Meningococcal meningitis

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Key facts

- Meningococcal meningitis is a bacterial form of meningitis, a serious infection of the thin lining that surrounds the brain and spinal cord.
- The meningitis belt of sub-Saharan Africa, stretching from Senegal in the west to Ethiopia in the east, has the highest rates of the disease.
- Group A meningococcus accounts for an estimated 80–85% of all cases in the meningitis belt, with epidemics occurring at intervals of 7–14 years.
- In the 2009 epidemic season, 14 African countries implementing enhanced surveillance, reported 88 199 suspected cases, including 5352 deaths, the largest number since a 1996 epidemic.
- Several vaccines are available to control the disease: a meningococcal A conjugate vaccine, C conjugate vaccines, tetravalent A, C, Y and W135 conjugate vaccines and meningococcal polysaccharide vaccines.

Meningococcal meningitis is a bacterial form of meningitis, a serious infection of the meninges that affects the brain membrane. It can cause severe brain damage and is fatal in 50% of cases if untreated.

Several different bacteria can cause meningitis. *Neisseria meningitidis* is the one with the potential to cause large epidemics. Twelve serogroups of *N. meningitidis* have been identified, six of which (A, B, C, W135, X and Y) can cause epidemics. Geographic distribution and epidemic potential differ according to serogroup.

Transmission

The bacteria are transmitted from person-to-person through droplets of respiratory or throat secretions from carriers. Close and prolonged contact – such as kissing, sneezing or coughing on someone, or living in close quarters (such as a dormitory, sharing eating or drinking utensils) with an infected person (a carrier) – facilitates the spread of the disease. The average incubation period is four days, but can range between two and 10 days.

*Neisseria meningitidis* only infects humans; there is no animal reservoir. The bacteria can be carried in the throat and sometimes, for reasons not fully understood, can overwhelm the body's defenses allowing infection to spread through the bloodstream to the brain.
Although there remain gaps in our knowledge, it is believed that 10% to 20% of the population carries *Neisseria meningitidis* in their throat at any given time. However, the carriage rate may be higher in epidemic situations.

**Symptoms**

The most common symptoms are a stiff neck, high fever, sensitivity to light, confusion, headaches and vomiting. Even when the disease is diagnosed early and adequate treatment is started, 5% to 10% of patients die, typically within 24 to 48 hours after the onset of symptoms. Bacterial meningitis may result in brain damage, hearing loss or a learning disability in 10% to 20% of survivors. A less common but even more severe (often fatal) form of meningococcal disease is meningococcal septicaemia, which is characterized by a haemorrhagic rash and rapid circulatory collapse.

**Diagnosis**

Initial diagnosis of meningococcal meningitis can be made by clinical examination followed by a lumbar puncture showing a purulent spinal fluid. The bacteria can sometimes be seen in microscopic examinations of the spinal fluid. The diagnosis is supported or confirmed by growing the bacteria from specimens of spinal fluid or blood, by agglutination tests or by polymerase chain reaction (PCR). The identification of the serogroups and susceptibility testing to antibiotics are important to define control measures.

**Treatment**

Meningococcal disease is potentially fatal and should always be viewed as a medical emergency. Admission to a hospital or health centre is necessary, although isolation of the patient is not necessary. Appropriate antibiotic treatment must be started as soon as possible, ideally after the lumbar puncture has been carried out if such a puncture can be performed immediately. If treatment is started prior to the lumbar puncture it may be difficult to grow the bacteria from the spinal fluid and confirm the diagnosis.

A range of antibiotics can treat the infection, including penicillin, ampicillin, chloramphenicol and ceftriaxone. Under epidemic conditions in Africa in areas with limited health infrastructure and resources, oily chloramphenicol or ceftriaxone are the drugs of choice because a single dose has been shown to be effective on meningococcal meningitis.

**Prevention**

There are three types of vaccines available.

- Polysaccharide vaccines have been available to prevent the disease for over 30 years. Meningococcal polysaccharide vaccines are available in either bivalent
(groups A and C), trivalent (groups A, C and W), or tetravalent (groups A, C, Y and W135) forms to control the disease.

- For group B, polysaccharide vaccines cannot be developed, due to antigenic mimicry with polysaccharide in human neurologic tissues. Consequently, vaccines against B used in particular in Cuba, New Zealand and Norway were outer membrane proteins (OMP) and strain-specific to control specific epidemics. Additional universal group B protein vaccines are in late stages of development.
- Since 1999, meningococcal conjugate vaccines against group C have been available and widely used. Tetravalent A, C, Y and W135 conjugate vaccines have been licensed since 2005 for use in children and adults in Canada, the United States of America, and Europe.

In December 2010, a new meningococcal A conjugate vaccine was introduced nationwide in Burkina Faso, and in selected regions of Mali and Niger. Subsequently these countries reported, in 2011, the lowest number of confirmed meningitis A cases ever recorded during an epidemic season. Other countries in the African meningitis belt are preparing for introduction of the vaccine; in 2011 Cameroon, Chad and Nigeria are introducing the vaccine in selected regions and Mali and Niger are completing their nationwide campaigns.

The vaccine has several advantages over existing polysaccharide vaccines: it induces a higher and more sustainable immune response against group A meningococcus; it reduces the carriage of the bacteria in the throat and thus its transmission; it is expected to confer long-term protection not only for those who receive the vaccine, but on family members and others who would otherwise have been exposed to meningitis; it is available at a lower price than other meningococcal vaccines; and it is expected to be particularly effective in protecting children under two years of age, who do not respond to conventional polysaccharide vaccines.

It is hoped that all 25 countries in the African meningitis belt will have introduced this vaccine by 2016. High coverage of the target age group of 1–29 years is expected to eliminate meningococcal A epidemics from this region of Africa.

**Outbreak trends**

Meningococcal meningitis occurs in small clusters throughout the world with seasonal variation and accounts for a variable proportion of epidemic bacterial meningitis.

The largest burden of meningococcal disease occurs in an area of sub-Saharan Africa known as the meningitis belt, which stretches from Senegal in the west to Ethiopia in the east. During the dry season between December to June, dust winds, cold nights and upper respiratory tract infections combine to damage the nasopharyngeal mucosa, increasing the risk of meningococcal disease. At the same time, transmission of *N. meningitidis* may be facilitated by overcrowded housing and by large population displacements at the regional level due to pilgrimages and traditional markets. This combination of factors explains the large epidemics which occur during the dry season in the meningitis belt.
Global public health response

With the introduction of the new meningococcal A conjugate vaccine, WHO promotes a strategy comprising epidemic preparedness, prevention and response. Preparedness focuses on surveillance, from case detection to investigation and laboratory confirmation. Prevention consists of vaccinating all 1-29 year-olds in the African meningitis belt with this vaccine. WHO regularly provides technical support at the field level to countries facing epidemics.

Epidemic response consists of prompt and appropriate case management with oily chloramphenicol or ceftriaxone and reactive mass vaccination of populations not already protected through vaccination.

Meningitis epidemics in the African meningitis belt constitute an enormous public health burden. WHO is committed to eliminating meningococcal disease as a public health problem.

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