

# Managing meningitis epidemics in Africa

A quick reference guide for health authorities and health-care workers



World Health  
Organization

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# **I. An introduction to epidemic meningitis control**

# Overview

This guide is for use by health workers and officials working in areas in Africa that are affected by epidemics of meningitis.

It provides a concise overview of the WHO strategy to detect and respond to meningitis epidemics and gives practical advice for those involved in all aspects of epidemic management, from pre-outbreak planning, to patient care and vaccination delivery. Quick reference cards are included in Part II of this guide.

The WHO strategy for the control of epidemic meningitis is based on three key pillars:

- surveillance
- treatment and care
- vaccination

This guide outlines the actions to be taken as part of this strategy – by the district authorities and by staff working within the health centres – before an epidemic strikes, as it evolves and after the event.

# What is epidemic meningitis?

Understanding the early symptoms of the disease is essential both to ensure patients receive prompt treatment and to implement the measures needed to control a potentially widespread epidemic.

**M**eningococcal meningitis is a bacterial form of meningitis, a serious infection of the meninges (brain membrane). It can cause severe brain damage and is fatal in 50 % of cases if untreated.

Several different bacteria can cause meningitis but it is *Neisseria meningitidis* (*Nm*) that has the potential to cause large epidemics. Five serogroups of *Nm* – A, B, C, W135 and X – are found across the “meningitis belt” that stretches across Africa, from Senegal to Ethiopia. In these areas during the dry season, from December to June, populations are at high risk of outbreaks of this disease.

*N. meningitidis* only infects humans; there is no animal reservoir. The bacteria are carried in the throat, often with no symptoms, and are transmitted from person to person through droplets of respiratory or throat secretions as a result of prolonged, close contact. The average incubation period is 4 days, but can range between 2 and 10 days.

The most common symptoms of the disease are high fever, headaches, a stiff neck, vomiting, confusion, sensitivity to light and bulging of the fontanel in infants. Even when the disease is diagnosed early and adequate treatment is started, 5–10 % of patients die, typically within 24 to 48 hours after the onset of symptoms. It may also cause brain damage, hearing loss or a learning disability in 10–20 % of patients who survive.

Understanding the early symptoms of the disease is essential both to ensure patients receive prompt treatment and to implement the measures needed to control a potentially widespread epidemic. Examination under a microscope of the cerebrospinal fluid (CSF), taken from a lumbar puncture, can detect the presence of the bacteria. Confirmation of the diagnosis, as well as the identification of the meningococcal serogroup responsible is then conducted under laboratory conditions.

Patients should receive treatment with antibiotics at a health centre as soon as possible. Isolation is not necessary. A range of antibiotics can treat the infection, including penicillin, ampicillin, chloramphenicol and ceftriaxone. In Africa, during epidemics, oily chloramphenicol or ceftriaxone are recommended because a single dose has been shown to be effective.

# The 3-pillar strategy for epidemic meningitis control

## ■ Pillar 1: Surveillance

A comprehensive surveillance system, if scaled-up at an early stage in the meningitis season before the epidemic has occurred, can help detect the first cases, identify the pathogen as well as the serogroup of the meningococcus (*Nm*) that is responsible for the infection, and serve as a trigger to launch a rapid response operation. Standard case definitions can be used to recognize early cases. These should then be confirmed by laboratory tests. Standard reporting mechanisms are needed in order to analyse the incoming data and determine the extent and evolution of an outbreak.

## ■ Pillar 2: Treatment and care

The second pillar focuses on reducing the impact of the disease on patients by providing prompt, appropriate, accessible and affordable treatment and care. Treatment for meningitis is with antibiotics. Ensuring sufficient stocks are available in the health centres well in advance of need requires careful planning and anticipation of areas likely to be most at risk of outbreaks.

## ■ Pillar 3: Vaccination

Thirdly, in order to limit the magnitude of the epidemic, WHO recommends large-scale vaccination of population groups that are at risk, with the appropriate polysaccharide or conjugate vaccine for the meningococcal serogroup that has been identified as being responsible for the outbreak. Vaccination campaigns on this scale require extensive coordination involving procurement, distribution and logistics, public information and post-vaccination follow-up.



# Planning and coordination at the district level

Planning and coordination is the responsibility of the local health authorities but requires the input of a wide range of partners.

Overall planning and coordination of the 3-pillar strategy for epidemic meningitis control should take place at the district level. It is the responsibility of the local health authorities but requires the input of a wide range of partners.

Experience has shown that establishing a committee for epidemic preparedness and response (EPR Committee), well in advance of the epidemic season, is the most effective way to plan, coordinate and supervise the activities of multiple partners to ensure outbreaks are detected early and an appropriate response is launched promptly.

- The EPR Committee should be led by representatives from the Ministry of Health, and should include staff from key hospitals in the area, reference laboratories and other partners who may be involved in treating patients and monitoring outbreaks.
- The EPR Committee should meet regularly – before and throughout the epidemic season.

## The role of the EPR Committee is to:

- ensure the **surveillance system** is strengthened for the epidemic season and covers the entire district and that health workers receive training in the collection, reporting, analysis, and monitoring of the information as it becomes available;
- ensure that information, training and medical supplies are made available to provide the best possible **treatment for patients** in the most remote health centres;
- ensure the distribution of appropriate vaccines as needed, coordinating **vaccination campaigns**;
- disseminate **information** for the general public on the risks of meningitis, where and how to seek treatment and any plans for vaccination campaigns.

# Pillar 1: Surveillance

## PRE-EPIDEMIC

### At the district level:

- design, print and distribute standard reporting forms and standard case definitions to all health centres;
- ensure all health centres are aware of standard case definitions;
- appoint and train surveillance officers in all areas of the district;
- compile surveillance data on a weekly basis of all suspected cases (as well as zero reporting), analyse trends and monitor any signs of disease activity;
- pre-position diagnostic reagents and other surveillance material within district and reference laboratories.

### In the health centres:

- be aware of and understand the standard case definitions;
- report on zero cases and be ready to report on suspected, probable and confirmed cases;
- conduct lumbar punctures on any suspected case;
- complete a case-base form for all suspected cases.

## DURING AN EPIDEMIC

### At the district level:

- monitor and analyse the in-coming surveillance data on a weekly basis to determine the weekly attack rate (AR) and the case-fatality ratio (CFR) (**see Part II**);
- disaggregate the data to identify disease activity within age groups and population centres of less than 100 000 people;
- recognize as soon as a district has crossed an alert or epidemic threshold and alert all the health facilities in the area;
- investigate and verify the extent of any outbreaks that have been identified;
- ensure 30 CSF samples are collected (**see Part II**) at the start of the epidemic in order to determine the *Nm* serogroup responsible and the type of vaccine required;
- forward CSF samples received from health centres on to reference laboratories for analysis at least twice a week (**see Part II**);
- continue monitoring the disease activity for the duration of the epidemic season.

### In the health centres:

- compile and submit reports on the number of cases and deaths on a weekly basis;
- continue to collect CSF samples on a regular basis throughout the epidemic in order to detect any change in serogroup;
- package and forward CSF samples to a reference laboratory, conditioning samples in triple packaging for travel.

# Pillar 2: Treatment and care

## REMEMBER!

- Meningitis is a life-threatening emergency – NEVER delay adequate treatment.
- If laboratory results are available, treat according to microbiological results.

## PRE-EPIDEMIC

### At the district level:

- plan and implement training courses for health-workers on epidemic treatment protocols;
- print and distribute national treatment protocols (5–7 day treatment) to all health centres;
- calculate the amount of antibiotics and material that may be needed during an epidemic (**see Part II**), pre-position stocks in high-risk areas and establish smooth lines for distribution throughout the district.

### In the health centres:

- following lumbar puncture, treat every new patient who is suspected of having meningitis with antibiotics as soon as possible;
- ensure any child under 2 years of age or any patient with severe symptoms is admitted to the health centre for in-patient treatment and adjust the treatment as necessary;
- record details of all patients in the registry.

## DURING AN EPIDEMIC

- instruct all health centres to switch to the epidemic treatment protocol – single dose oily chloramphenicol/ceftriaxone (**see Part II**);
- launch a public information campaign informing communities of the availability of free treatment in government health centres;
- monitor supplies of antibiotics and restock health facilities as stocks become limited.

# Pillar 3: Vaccination

## WHEN THE EPIDEMIC THRESHOLD HAS BEEN CROSSED

- As soon as the epidemic threshold has been crossed in a district, and the Nm serogroup responsible identified, it is essential that a vaccination campaign is conducted in both the district affected and any adjacent district that has reached the alert threshold.
- The areas affected should be identified as soon as possible and plans made to conduct mass vaccination campaigns.
- A micro-plan and budget for each area targeted for mass vaccination must be prepared (**see below**).
- Sufficient amounts of vaccines must be requested from either the Ministry of Health, which maintains the national stocks, or from the International Coordinating Group on Meningitis Vaccine Provision (ICG)<sup>1</sup> which manages the international emergency stockpile (**see below**).
- A public information campaign must be launched to inform all the communities in the target areas of the coming campaign.
- A cold chain to distribute the vaccines to the target areas must be established.
- Preparations must be made to manage the waste from the campaigns.
- A system for monitoring adverse events following vaccination will be needed.

<sup>1</sup> The ICG is composed of representatives from WHO, UNICEF, Médecins sans Frontières (MSF) and the International Federation of the Red Cross and Red Crescent Societies (IFRC).

### **To access the ICG emergency vaccine stockpile**

- Provide evidence of a meningococcal disease outbreak.
- Provide laboratory confirmation of the *Nm* serogroup responsible.
- Develop and provide plan(s) of action for the vaccination campaign(s).
- Provide proof of necessary storage and transportation resources to ensure the safe and effective delivery and maintenance of the vaccines to the area affected.

## **PREPARING A VACCINATION MICRO-PLAN**

A micro-plan must be prepared for every district targeted for a vaccination campaign. It is the responsibility of the district health authorities to complete and submit the plan in order to prepare thoroughly for the campaign and to secure the necessary vaccines.

### **The micro-plan should include:**

- the names of sub-districts targeted for vaccination;
- the total population currently present in the target areas;
- the population targeted for vaccination;
- the type and quantity of vaccine needed;
- the quantity of additional supplies needed – AD syringes, safety boxes, dilution syringes (10 ml), cotton wool, gloves;
- the number of teams conducting the campaign (each team requires vaccinators, recorders, crowd controllers and a supervisor);
- the number of supervisors – at team, district, provincial and central levels;
- the mechanism for training the vaccination teams;
- logistic needs – cold chain equipment, vehicles;
- the mechanism for managing waste resulting from the campaign;
- the plans for vaccination campaign coverage surveys.

### **The budget should include:**

- allowances for members of the vaccination team;
- social mobilization costs (including allowances for staff);
- costs of logistic equipment;
- costs of waste management.

# Post-epidemic follow-up

A meningitis epidemic is declared to be over when the attack rate descends below the alert threshold over two consecutive weeks. Once that point has been reached, a number of follow-up activities are needed:

- continue weekly reporting of both cases and laboratory results to monitor trends;
- gather remaining stocks of antibiotics or reposition for use in treatment for other conditions;
- return any remaining stocks of vaccines to district stockpiles;
- dispose of all waste following vaccination campaigns;
- conduct a vaccination coverage survey;
- revert to the national endemic treatment protocol;
- evaluate the outbreak response and complete a report on the outbreak;
- propose feedback to stakeholders.

## **II.** Useful reference material



# How to identify meningitis cases

## STANDARD CASE DEFINITIONS

### ■ Suspected case:

Any person with sudden onset of fever (>38.5 °C rectal or >38.0 °C axillary) and one of the following signs – neck stiffness, flaccid neck, bulging fontanel, convulsion or other meningeal signs.

### ■ Probable case:

Any suspected case with macroscopic aspect of its CSF turbid, lousy or purulent; or with microscopic test showing Gram negative diplococci, Gram positive diplococci, Gram positive bacilli; or with leukocytes count of more than 10 cells/mm<sup>3</sup>.

### ■ Confirmed case:

Isolation or identification of the causal pathogen (*Neisseria meningitidis*, *Streptococcus pneumoniae*, *Haemophilus influenzae b*) from the CSF of a suspected or probable case by culture, PCR or agglutination test.

## LABORATORY TESTS PERFORMED ON CSF SAMPLES TO DETERMINE PROBABLE AND CONFIRMED CASES

### ■ Gram stain and cell count

Gram negative diplococci suggests *Nm*. Performed at district level laboratory.

### ■ Rapid latex agglutination test

Confirms pathogen and *Nm* serogroup (cannot differentiate between W135 and Y). Performed at field/peripheral/health-care facility level.

### ■ Culture and sero-grouping

Confirms pathogen and *Nm* serogroup. Gold standard for laboratory confirmation. Also confirms antibiotic sensitivity. Performed at national or regional laboratory.

### ■ Polymerase chain reaction (PCR)

Confirms etiological agent and its serogroup and confirms meningitis diagnosis (even in the absence of growth by culture). Performed at national or regional laboratories with specialized equipment.

# How to determine the alert and epidemic thresholds

## CALCULATING DISEASE INCIDENCE AND CASE-FATALITY RATIO

ATTACK RATE (AR)	CASE-FATALITY RATIO (CFR)
Number of cases per week <i>divided by</i> total district population X 100 000	Number of deaths <i>divided by</i> number of cases in same period X 100

## DETERMINING ALERT AND EPIDEMIC THRESHOLDS

	POPULATION <30 000	POPULATION >30 000
Alert threshold	2 cases in one week <i>or</i> Greater number of cases than over the same period in non-epidemic years	AR = 5 cases/100 000 population/week
Epidemic threshold	5 cases in one week <i>or</i> doubling in number of cases over 3-week period Special situations should be studied on a case-by-case basis <sup>a</sup>	AR = 15/100 000 population/week In certain conditions indicating higher epidemic risk: <sup>b</sup> AR = 10/100 000 population/week Special situations should be studied on a case-by-case basis <sup>a</sup>

<sup>a</sup> For mass gatherings, refugees and displaced persons, 2 confirmed cases in 1 week are enough to warrant vaccination of the population.

<sup>b</sup> No epidemic in previous 3 years or vaccination coverage < 80 % or alert threshold crossed early in season.

# How to collect CSF for laboratory analysis

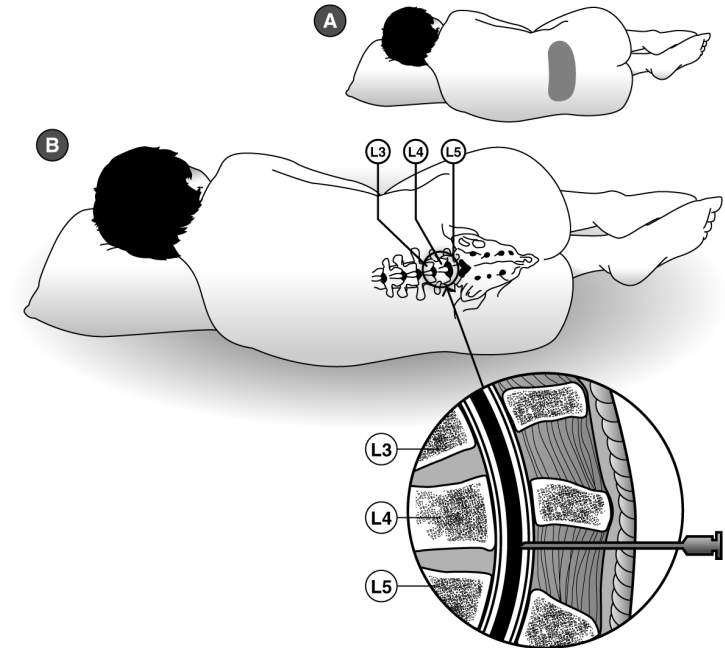
## HOW TO PERFORM A LUMBAR PUNCTURE

### What you need:

- lumbar puncture needles
- sterile tube
- alcohol swabs
- sterile gauze pad
- band aid
- sterile gloves
- iodine
- adhesive labels

### Step by step:

1. wash your hands
2. put on sterile gloves
3. disinfect the puncture site
4. locate the puncture site between L4 and L5 or L3 and L4
5. use a spinal needle to collect 1 to 3 ml of spinal fluid (CSF) in the sterile tube
6. dress the puncture site and allow the patient to lie flat for a minimum of 30 minutes.



- A** The patient lies on his side with knees flexed and back arched to separate the lumbar vertebrae, and the area overlying the lumbar spine is disinfected.
- B** The space between the L4 and L5 (or L3 and L4) is located and the spinal needle is carefully directed into the spinal canal.

# How to prepare CSF samples for transportation

## REMEMBER!

- TI vials should never be frozen.
- Before inoculation TI vials should be kept in the refrigerator.
- Once inoculated, TI vials should be kept at room temperature.
- Inoculated TI vials must be ventilated if not transported the same day.

Place 1–2 ml of CSF sample in cryotube for Polymerase chain reaction (PCR).

Place 1 ml of CSF sample into a Trans-Isolate (TI) bottle for culture, sensitivity testing and serogrouping.

### Procedure:

- Remove a vial of Trans-Isolate (TI) medium from the refrigerator at least 30 minutes before inoculating it with the specimen.
- Before inoculating the vial, check to see if there is any visible growth or turbidity. If there is visible growth or turbidity, discard the vial, because it may be contaminated.
- Lift up the small lid in the middle of the metal cap on top of the TI vial.
- Disinfect the top of the TI vial with alcohol and allow to dry.
- With a new, sterile needle and syringe transfer 1 ml of CSF from the sterile tube into the TI vial.
- If not transported the same day, puncture the top of the TI vial with a sterile needle to ventilate and ensure bacteria growth.
- Keep the sample at room temperature away from light and cold.
- TI vials should be forwarded to the district authority for onward transportation to a reference laboratory at least twice a week, removing the needle before conditioning in triple packaging for travel.
- Label the TI vial and complete the appropriate form.

# Treatment protocols during meningitis epidemics in Africa (without laboratory confirmation)

## REMEMBER!

Never give chloramphenicol to:

- pregnant or breastfeeding women
- infants less than two months old

### In children aged 0–23 months

Ceftriaxone 100 mg/kg/day once a day 7 days (< 2 months) and 5 days (2–23 months)

Transfer if no improvement within 48 hours or coma or convulsion

Adapt treatment according to patient's age and most likely causative pathogen.

### In children over 2 years and adults

*N. meningitidis* should be considered the most likely pathogen – presumptive treatment is justified

#### Ceftriaxone

Single dose as presumptive treatment.  
Intramuscular route

Dose = 100mg/kg (max 4 g)

2nd dose if no improvement after 24 hours

If no improvement after 48 hours, treat for 5 days or refer

or

#### Oily chloramphenicol

Single dose as presumptive treatment.  
Intramuscular route

Dose = 100 mg/kg (max 3 g)

2nd dose if no improvement after 24 hours

Note: These treatment protocols should only be used in districts undergoing an epidemic.

## ESTIMATION OF ANTIBIOTIC NEEDS

FORMULA	EXAMPLE
Total population in district	295 484
Likely cumulative attack rate for season (based on past epidemics)	150/100 000
Estimated number of cases during season (population X cumulative AR), less number of actual cases	$295\,484 \times 150/100\,000 = 443$ $443 \text{ less } 56 = 387$
Plus additional 25 % buffer stock	$387 \text{ plus } 97 = 484$
Antibiotics needed: For ceftriaxone (4 vials per treatment) or For oily chloramphenicol (6 vials per treatment)	$484 \times 4 = 1936$ vials of ceftriaxone  $484 \times 6 = 2904$ vials of oily chloramphenicol
Plus water for injection, needles and syringes	

# Information resources

## **International Coordination Group on Meningitis Vaccine Provision (ICG)**

Application forms and guidelines

*International Coordinating Group on Vaccine Provision for Epidemic Meningitis Control (ICG).*

*Guidelines for applying to the emergency stockpile*

[http://www.who.int/csr/disease/meningococcal/ICG\\_guidelines\\_2008\\_02\\_09.pdf](http://www.who.int/csr/disease/meningococcal/ICG_guidelines_2008_02_09.pdf)

Application form to access ICG support

<http://www.who.int/csr/disease/meningococcal/icg/en/index.html>

Annex: Epidemiological and laboratory information

<http://www.who.int/csr/disease/meningococcal/icg/en/index.html>

## **Surveillance**

*Standard Operating Procedures for Enhanced Meningitis Surveillance in Africa* (WHO-AFRO, 2009).

[http://www.afro.who.int/index.php?option=com\\_docman&task=doc\\_download&gid=4722](http://www.afro.who.int/index.php?option=com_docman&task=doc_download&gid=4722)

Detecting meningococcal meningitis epidemics in highly-endemic African countries.

*Weekly Epidemiological Record*, 2000, 75:306–309.

<http://www.who.int/docstore/wer/pdf/2000/wer7538.pdf>

## **Treatment and care**

Prasad K, et al. Third generation cephalosporins versus conventional antibiotics for treating acute bacterial meningitis. *Cochrane Database of Systematic Reviews* 2007, Issue 4. Issue 4. Art.

No.: CD001832. DOI: 10.1002/14651858.CD001832.pub3

<http://www.mrw.interscience.wiley.com/cochrane/clsysrev/articles/CD001832/frame.html>

*Pocket book for hospital care for children: guidelines for the management of common illnesses with limited resources.* Geneva, World Health Organization, 2005.

<http://whqlibdoc.who.int/publications/2005/9241546700.pdf>



*Standardized treatment of bacterial meningitis in Africa in epidemic and non epidemic situations.* Geneva, World Health Organization, 2007 (WHO/CDS/EPR/2007.3)

[http://www.who.int/csr/resources/publications/meningitis/WHO\\_CDS\\_EPR\\_2007\\_3/en/index.html](http://www.who.int/csr/resources/publications/meningitis/WHO_CDS_EPR_2007_3/en/index.html)

*WHO model formulary 2008.* Geneva, World Health Organization, 2009 (pages 109 and 114).

[http://www.who.int/selection\\_medicines/list/WMF2008.pdf](http://www.who.int/selection_medicines/list/WMF2008.pdf)

*WHO Model List of Essential Medicines*, 16th edition, March 2010. Geneva, World Health Organization, 2010 (pages 5 and 6).

[http://www.who.int/entity/medicines/publications/essentialmedicines/Updated\\_sixteenth\\_adult\\_list\\_en.pdf](http://www.who.int/entity/medicines/publications/essentialmedicines/Updated_sixteenth_adult_list_en.pdf)

## **Vaccination**

*The use of polysaccharide trivalent ACW vaccine for the control of epidemic meningococcal disease outbreaks in countries of the African meningitis belt. Recommendations from an international informal consultation.* Geneva, World Health Organization, 2003. (WHO/CDS/CSR/GAR/2003.14)

[http://www.who.int/csr/resources/publications/meningitis/WHO\\_CDS\\_CSR\\_GAR\\_2003\\_14/en/index.html](http://www.who.int/csr/resources/publications/meningitis/WHO_CDS_CSR_GAR_2003_14/en/index.html)

## **Lumbar puncture**

*The use of lumbar puncture kits in the context of Epidemic Meningitis Surveillance: an audiovisual aid to safe practices and appropriate specimen handling procedures.* WHO/CDS/EPR/2006.1

[http://video.who.int/streaming/eprfilms/Lumbar\\_Puncture\\_Training\\_Film.wmv](http://video.who.int/streaming/eprfilms/Lumbar_Puncture_Training_Film.wmv)

*WHO Guidelines on Hand Hygiene in Health Care.* Geneva, World Health Organization, 2009.

[http://whqlibdoc.who.int/publications/2009/9789241597906\\_eng.pdf](http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf)

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