Chapter 3
Meningitis outbreaks

Purpose of assessment

The purpose of this rapid assessment is to:

- — confirm that an epidemic or potential epidemic of meningococcal meningitis exists and estimate its geographical distribution;
- — estimate its health impact, and
- — assess local response capacity and identify the most effective control measures to minimize the outbreak's ill effects.

Background

Geographical distribution

Meningococcal meningitis, caused by the organism *Neisseria meningitidis*, is responsible for epidemic emergencies that are particularly severe in sub-Saharan Africa. In areas within the "meningitis belt", epidemics occur in 8 to 12 year cycles and are characterized by attack rates as high as 1%, mortality rates of up to 10%, even with treatment, and neurological sequelae among survivors

However, outbreaks of meningococcal disease have reached other African countries. The epidemics seen towards the end of the 1980s and the early 1990s in Burundi, the Central African Republic, Kenya, Rwanda, Uganda, the United Republic of Tanzania and Zambia are examples of the disease's spread outside its usual boundaries. This reflected the extension of drought areas, or increased population movements owing to voluntary travel, warfare or movements of refugees. The outbreaks may also reflect the introduction of a new meningococcal strain into susceptible populations.

Cluster outbreaks in the Eastern Mediterranean Region have also occurred through transmission at international gatherings, such as pilgrimages. At a country level, epidemics have been reported in at-risk settings such as refugee camps, military facilities, and disadvantaged communities The risk of person-to-person transmission is greatly increased in these populations since the disease is spread through respiratory droplets from cases with nasopharyngitis or from asymptomatic carriers.

Recently, Mongolia has experienced epidemics of magnitude comparable to that of the meningitis belt. India and Nepal also had serious outbreaks in the mid-1990s.

Epidemic threshold

For countries with high rates of endemic meningitis, such as those within the traditional meningitis belt, a rate of 15 cases per 100 000 per week in a given area,

averaged over two consecutive weeks, appears to be a sensitive and specific predictor of epidemic disease in this area.

In areas where epidemic meningococcal disease is unusual, a three- to four-fold increase in cases compared with a similar time period in previous years may indicate an epidemic. Another potentially useful indicator of an emerging epidemic in areas outside the meningitis belt is a doubling of meningitis cases from one week to the next for a period of three weeks. This criterion may be used, for example, in countries where population data are not available, in refugee camps, and in closed communities.

Vaccines

Vaccines are currently available to prevent meningococcal meningitis caused by serogroups A, C, Y and W135, usually provided as bivalent A and C, or quadrivalent vaccines.

A single dose of group A vaccine protects those over one to two years of age. Data show that antibody levels rise within 7 to 10 days of vaccination Children of three months to two years of age may benefit from a second dose, although the vaccine's efficacy has not been proven for this age group. The duration of protection in adults is at least three years.

Group C vaccine has not been shown to be effective in children under two years old.

Treatment

A single intramuscular injection of long-acting chloramphenicol in oil has been proved effective in meningococcal meningitis epidemics If there is no clinical improvement after 24 to 48 hours, a second dose should be given. Penicillin, ampicillin, and chloramphenicol are also effective, but require multiple doses and, in severe cases, intravenous administration.

Conducting the assessment

Although a functioning health surveillance system should detect any unusual increase in the number of meningitis cases, meningitis epidemics are often first reported by hospitals, community leaders or the media.

In any instance, a rapid assessment is necessary.

It is important to choose a sufficiently large population for the assessment of weekly attack rates, at least 30000 to 50000 since disease rates in smaller populations can fluctuate widely even with a small number of cases. On the other hand, if only very large (>1 000 000) populations are observed, low overall attack rates may obscure high rates within smaller populations in local areas. The most appropriate denominators are administrative areas with population ranging between 30000 and 100000.

The decision to call for an emergency response to a meningococcal meningitis outbreak is determined by:

— the seriousness of its health impact on the population at risk; and
— the ability of local health services to respond.

These two factors should be given priority during the assessment.

The rapid assessment consists of confirming a meningitis outbreak and estimating its geographical distribution, assessing the health impact, and the local response capacity and immediate needs.

Confirming a meningitis outbreak and estimating its geographical distribution

To confirm the existence of a meningitis outbreak and estimate its geographical distribution, establish an initial case definition, undertake case-findings, and collect appropriate specimens for laboratory analysis and confirmation.

Initial case definition

The initial case definition is best determined in advance, as part of emergency preparedness. Simple, viable case definitions should be determined for infants, older children, and adults

The standard case definition of bacterial meningitis[1] is as follows:

- *Suspected case:*[2] Sudden onset of elevated temperature (>38.5 °C rectal or 38.0 °C axillary) with stiff neck or petechial or purpural rash or both.

  In patients under one year of age, a suspected case of meningitis occurs when fever is accompanied by a bulging fontanelle.

- *Probable case:*[3] Suspected case as defined above with turbid cerebrospinal fluid (CSF) (with or without positive Gram stain) or ongoing epidemic.
- *Confirmed case*[4] Suspected or probable case as defined above and either positive cerebrospinal fluid (CSF) antigen detection or positive culture.

Case-finding

Case-finding is best undertaken through hospitals and other health facilities in the affected area. A rapid survey of households is probably not useful as, even in serious epidemics, the attack rate may not exceed 5 per 1000

By reviewing hospital records for the same period during previous years, it may be possible to determine whether there is a significant increase in cases. Look at their geographical distribution, and at the speed at which new cases are being reported

[1] This case definition allows the detection of meningococcal septicaemia.
[2] Often the only diagnosis that can be made in dispensaries (peripheral level of health care)
[3] Diagnosed in health centres where lumbar puncture and CSF examination are feasible (intermediate level)
[4] Diagnosed in well-equipped hospitals (provincial or central level)

Collection of specimens

In areas where meningitis is hyperendemic or periodically epidemic, clinical recognition is usually reliable. However, every effort should be made to obtain CSF from cases. This is essential to:

— confirm the diagnosis and define the serogroup to determine whether vaccination is a useful strategy; and
— determine antimicrobial sensitivity for treatment and possible prophylaxis.

If routine bacteriological capability is available, CSF specimens can be plated and incubated on site (e.g. in an equipped provincial hospital).

Although diagnosis in the field can be undertaken by examining a smear of CSF, the results may be unreliable. In such cases, CSF specimens should be transported under sterile conditions for analysis at a laboratory equipped with commercially available antigen detection kits.

The following considerations are important in specimen collection:

- While it is preferable to obtain CSF specimens before antibiotic therapy has begun, treatment should not be delayed. Rather, it should be noted on the form accompanying the specimen that antibiotics have already been administered.
- If adequate laboratory capacity is not available, CSF specimens can be inoculated into transport-isolation media on site, and then transported to an equipped laboratory (screw-top tubes are less likely to become contaminated in field conditions than plates).
- If transport media are not available, then CSF should be collected in a clean and sterile container for transport to a suitably equipped laboratory.

To verify the laboratory diagnosis and confirm the organism serogroup and antibiotic sensitivities, it is advisable to ship specimens to WHO collaborating centres for urgent analysis.

Assessing the impact on health

To assess the impact on health of a meningitis outbreak, collect information on sample cases, analyse the information gathered, and draw initial conclusions.

Collecting information on a sample of cases

Time and resources permitting, information on age, sex, occupation, residence, and date of onset is helpful in identifying groups at greatest risk from:

— the spread of the disease (e.g. overcrowded squatter settlements where the potential risk of rapid transmission is great); and
— mortality (e.g. identify populations with poor access to health facilities and those with poorly equipped health facilities where a higher mortality risk might be expected).

Analysing the information

Time: When did cases occur? Is the number increasing?

- Draw a simple graph to show the number of cases reported per day for the epidemic so far.
- If the meningitis outbreak has affected a wide area, construct simple graphs for the different areas affected.

Place: Where have meningitis cases occurred? Is the outbreak spreading? Are there accessible health facilities in affected areas?

- Map cases geographically if possible by date of onset.
- Use maps that identify settlements, health facilities, and major transport routes. If these are not available, sketch a rough map including this information. This helps identify at-risk areas and their relation to road or rail links and existing health facilities that are important for organizing a rapid response.

Person: Which groups and communities are at greatest risk? How many cases are there so far, or could there be in the future?

- Estimate the number of hospital admissions and clinic attendances for affected areas and for specific facilities.

Drawing initial conclusions on the outbreak

To draw initial conclusions about the outbreak, you should obtain answers to the following questions:

- Is there an outbreak of acute meningococcal meningitis?
- How many cases and deaths so far?
- What is the geographical distribution of the cases?
- What is the size of the population at risk?
- Is the outbreak spreading? Where?
- What do preliminary laboratory results show?

Assessing local response capacity and immediate needs

Local response capacity and immediate needs should be assessed to determine the type and quantity of external support required.

Local epidemiological surveillance

- Are more extensive field investigations needed?
- If the outbreak has affected a large population or has occurred in an area inaccessible to the capital or both, is there at least one available person with training in epidemiology to maintain and supervise outbreak surveillance?
- Will she or he have available an appropriate vehicle to visit the area affected?
- Is outside help needed?

Response capacity of local health services

- What is the case-fatality ratio?
- What steps have local health officials taken to organize epidemic response? Is there a plan of action, standardized reporting procedures, and trained staff?

- What linkages have been established with key community leaders (e.g. to improve case detection and allay panic)?
- Are health facilities accessible to affected populations? Are temporary centres needed? Where?
- Is there at least one qualified physician in the affected area experienced in the clinical management of meningitis?
- At district-level facilities, is there at least one nurse or health worker with experience in the care of severely ill meningitis patients?
- Are health facilities equipped and do they have sufficient staff for projected patient load?
- What is the local cold chain capacity? Are there trained vaccinators, jet injectors, vehicles, stocks of syringes and vaccines?
- Is there access to vehicles for local distribution and supply of emergency drugs?
- What stocks of drugs (e.g. oily and oral chloramphenicol, crystalline benzylpenicillin, and supportive drugs) are available?

Determine immediate needs

When deciding on the need for emergency response the following questions should be considered.

- Is there an outbreak of meningococcal meningitis that has or could lead to a large number of cases?
- If so, are outside resources needed to contain it?

If the answer to both questions is "yes", then an emergency response is needed.

Presenting results

When presenting the results of the rapid health assessment indicate the following:

- — confirm the serogroup responsible for the outbreak and determine antibiotic sensitivities as urgent priorities, if still unknown;
- — describe the situation; and
- — recommend action.

Describe the situation

- Give an estimate of the geographical magnitude and potential health impact by determining the size of the population at risk and the number of projected cases, hospital admissions, and deaths.
- Quantify the available resources and the need for outside assistance based on these preliminary findings (e.g. vaccines, drugs, and logistics and communications support).

Recommend action

- If the epidemic is caused by serogroups A or C, immediate immunization should begin.
- If sufficient vaccine supplies and administrative support are available, mass vaccination of the entire population should be considered.

- If resources are limited, it may be necessary to restrict vaccination to the age groups most at risk, namely those with the highest attack rates or accounting for the largest proportion of cases.
- Prepare and convey assessment findings to epidemic emergency decision-makers at community, subnational, national, and international levels.