of human malaria. Some tests detect only one species (falciparum) while others detect one or more

Advantages
- Provides a rapid result (relatively easy to use)
- Fewer requirements for training and skilled personnel (can train health worker in one day)
- Patient confidence in the diagnosis and the health service
- Useful in out**-of-health centre settings (community, home, private providers)**

Disadvantages
- Sensitivity and specificity are variable; they are vulnerable to high temperatures and humidity
- Inability to distinguish new infections from a recently and effectively treated infection (increases the misinterpretation of a positive result)

Effective Treatment

Diagnosis rests on high index of clinical suspicion and performing a parasitological diagnosis of blood.

In uncomplicated malaria, sulphadoxine–pyrimethamine, mefloquine, or quinine can be utilized. For severe malaria, parenteral quinine, artemisinin-based combination therapy (ACT), and supportive therapy is necessary.

Note 1: Chloroquine is not used much because of widespread high resistance.
Note 2: Quinine does not cause abortion, malaria does.
Note 3: Treatment should reflect the national guidelines in the country and varies based on the sensitivity patterns of the parasites to drugs and their availability.

Case Management of Malaria in Pregnancy

These are general World Health Organization guidelines (2006) that need to be adapted by regions and countries to take account of local conditions. See Appendix 3.

Uncomplicated falciparum malaria
1st trimester
> First episode: quinine
> Subsequent episodes: quinine and clindamycin
> ACT (locally effective) or artesunate w clindamycin

2nd trimester
> First episode: ACT or artesunate and clindamycin
> Subsequent episodes: artesunate + clindamycin or quinine w clindamycin

Prevention: intermittent preventive treatment (IPT) using sulfadoxine-pyrimethamine (SP for short, brand name is Fansidar) single-dose, once at the beginning of 2nd and once at the beginning of the 3rd trimester.

Severe malaria
Quinine IV then oral with clindamycin
Or
Artesunate IV then oral with clindamycin

Non-falciparum malaria
Chloroquine phosphate
For chlorquiene-resistent *P.vivax*: amodiaquine, quinine or artemisinin derivative

Preventive Strategies

- Use of chemoprophylaxis or Preventive Intermittent treatment (PIT)
- Use of insecticide treated bed nets
- Reduction of mosquito breeding grounds by removing or covering standing water in cans, cups and rain barrels around houses; ensure good management of water irrigation systems
- Regular antenatal care and health education about malaria
- Effective case management of malaria illness: early and accurate diagnosis and effective treatment

Use of chemoprophylaxis or intermittent preventive treatment

In malaria-endemic areas, women are at an increased risk of parasitaemia during pregnancy with adverse effects. It is recommended that women from high-transmission areas receive chemoprophylaxis or IPT during pregnancy.

Chemoprophylaxis or IPT reduces antenatal parasite prevalence and placental malaria when given to women in all parity groups. It is also associated with a decrease in episodes of febrile illness. In addition, it also has positive effects on birthweight and possibly on perinatal death in low-parity women (Garner, 2006).

Chemoprophylaxis or IPT is most significant in primigravida where a significant reduction in the number of women with severe anaemia at 34 weeks, a decrease clinical malaria in mothers, and a significant reduction in low birth weight is noticed.

Intermittent preventive treatment with sulphadoxine–pyrimethamine (SP) compared with weekly chloroquine chemoprophylaxis has been shown to have similar beneficial effects (8,9). Sulphadoxine–pyrimethamine (SP) is cheap, safe in the second and third trimesters, and can be given as a single dose two or three times during pregnancy.

This regimen has fewer problems of compliance, better adherence and, so far, less drug resistance then weekly chloroquine making this intervention superior.

WHO recommendations for prevention of Malaria during pregnancy

Falciparum malaria: Intermittent preventive treatment with sulphadoxine–pyrimethamine SP (beginning of 2nd and 3rd trimesters)
Non-falciparum malaria: Chloroquine phosphate (on admission and then per week)

Insecticide-treated bed nets

The effectiveness of insecticide-treatment bed nets in preventing malaria is significant in decreasing childhood mortality and morbidity. In Gambia during the rainy seasons, they were found to significantly reduce parasitaemia, perinatal mortality, and preterm delivery. In Thailand, raises in hemoglobin levels were observed.

Summary
Malaria is a major cause of maternal and perinatal mortality and morbidity. Political commitment, adequate effective availability and supply of drugs, vector control measures, and the integration of interventions in the existing antenatal care delivery and community would, in the long run, decrease the ill effects of malaria in pregnancy.

Key Messages

1. Pregnant women living in tropical areas are vulnerable to malaria, affecting both maternal and fetal outcomes.
2. Prevention and treatment strategies are required to improve outcomes for women and their children in these areas.
3. Clinicians should refer to their national malaria guidelines for the prevention and treatment of malaria in pregnancy.

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HIV AND PREGNANCY

Learning Objectives
By the end of this section, the participant will:

1. List the factors affecting vertical transmission of HIV.
2. Summarize the strategies in the prevention of mother- to-child transmission of HIV.

Introduction

In 2004, the World Health Organization reported that 40 million people were infected with HIV/AIDS, 17.6 million women, 2.7 million children, and 13 million orphans worldwide. In 2005, 700,000 children became infected with HIV, with approximately 95% arising from mother-to-child transmission   (MTCT). 90% of new infections in children occur in Africa, due to the fact that MTCT interventions are almost non-existent.

MTCT is the vertical transmission of HIV from mother to child that occurs during pregnancy, childbirth, and breastfeeding. The most probable point of transmission occurs in the late third trimester and even more so during the intrapartum period.

In some areas of the world, MTCT has been virtually eliminated thanks to the availability of specific interventions to reduce the risk of transmission. These interventions include: effective voluntary and confidential testing and counseling, access to antiretroviral therapy, safe delivery practices, and the availability and safe use of breast-milk substitutes.

Effects of Pregnancy on HIV: Course and Outcome

The clinical course of HIV disease is not altered in pregnancy. There is no significant difference in the death rate or in the progression of AIDS-related illness.

Effect of HIV on Pregnancy: Course and Outcome

Table 1 summarizes the evidence available from current research about the effect of HIV on adverse pregnancy outcomes.

Table 1- Effect of HIV on adverse pregnancy outcomes

Adverse Pregnancy Outcome	Relationship to HIV Infection
Spontaneous abortions	Limited data, evidence of possible increase
Fetal malformation	No increased risk
Prenatal mortality	No association in developed countries Increased risk in low-resource countries
Intrauterine growth retardation	Evidence of possible increased risk
Preterm delivery	Evidence of possible increased risk
Low birth weight	Evidence of increased risk
More frequent and severe episodes of malaria attacks	Evidence of increased risk

Factors Affecting Perinatal Transmission

HIV-related factors
- HIV-related RNA (viral load): The higher the viral load the greater the risk of transmission.
- Strain variation (genotype)
- Biologic growth characteristics
- CD4 cell count: Lower CD4 count or decreased CD4:CD8 ratio is associated with increased risk of transmission.

Maternal and obstetric factors
- Clinical stage: Primary infection with greater viraemia is associated with increased risk.
- STDs: There is increased HIV shedding in genital tract epithelial disruption associated with an increased risk of transmission.
- Sexual behaviour: Unprotected sex with multiple sexual partners associated with increased risk.
- Placental abruption: Disruption of fetal-placental barrier increases exposure to the fetus.
- Duration of membrane rupture: The transmission rate is directly proportional to the increased duration of rupture of membranes with a 2% increase for each hour increment.
- Gestational age at delivery. Prematurity is associated with increased risk.
- Invasive procedure in labour, such as episiotomy, vacuum delivery, forceps, artificial rupture of membranes (ARM)
- Vaginal vs. cesarean delivery: A meta-analysis of studies done in developed countries show that elective cesarean section done prior to rupture of membranes and labour significantly reduces the risk of perinatal transmission. Planned cesarean section surgery must be considered in the context of the woman's life and availability of local resources.
- Knowledge of HIV status combined with accessibility of and acceptance of antiretroviral therapy decreases transmission.
- Substance abuse: Substance use during pregnancy is associated with increased risk.

Fetal and neonatal factors
- Immature immune system (especially preterm babies)
- Genetic susceptibility

Breastfeeding
- Without antiretroviral treatment, risk of transmission through the breastfeeding by an infected mother may increase the risk to a total of 20-45%.
- Where breastfeeding is common and prolonged, transmission through breastfeeding may account for up to half of HIV infections in infants and young children.
- Early findings show a low rate of transmission through breastfeeding in the first 3 months in infants receiving prophylaxis with either lamivudine or nevirapine.
- The risk can be reduced to under 2% by combination of antiretroviral prophylaxis during pregnancy and delivery and to the neonate, with elective cesarean section and avoidance of breastfeeding.
- Availability of safe breast milk substitutes must be considered, including a safe water supply, when educating and counseling women to avoid breastfeeding.

Strategies for the Prevention of Mother-to-Child Transmission

- Primary prevention of HIV among prospective parents.
- Prevention of unwanted pregnancy among HIV-infected women.

- Prevention of MTCT among HIV-infected mothers through provision of voluntary confidential counseling and testing, antiretroviral agents, safe delivery practices, and safe infant feeding practices.
- Support for the affected family and the community at large. Education and counseling services may help the woman's family understand the issues and thus support the woman with her choices to prevent transmission of HIV to her baby.

Components of a Comprehensive Prevention Program

- Health education, provision of information, counseling on HIV preventative care, including MTCT
- Voluntary confidential counseling and testing services that are acceptable and accessible
- Quality and focused antenatal care
- Safe delivery practice
- Support and counseling on infant feeding practice
- Family planning services
- Community mobilization and education to decrease the stigma and discrimination against, as well as to increase support for, HIV-positive clients

Interventions to Prevent Mother-to-Child Transmission of HIV

1. **Antiretroviral treatment (ante-, intra-, and postpartum interventions)**

   Efficacy
   The Pediatric AIDS Clinical Trial Group in 1994 demonstrated a 68% reduction in MTCT when zidovudine was administered from 14 weeks' gestation, intrapartum, and to the neonate in the postpartum in the absence of breastfeeding.

   Subsequent trials using short-course antiretroviral drugs done in low-resource countries have shown a 50% reduction in vertical transmission. In terms of policy, implementation, and costs, the following regimens are more realistic in low-resource settings.

   Regimens
   - (Pediatric AIDS Clinical Trial Group 076): Zidovudine given antepartum, intrapartum by intravenous infusion, and to the neonate for 6 weeks reduces risk of vertical transmission by 68%.
   - Short-course Zidovudine (Thai study): Zidovudine given 300 mg twice daily beginning at 36 weeks' gestation, and 300 mg 3 hourly in labour reduces transmission by 50% in a non-breastfeeding population.
   - A breastfeeding population in West Africa: Short-course Zidovudine given 300 mg twice daily beginning at 36 weeks' gestation, 300mg 3 hourly in labour, and 300 mg twice daily to the mother for 1 week after delivery reduces transmission by 28% at 18 months.
   - Nevirapine (HIVNET012): Nevirapine 200 mg given at onset of labour, and to the neonate 2 mg/kg within 72 hours is associated with a 47% reduction in vertical transmission at 8 weeks' gestation. It is the only single dose drug available and it is relatively cheap and easy to admininster.
   - Nevirapine is most effective when administered in combination with azidothymidine (AZT) and 3TC). However, this regime can be difficult to provide in low-resource settings because it is more expensive and difficult to implement.
   - The one concern about the single dose nevirapine is that it can make subsequent treatment of nevirapine or efavirenz (a similar drug) less effective. This drug resistance is typically short lived, lasting about 6 months. After 6 months treatment with nevirapine or efavirenz is usually successful. Due to these concerns, a single dose of nevirapine should only be used when the combination of drugs to prevent HIV resistance problems are not available.

Health care providers should use the best drug therapy available to them. Table 2 outlines the World Health Organization guidelines for the prevention of MTCT of HIV in low- resource settings where women have had no previous antiretroviral therapy. These are general guidelines, and consideration of national guidelines for the prevention of MTCT of HIV should be considered as well. See Appendix 4 for recommendations on antiretroviral therapy for specific clinical situations.

Table 2 - World Health Organization guidelines for prevention of MTCT of HIV in low-resource settings where women have had no previous antiretroviral therapy (WHO, 2006)

	Pregnancy	**Labour**	**After birth: mother**	**After birth: infant**
Recommended	AZT after 28 weeks	Single dose nevirapine; AZT + 3TC	AZT+ 3TC for 7 days	Single dose nevirapine; AZT for 7 days
Alternative (higher risk of drug resistance)	AZT after 28 weeks	Single dose nevirapine	-----	Single dose nevirapine; AZT for 7 days
Minimum (less effective)	-----	Single dose nevirapine; AZT+ 3TC	AZT+ 3TC for 7 days	Single dose nevirapine
Minimum (less effective; higher risk of drug resistance)	-----	Single dose nevirapine	-----	Single dose nevirapine

2. **Safe delivery practices**

Cesarean section is recommended for women with a high viral load. This option protects the baby from coming into direct contact with the mother's bodily fluids. However, in regions with a high HIV prevalence, caesarean section surgery may not be a safe option for women. In these areas, women are likely to have many babies thus exposing them to the risk of uterine rupture with subsequent deliveries. These women are also at a higher risk of infectious complications from the surgery.

In low-resource settings, it is therefore important to emphasize the need for:
- Universal precautions
- Modified obstetrical practice—delay artificial rupture of membrane, avoid invasive fetal monitoring procedures, avoid the use of episiotomy, and avoid instrumental vaginal deliveries
- Discussion with the parents about the benefits and risk of caesarean section surgery.

If the mother is already taking combination antiretroviral therapy during pregnancy and has a low viral load, an elective cesarean section may not be recommended because the chance of infection is already low.

3. **Breastfeeding**

HIV is transmitted through breast milk. When there is no intervention to reduce infection, the rate of transmission of HIV through breast milk ranges between 5–20%. The risk of infection is increased when a mother has a high viral load, a low CD4 T cell count, subclinical mastitis, abscesses, cracked nipples, or when an infant has oral infections, sores, or damaged intestinal epithelium.

Subclinical mastitis and breast abscesses increase the viral load of HIV in breast milk. Cow's milk and solid foods create damage to a baby's intestinal mucosa and allows for easy entry of the HIV virus into the blood stream.

Recommendations for breastfeeding in low-resource settings

There is no easy answer to whether a woman should breastfeed her child or not. In high- resource settings, women are recommended not to breastfeed their baby. In low-resource settings, there are other variables that need to be taken into consideration.

- Women infected with HIV (and all women) should have access to information about how to best feed her baby. People who counsel in regard to HIV and breastfeeding need to provide clear impartial messages to women that explore the availability and feasibility of infant feeding methods. Counselors need to be well trained and supported.

The WHO states: *"When replacement feeding is acceptable, feasible, affordable, sustainable and safe, avoidance of all breastfeeding by HIV-infected mothers is recommended. Otherwise, exclusive breastfeeding is recommended during the first months of life."*

- For women to make a choice, essential information includes the greater risk of infant mortality from diarrhea and respiratory infections related to replacement feeding in areas where access to clean water and fuel is limited vs. the risk of HIV infection in breastfeeding. One study revealed that the risk of death from diarrhea in babies who receive replacement feeding was double that of exclusively breastfed babies (Coovadia et al., 2007).
- **Women who are HIV positive and who breastfeed** their babies should receive information about how to ensure healthy breasts and nipples to reduce vertical transmission. Counseling includes proper latch and hold, changing the baby's position while at the breast, keeping the baby close during breastfeeding to ensure adequate emptying of the breast, and avoiding milk stasis (full breasts). Women should also receive information about when to seek health care for breast ailments. They should also be informed to watch for any oral sores in their baby and to seek medical attention if and when this does occur.
    - When it is time to wean, it is recommended to stop breastfeeding over a period of a few days to shorten this period (to lessen the amount of time where the baby would receive mixed feedings).
    - Women who breastfeed need to keep their viral load low and CD4 count high (as much as possible) to decrease transmission of HIV to their baby. Use of antiretrovirals, clinical care to prevent co-infections, and good nutrition should be available to these women.
- **Women who are HIV positive and provide replacement feeding** to their babies need to understand how to prevent infection (respiratory and diarrhea) and to ensure adequate nutrition to their babies, i.e. teaching proper preparation and cleaning of bottles, nipples, or cups. Part of the teaching includes the women demonstrating their newly acquired knowledge. Women who choose this method also need to have home support to ensure clean feeding to prevent infection.
- **Women need to be informed about the dangers of mixed feeding**. It has been shown that HIV transmission is higher in babies who receive a mixture of replacement feeding and breastfeeding. The most recent, good quality study on this phenomena reported that babies who received a mixture of feeding were four times more likely to be infected with HIV than babies who were exclusively breastfed (16% compared with 4%) (Coovadia et al., 2007). **Women need to be supported in their decision to breastfeed or replacement feed so that they stick to that decision and do not mix feed their child**.
- HIV-infected women (as well as all women) should have access to information, follow-up clinical care and support, including family planning services and nutritional support.
- Women who are HIV negative or who do not know their status should be encouraged to exclusively breastfeed and be supported to continue for 6 months.

4. Care of mother and infant

Continuous counseling and support of the mother and her family, combined with the provision of long-term antiretroviral therapies to the mother and/or her child, are required. To reduce the stigma associated with infection, strong linkages between communities and HIV/AIDS support groups should be priorities, as well as community mobilization and education on the topics of HIV/AIDS prevention, infection, and care.

5. Family planning methods

Effective contraception provides women and their partners an opportunity to decide whether they want to have children and control the number and frequency of children. However, family planning is not just about regulating the number of children; it is also about preventing infections. Counseling to couples should include the concept of dual contraception. This means that, although a couple may choose use a hormonal method to prevent conception, they should be educated about the benefits of using a barrier method, in particular a condom to prevent re-infection with another strain of the HIV. Use of condoms during pregnancy will prevent primary HIV infection. Primary HIV infection in pregnancy is a greater risk to the fetus.

Conclusion

Prevention of MTCT can be reduced. Governments, families, communities, and health care providers should endeavour to provide quality antenatal care, voluntary confidential counseling and testing, provision of antiretroviral treatment particularly at the crucial time of delivery, and adequate support after delivery in order to improve quality of life to child and mother. Avoidance of breastfeeding and planned caesarean section in prevention of MTCT is still an open debate. It should be addressed according to the local and specific context of the woman. The prevention of the spread of HIV infection is not just one simple intervention. It involves a multidisciplinary collaborative approach among community, regional, and national care providers. The international community also has a rolein the contribution of the needed resources.

Key Messages

1. Health care providers have a responsibility to minimize vertical transmission at time of delivery and to use their national HIV guidelines.
2. Health care providers should be familiar with antiretroviral treatment options for prevention of MTCT and treatment of mothers.
3. Women deserve to be provided with the best available treatment, educated, and supported with respect to infant feeding.

Resources:

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- Fowler MG, Newell ML. *Breastfeeding, HIV transmission and options in poor resource setting*. Background Paper for Geneva UNAIDS/WHO/UNICEF Meeting, Oct 2000.
- Gallagher, J, Ed. *HIV transmission through breastfeeding, A Review of the Available Evidence*. UNICEF, UNAIDS, WHO, UNFPA. WHO, Geneva; 2004.
- WHO. New data on the prevention of Mother-to-Child Transmission of HIV and their policy implications. Geneva. 2001
- World Health Organization. *Prevention of mother to child transmission: Selection and use of nevirapine*. Technical notes. WHO, Geneva; 2001.
- WHO. Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants: towards universal access: recommendations for a public health approach. WHO. Geneva. 2006. http://www.who.int/hiv/pub/guidelines/pmtctguidelines2.pdf
- WHO. Antiretroviral drugs for treating pregnant women and prevention HIV infection in infants: guidelines on care, treatment and support for women living with HIV/AIDS and their children in resource-constrained settings. WHO. Geneva 2004.
- WHO. HIV transmission through breastfeeding—A Review of the Available Evidence. Geneva, 2004.

TUBERCULOSIS IN PREGNANCY

Learning Objectives
By the end of this section, the participant will:

1. List the effects of tuberculosis (TB) in pregnancy.
2. Identify the relationship between HIV and TB.
3. Define the clinical features of TB and its treatment.

Definition

TB is an infectious disease caused by the tubercle bacillus (*Mycobacterium tuberculosis*). It most commonly affects the respiratory system, but it can also infect other bodily regions, such as the gastrointestinal and genitourinary tracts, bones, joints, nervous system, and lymph nodes. Like the common cold, it spreads through the air. Only people who are sick with pulmonary TB are infectious; the bacilli are propelled into the air when contagious people cough, sneeze, talk, or spit. A person needs only to inhale a small number of these germs to be infected.

Incidence and Scope

TB is a serious public health, social, and economic problem. Every second, someone in the world is newly infected with TB bacilli. Globally, it is estimated that 8.4 million people develop TB each year, and nearly 2 million deaths result from the disease.

Overall, one-third of the world's population is currently infected with the TB bacillus, and over 95% of global cases occur in developing countries. The largest number of cases occurs in the Southeast Asia region, which accounts for 33% of global cases. However, the estimated incidence per capita in sub-Saharan Africa is nearly twice that of Southeast Asia, at 350 cases per 100,000 population.

TB kills more youth and adults than any other infectious disease (WHO, 2002) and TB causes more maternal deaths than any other single cause of maternal mortality, estimated to be in the order of more than 1 million women per year (WHO, 2002). TB affects women mainly in their active economic and reproductive years; therefore, the impact of the disease is also strongly felt by their children and families.

TB is a highly stigmatized disease and is felt more among women than in men. Stigma experienced by women includes ostracism, divorce, the taking of a second wife by her husband, difficulty finding a spouse, no longer having access to children, or no economic support.

Left untreated, each person with active TB will infect on average of 10 to 15 people per year. But people infected with TB bacilli will not necessarily become sick with the disease. In some people, the immune system "walls off" the TB bacilli that, protected by a thick waxy coat, can lie dormant for years. When someone's immune system is weakened, the chances of becoming sick are greater. It is recognized that poor nutrition, smoking, and alcohol abuse may result in decreased immunity.

> *It is the poorest people from the poorest countries who are most affected by TB. Not only are they more vulnerable to the disease because of their living and working conditions, they are also plunged deeper into poverty as a consequence of TB. A person with TB loses, on average, 20-30% of annual household income due to illness* (WHO, 2002).

Halving the TB prevalence and death rates by 2015 is included in the United Nations Millennium Development Goals.

Reasons for the global increase in TB

According to the World Health Organization, the main reasons for the increasing global burden of TB are:
- Lack of political leadership and commitment to implement, sustain, and expand the TB strategy. The TB strategy includes:
    - Implementing a high-quality DOTS program (Directly Observed Treatment, Short-Course).
    - Addressing TB/HIV, MDR-TB and other challenges
    - Contributing to health system strengthening
    - Engaging all care providers
    - Empowering people with TB, and communities
    - Enabling and promoting research.
- Increasing poverty, social upheaval, and crowded living conditions in developing countries.
- Inadequate health coverage and poor access to health services.
- Inefficient TB control programs, with low cure rates, because of inadequate and interrupted treatment.
- Reluctance to report TB suspects to poorly administered programs.
- Impact of the HIV epidemic.

HIV and TB

HIV has contributed to the rapid increase in the incidence of TB, as well as increasing the likelihood of dying from TB. TB is the leading cause of death among people who are HIV positive and it accounts for about 13% of AIDS deaths worldwide. HIV and TB form a lethal combination, each speeding the other's progress. Someone who is HIV positive and infected with TB bacilli is many times more likely to develop TB. TB contributes to the rapid progression of HIV/AIDS. As the HIV infection progresses, previously dormant TB reactivates and new infections progress rapidly. DOTS is effective in HIV-infected patients: it vital to ensure this treatment is delivered to those with dual infection.

In Zambia, in 1999, TB accounted for 25% of all non-obstetric deaths, most in combination with HIV positivity. The dual epidemic is the major factor in an eightfold increase in maternal mortality (Ahmed et al, 1999).

Effects of Tuberculosis on Pregnancy

The signs and symptoms of TB are similar in pregnant women and in non-pregnant women. The diagnosis of TB in pregnant women is often delayed by the non-specific nature of early symptoms of TB and by the frequent malaise and fatigue that occur in normal pregnancy. It has been reported that in women, 70% of deaths due to TB occur during the childbearing years.

It is recognized that TB enhances the risk of poor pregnancy outcomes. As reported by the World Health Organization, (WHO, 2001), in case-control studies from Mexico and India, pulmonary TB in pregnant women increases the risk of prematurity and low birth weight in neonates twofold, and the risk of perinatal deaths between threefold and sixfold. Pregnant women with a late diagnosis of pulmonary TB have an increased fourfold risk of obstetric morbidity and a higher risk of miscarriage, eclampsia, and intrapartum complications.

Clinical Features and Diagnosis

The symptoms of TB are a cough that is persistent and not responsive to antibiotics, fever, and weight loss. Chest pain and hemoptysis may also be present.

TB may occur outside of the lungs in several other sites. These include the lymph nodes, kidneys, bones, and the central nervous system, with consequent serious illness. However, those that are infected are not likely to transmit the disease unless they have TB in the lungs.

Evidence from some settings indicates that despite seeking treatment for symptoms, women experienced a longer delay than men in diagnosis. Some possible reasons are that fewer women with chest symptoms are referred for sputum examination; women with TB do not present what is considered a "typical" symptom, i.e. prolonged cough with expectoration; and chest radiography, when available, is likely to be postponed. Furthermore, other opportunistic infections due to HIV may mask the signs and symptoms of TB.

After a clinical history and examination, the patient suspected of TB must be referred for a laboratory exam; a sputum-smear microscopy identifies the bacillus and thus confirms the diagnosis. When feasible, a chest X-ray, complete blood count, and tuberculin tests (used to identify infected persons at high risk) may also help to confirm the diagnosis.

Treatment

Treatment not only cures and saves lives, but it also prevents the spread of infection and the development of drug-resistant TB, which is far more difficult and costly to treat. Due to the fact that poor treatment can cause drug resistance, no treatment at all is better than poor treatment.

DOTS is the recommended treatment for TB. This treatment strategy requires a total of 6 to 8 months of drug therapy—a combination of drugs taken daily by the patient without interruption, with at least the first 2 months under supervision. When HIV is associated with TB, the appropriate HIV treatment must be provided concomitantly.

The most common anti-TB medicines are isoniazid, rifampicin, pyrazinamide, streptomycin, and ethambutol. Sputum-smear testing is repeated after 2 months to check progress, and again at the end of treatment. A negative sputum confirms the cure. All the previously mentioned anti-TB drugs are compatible with breastfeeding. As with other medications, particularly in the first trimester, the main concern relating to TB treatment in pregnancy is the risk of teratogenicity.

A successful DOTS program requires a collaborative approach with all involved. The village volunteer, the primary health-care worker, or the nurse are the best patient allies in recognizing TB symptoms, referring for diagnosis, and assuring treatment.

It is recognized that DOTS:
- Produces cure rates of up to 80—90% (WHO 2005) even in the poorest countries
- Prevents new infections by curing infectious patients
- Prevents development of drug resistance by ensuring that the full course of treatment is followed
- Provides 6 months of drugs for treatment.

Drug-Resistant TB

Drug-resistant TB is caused by inconsistent or partial treatment. This occurs when patients do not take all their medicines regularly for the required period because:
- they start to feel better
- doctors and health workers prescribe the wrong treatment regimens
- the drug supply is unreliable

While drug-resistant TB is generally treatable, it requires up to two years of extensive second-line anti-TB drugs that are more expensive and produce more severe drug reactions than the first-line anti-TB drugs.

"The emergence of extensively drug-resistant (XDR) TB, particularly in settings where many TB patients are also infected with HIV, poses a serious threat to TB control, and confirms the urgent need to strengthen basic TB control and to apply the new WHO guidelines for the programmatic management of drug-resistant TB" (WHO 2007).

Key Messages

1. The incidence of TB has rapidly increased due to the HIV epidemic.
2. TB is associated with poor pregnancy outcomes.
3. Health care providers should be knowledgeable about DOTS and reinforce patient compliance.

Suggestion for Applying the Sexual and Reproductive Rights Approach to this Chapter

Knowing how to prevent infection is just as important as knowing how to treat it. Prevention of infection involves education. Take time in the post partum to inform women of what they can do to prevent an infection from developing, as well as warning them of the signs and symptoms of infection so they know when to seek help immediately.

Another way to educate people about infection prevention is through health education programs or radio shows that promote good nutrition and hygiene. These programs can provide suggestions to women and their families about what they can do to decrease the incidence of infections in their homes.

Resources:

- Ahmed Y, Mwamba P, Chintu C, et al. *A study of maternal mortality at the University Teaching Hospital, Lusaka, Zambia: the emergence of tuberculosis as a major non-obstetric cause of maternal death*. Int J Tuberc Lung 1999; 3: 675-649 (MEDLINE)
- AVERT. http://www.avert.org/motherchild.htm
- Figueroa-Damien R, Arredondo-Garcia JL. *Pregnancy and tuberculosis: influence of treatment on perinatal outcome*. Am J Perinatol 1998; 15:303-306 (MEDLINE)
- Treatment of TB with the DOTS has been declared by the World Bank as one of the most cost-effective health-intervention strategies in terms of years of life saved. The cost of drugs in some countries is as little as US $13 to cure a patient.
- Ormerod LP. *Tuberculosis in pregnancy and the puerperium*. Thorax 2001; 56:494-499. http://thorax.bmjjournals.com/cgi/content/full/56/6/494
- World Health Organization. Tuberculosis Fact Sheet. www.who.int/entity/gender/documents/en/TB.Factsheet.pdf
- World Health Organization. Tuberculosis Fact Sheet. http://www.who.int/gender/documents/en/TB.factsheet.pdf
- WHO. Stop TB Guidelines for Social Mobilization: A Human Rights approach to tuberculosis. Geneva, 2001).
- WHO. Progress to*wards the Millenium Development Goals. WHO,* Geneva, 2005. Available at http://www.who.int/tb/publications/global_report/2005/discussion/en/
- WHO. Tuberculosis and infection: Factsheet 104. WHO, Geneva, 2007. Available at http://www.who.int/mediacentre/factsheets/fs104/en/index.html

APPENDIX 1

ANAPHYLAXIS

All care providers must be prepared to deal with an anaphylactic reaction in a patient whenever administration of medication is undertaken. **It is important to obtain a history of allergic reaction at the initial antenatal appointment and each time prior to prescribing or administering any medication.**

Common Antigens That Cause Anaphylactic Reactions

- Antibiotics
- Local anesthetics
- Blood products
- ASA
- Iron dextran

Signs and Symptoms of Anaphylaxis

- Dizziness
- Urticaria
- Shortness of breath (wheezing or decreased breath sounds)
- Cyanosis
- Laryngeal oedema, spasm
- Hypotension
- Tachycardia
- Nausea, vomiting, diarrhea, abdominal cramping

Management

Overall management

- Timely assessment of signs and symptoms of anaphylaxis
- Determine if early or late phase reaction
- Call for help
- Monitor vitals every 3–5 minutes
- Provide oxygen at 10–15 L/minute by non-rebreathing mask

Early phase anaphylaxis reaction may occur hours after exposure. In the patient who presents with urticaria, pruritis, and nausea, with no airway compromise, treat as early phase.

- Give oral antihistamine: Benadryl (Diphenhydramine)
- Observe carefully
- Document assessments and actions
- Transport to nearest hospital

Late phase anaphylaxis occurs within minutes of exposure. In addition to widespread urticaria or diffuse erythema, the patient many present with;

- Hypotension
- Tachycardia
- Respiratory distress (wheezing)

- Cyanosis
- Decreased level of consciousness or collapse
- Pale, clammy, cool to touch
- Dizziness
- Swelling caused by airway obstruction
- Convulsions

Give epinephrine 0.3 ml–1:1,000 IM.
Repeat epinephrine if condition fails to improve (5–10 minute onset with 5–10 minute duration).
Give Benadryl (Diphenhydramine) 25–50 mg IM.
 Transport to nearest hospital.

Note: IM Benadryl (diphenhydramine hydrochloride) should be considered as an adjunct to epinephrine and acts for a longer period.

Caution: Epinephrine can produce severe hypertension, tachycardia, and anxiety if given inappropriately to a patient without anaphylaxis. Take the patient's blood pressure before considering epinephrine. In pregnancy it may decrease placental blood flow and induce labour.

APPENDIX 2

UNIVERSAL PRECAUTIONS TO PREVENT TRANSMISSION OF INFECTION WITH HIV WHEN ASSISTING AT CHILDBIRTH

- Ensure gloves, aprons, soap, and water are accessible when planning for childbirth in the hospital or at home.

- Wear suitable gloves before exposure to blood or body fluids.

- Cover broken skin or open wounds with watertight dressings.

- Wash hands with soap and water immediately after contact with blood or other body fluids.

- Protect mouth, nose, and eyes against splashes of blood and other body fluids.

- Use a mucous extractor with a trap when mouth-to-mouth suction of newborns must be done.

- Where resuscitation is likely, Neonatal Resuscitation Kits must be available.

- Carry linen soiled with blood or other body fluids in leak-proof bags or folded with the soiled part contained inside. Wash in hot water and detergent.

- Burn solid waste, such as blood-soaked dressings or placentas, or bury these items in places where they are not likely to be dug up.

- Reduce needle-stick injuries by handling used needles as little as possible. Use a needle holder during repair of episiotomy. Avoid recapping disposable needles. Place needles and other sharp objects in puncture-resistant containers located as close as possible to the area where they are used.

- Clean all soiled surfaces with a bleach and water solution.

Resource:

- Safe Motherhood Program, Ministry of Health, the Republic of Uganda.

APPENDIX 3

ADAPTATION OF *WHO MALARIA TREATMENT GUIDELINES* FOR USE IN COUNTRIES

A2.1   Background

The guidelines are generic in nature and should therefore be adapted by regions and countries alike to take account of local conditions, especially when formulating implementation and scale-up strategies.

A number of malaria endemic countries have not yet elaborated national malaria treatment guidelines, although treatment protocols may be available at the health-care provider level. Furthermore, existing national guidelines need to be updated as many countries, especially in sub-Saharan Africa, are adopting and starting to implement policies specifying the use of artemisinin combination therapies (ACTs).

This annex provides orientation and guidance on the process countries should follow in adapting the content of the generic malaria treatment guidelines provided in the main document.

A2.2   The development process

The ministry of health should take the lead in the process of developing national malaria treatment guidelines.

The proposed steps include the following.

- *A national workshop on the malaria treatment guidelines* is the first step at country level. This workshop will review any current national malaria treatment guidelines, identify specific issues that need to be addressed and provide major policy recommendations.
- *Drafting/updating the national malaria treatment guidelines*. Following the national workshop, the national malaria case management committee (or its equivalent) should spearhead the development of new national malaria treatment guidelines in accordance with the standard outline set out below.
- *A consensus workshop on the national malaria treatment guidelines* should then be arranged to present, discuss and adopt the draft national malaria treatment guidelines.
- *Finalization and dissemination*. The national malaria treatment guidelines are finalized, officially endorsed and disseminated.

A2.3   The content

It is recommended that national malaria treatment guidelines are presented in a similar way as WHO Guidelines on the Treatment of Malaria. The following outline is suggested:

1. General introduction
   - Epidemiological situation and parasite distribution
   - National drug resistance pattern
2. Diagnosis of malaria
   - Clinical diagnosis
   - Role of parasitological diagnosis
3. Treatment of *P. falciparum* malaria or the most prevalent species in the country
   - Uncomplicated malaria
     - definition
     - treatment objectives
     - treatment recommendations
     - treatment in specific populations and situations
   - Severe malaria
     - definition
     - treatment objectives
     - treatment recommendations
     - pre-referral treatment options
     - management in epidemic situations
4. Treatment of malaria caused by other species
5. Disease management at the different levels of the health care delivery system
6. Annexes - Relevant annexes should be attached to provide more detailed information on, for example, dosages of drugs, specific data on therapeutic efficacy of antimalarial medicines in the country, other available evidence for treatment recommendation.

APPENDIX 4

CLINICAL SITUATIONS AND RECOMMENDATIONS FOR THE USE OF ANTIRETROVIRALS

Clinical situation	Recommendation
A: HIV-infected women with indications for initiating ARV treatment (see note 1, below) who may become pregnant	First-line regimens: ZDV + 3TC + NVP or d4t + 3TC + NVP EFV should be avoided in women of childbearing age, unless effective contraception can be ensured. Exclude pregnancy before starting treatment with EFV.
B: HIV-infected women receiving ARV treatment who become pregnant	**Women** Continue the current ARV regimen (see note 2, below) unless it contains EFV, in which case substitution with NVP or a PI should be considered if the woman is in the first trimester. Continue the same ARV regimen during the intrapartum period and after delivery. **Infants** Infants born to women receiving either first- or second-line ARV treatment regimens: ZDV for 1 week or single dose NVP or single-dose NVP plus ZDV for 1 week.
C: HIV-infected pregnant women with indications for ARV treatment (see note 1, below)	**Women** Follow the treatment guidelines as for non-pregnant adults except that EFV should not be given in the first trimester. First-line regimens: ZDV + 3TC + NVP or d4T + 3TC + NVP Consider delaying initiation ARV treatment until after the first trimester, although for severely ill women the benefits of initiating treatment early clearly outweigh the potential risks. **Infants** ZDV for 1 week or single-dose NVP or single-dose NVP plus ZDV for 1 week (see note 3, below).
D: HIV-infected pregnant women without indications for ARV treatment (see note 1, below)	**Women** ZDV starting at 28 weeks or as soon as feasible thereafter, continue ZDV during labour, plus single-dose NVP at the onset of labour. **Infants** Single-dose NVP plus ZDV for 1 week (see note 3). ***Alternative regimens (not in any order of preference)*** **Women** ZDV starting at 28 weeks or as soon as feasible thereafter, continue in labour. **Infants** ZDV for 1 week (see note 3, below) **Women** ZDV + 3TC starting at 36 weeks or as soon as feasible thereafter; continue in labour and for 1 week post partum. **Infants** ZDV + 3TC for 1 week **Women** Single-dose NVP **Infants** Single-dose NVP
E: HIV-infected pregnant women who have	Follow the recommendations in clinical situation D, but preferably

Clinical situation	Recommendation
indications for starting ARV treatment, but treatment is not yet available	use the most efficacious regimen that is available and feasible,
F: HIV-infected pregnant women with active tuberculosis	If ARV treatment is initiated, consider (see note 4, below) ZDV + 3TC + SQV/r or d4T + 3TC + SQV/r If treatment is initiated in the third trimester, ZDV + 3TC + EFV or d4T + 3TC + EFV can be considered If ARV treatment is not initiated, follow the recommendations in clinical situation D.
G: Pregnant women of unknown HIV status at the time of labour or women in labour know to be HIV-infected and who have not received ARV drugs before labour	If there is time, offer HIV testing and counseling to women of unknown status, and if positive initiate intrapartum ARV prophylaxis. If there is insufficient time for HIV testing and counseling during labour, then offer testing and counseling as soon as possible post partum, and follow the recommendations in clinical situation H. ***Recommended regimens (not in any order of preference)*** **Women** Single-dose NVP; if imminent delivery is expected, do not give the dose but follow the recommendations in clinical situation H. **Infants** Single-dose NVP **Women** ZDV + 3TC in labour and ZDV + 3TC for 1 week post partum **Infants** ZDV + 3TC for 1 week
H: Infants born to HIV-infected women who have not received any ARV drugs	**Infants** Single-dose NVP as soon as possible after birth plus ZDV for 1 week. If the regimen is started more than 2 days after birth, it is unlikely to be effective.

Legend to abbreviations in the table in Appendix 4

3TC	Lamivudine
ABC	Abacavir
ARV	Antiretrovirals
d4t	Stavudine
EFV	Efavirenz
NVP	Nevirapine
PI	Protease inhibitor
SQV/r	Saquinavir/ritonavir
ZDV	Zidovudine (also known as AZT)

Notes for the table of clinical situations and recommendations for the use of antiretrobirals in Appendix 4

1. *WHO recommendations for initiating ARV treatment in HIV-infected adolescents and adults*: If CD4 testing is available it is recommended to offer ARV treatment to patients with: WHO STAGE IV disease irrespective of CD4 cell count, WHO Stage III disease with consideration of using CD4 cell counts less than 350 10X6 cells/L to assist decision-making and WHO Stage I and II disease in the presence of a CD4 cell count less than 200 10X6 cells/L. If CD4 testing is unavailable, it is recommended to offer ARV treatment to patients with WHO Stage III and IV disease irrespective of total lymphocyte count or WHO Stage II disease with a total lymphocyte count less than 1200 10X6 cells/L.
2. Conduct clinical and laboratory monitoring outlined in the 2003 revised WHO treatment guidelines.
3. Continuing the infant on ZDV for 4 to 6 weeks can be considered if the woman received antepartum ARV drugs for less than 4 weeks.
4. Abacavir (ABC) can be used in place of SQV/r; however, experience with ABC during pregnancy is limited. In the rifamicin-free continuation phase of tuberculosis treatment, an NVP-containing ARV regimen can be initiated.
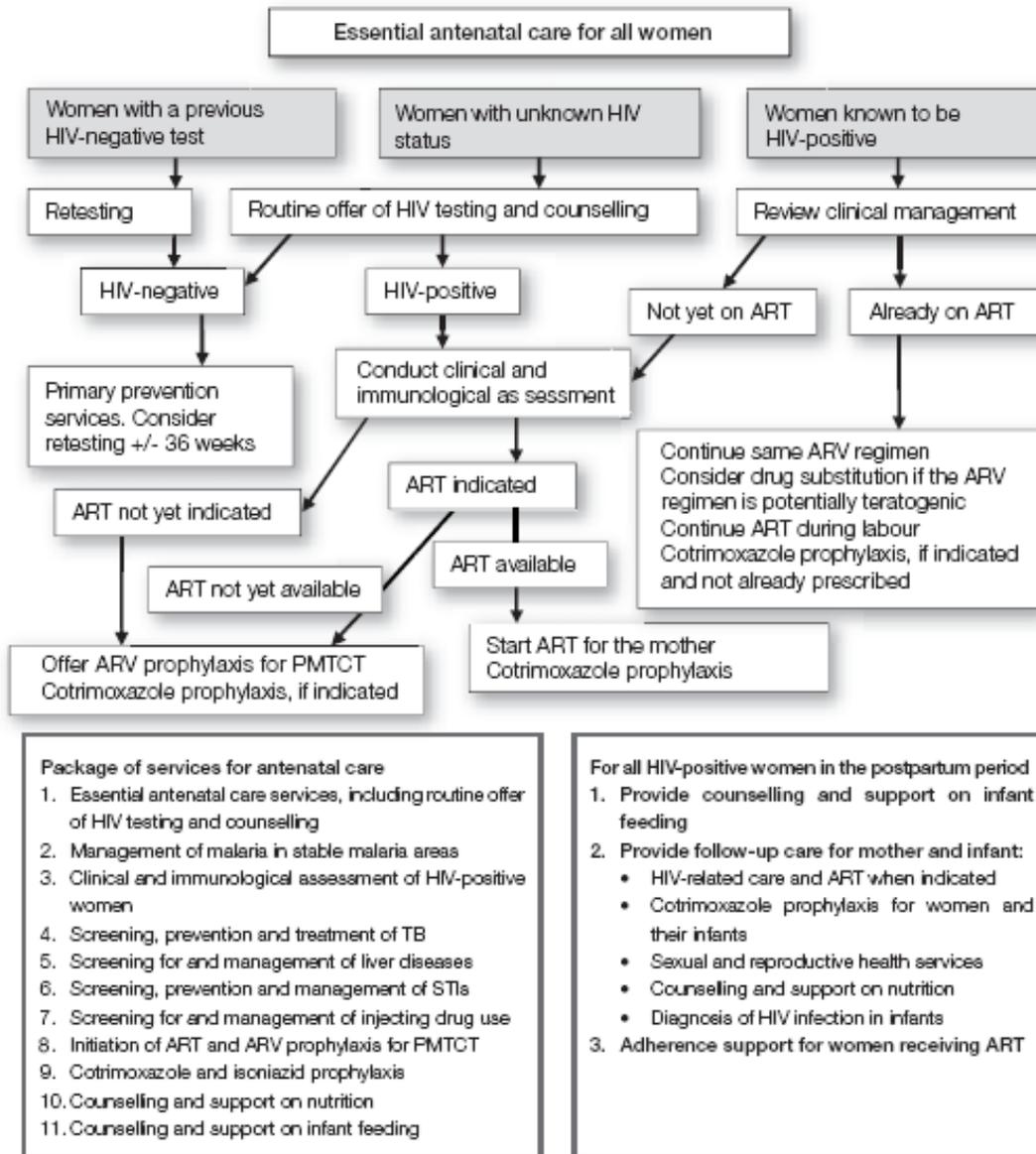
Resource:

*   WHO. Antiretroviral drugs for treating pregnant women and prevention HIV infection in infants: guidelines on care, treatment and support for women living with HIV/AIDS and their children in resource-constrained settings. WHO. Geneva 2004.
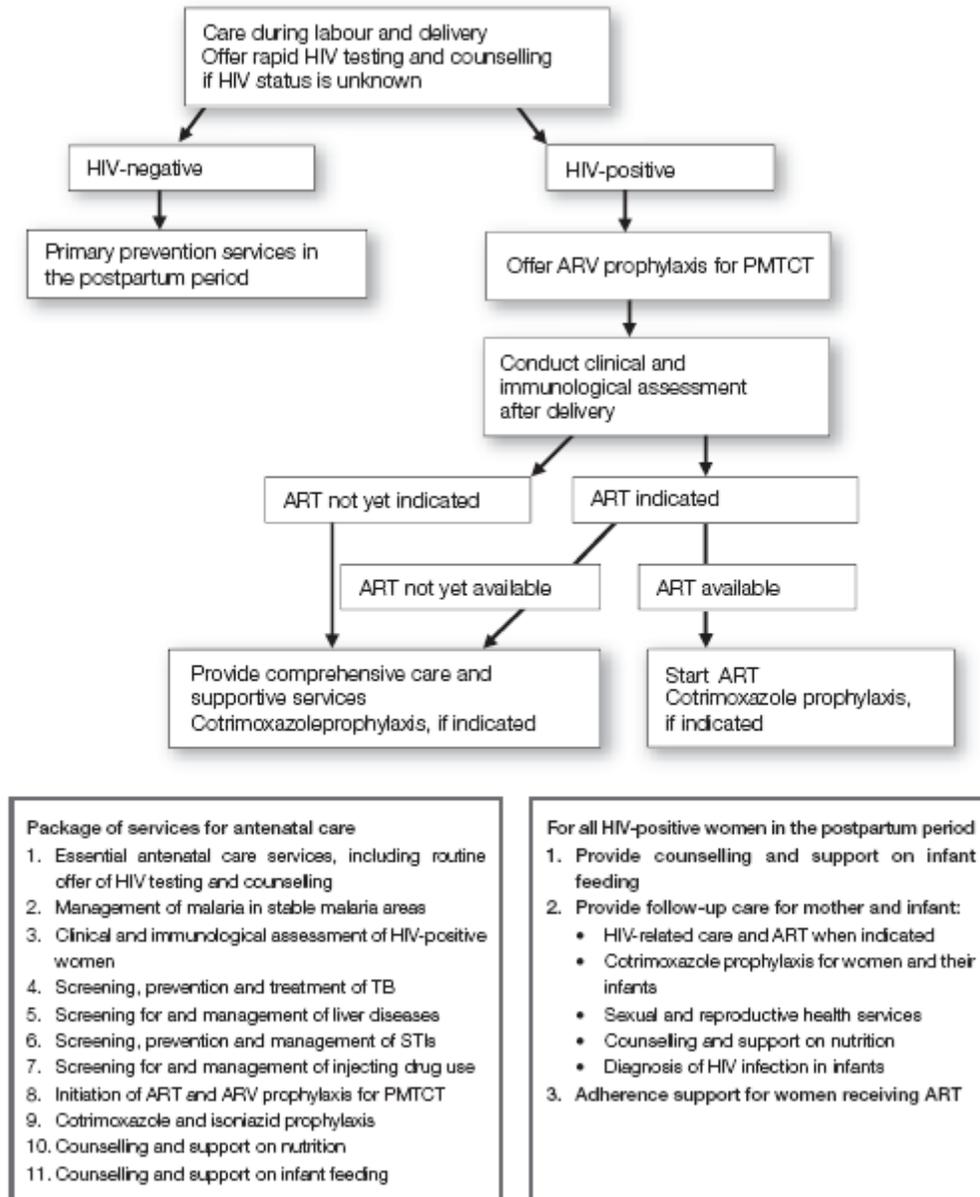
APPENDIX 5

The following figure describes services for women seen during pregnancy and distinguishes between pregnant women with a previously HIV-negative test, those with unknown HIV status, and those known to be HIV-positive.

COMPREHENSIVE SERVICES FOR THE PREVENTION OF MOTHER-TO-CHILD TRANSMISSION

The following figure describes services for women seen during labour.

COMPREHENSIVE SERVICES FOR THE PREVENTION OF MOTHER-TO-CHILD TRANSMISSION

Source: WHO. Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants: towards universal access: recommendations for a public health approach. WHO. Geneva. 2006.
http://www.who.int/hiv/pub/guidelines/pmtctguidelines2.pdf