Meningitis in children

Meningitis is a medical emergency and a feared disease. Nobody likes to talk or hear about it, since it's easier to just think that it will never happen to us. Having the right information though, can be of crucial importance to understand the "why"s and the "how"s, to be able to detect it early or even prevent it.

What does “meningitis” mean?

Like all the "-itis", meningitis means inflammation, in this case of the meninges, which are three fine layers of tissue surrounding the brain and the spinal cord. Usually, they get inflamed after an infection in a different part of the body, from which germs can travel through the bloodstream to the meninges, but other conditions can also cause this.

Depending on the cause, the patient's age, concomitant illnesses and treatments, there can be different types of meningitis, with different degrees of severity, different treatment options, different prevention measures and outcomes.
What are the causes of meningitis?

- The immense majority of meningitis is produced by viral or bacterial infections.
- Viral meningitis: it's the most common form, especially in developed countries, where vaccination has decreased the frequency of bacterial invasive infections. Many viruses can cause meningitis, but the most frequently met are viruses which belong to the Enterovirus family.
- Bacterial meningitis: although less frequent, it's by far more dangerous as it can cause severe complications and even death. Streptococcus pneumoniae or pneumococcus, Neisseria meningitidis or meningococcus and Haemophilus influenzae are the most commonly involved bacteria.
- Fungal infections or even tuberculosis can cause meningitis, although these are very rare and almost always associated with other risk factors.
- Other conditions like autoimmune / autoinflammatory diseases, certain types of cancer, certain medications (extremely rare).

How can one get meningitis?

- It is important to mention that not all persons who become infected with a virus or bacteria will get the same symptoms or disease. An infection is the result of the interaction of many factors (age, general condition of the patient, vaccinations, virulence of the germ, quantity of germs that enter the body, previous treatments etc).
- Depending on the type of microbe, the transmission mechanism can be different:
  - Through close personal contact with someone who is sick.
  - Through contact with contaminated feces (like diaper changing or improper hygiene measures), water, food and surfaces.
  - Through airborne droplets or breathing contaminated air.
  - Through animal or insect bites
  - During birth
- From an infection at a different site (like otitis or sinusitis), when the infection is not well controlled and the germs travel through the bloodstream and reach the meninges, among other possible sites (this situation is also known as bacteremia, which means presence of bacteria in the bloodstream, and it can lead to septicemia)
- Patients with weak immune system, like those affected by cancer or other chronic illnesses, primary immunodeficiencies, HIV infection etc, as well as the more “fragile” patients in the extremes of life (newborns, young infants and elderly persons) are more prone to develop a serious infection after coming into contact with a possible causative germ than healthy people.
- By traveling to areas where meningitis, especially bacterial, is endemic, or more frequent.
- After a serious head injury, which disrupts the intact barriers that prevent infections to propagate. Through the same mechanism, certain anatomic anomalies, where these barriers are not intact, increase this risk.
- Having a foreign body placed in contact with the meningeal space, like catheters, reservoirs, implants, in patients with other conditions.

What are the symptoms?

- The symptoms can be very similar.
• Bacterial meningitis usually progresses quicker and is more severe, but this is not always the case.

• Non-specific symptoms (especially in babies):
  • fever
  • irritability or lethargy
  • refusal to eat or drink
  • vomiting, diarrhea
  • runny nose, cough
  • the anterior fontanelle (the soft spot) may bulge or be pulsatile.
  • muscle aches similar to those produced by the flu

• More specific symptoms (more typical in older children), although not exclusive to meningitis and not present in all types of meningitis:
  • headache
  • nausea and vomiting
  • confusion
  • stiff neck
  • photophobia (being bothered by bright lights)
  • seizures
  • coma (decreased level of alertness, unexplainable sleepiness, difficulty to wake up)
  • petechiae or purpura (see picture)

How is meningitis diagnosed?

Early diagnosis is of extreme importance.

• The suspicion is made clinically and confirmed with laboratory tests.

• Blood analysis: to determine signs of inflammation, general repercussion of the infection over the organism, specific signs that orient towards a viral or bacterial cause or signs of septicemia.

• Lumbar puncture or spinal tap: by extracting a small quantity of cerebrospinal fluid through a needle, several tests can be done to determine the exact cause and degree of inflammation.

• Blood, cerebrospinal fluid and other cultures: to determine which microbe is the cause of the meningitis, what is the best antibiotic treatment and also the spread of the infection throughout the body.

• Other tests may be needed depending on the severity, clinical circumstances and if other causes cannot be ruled out.

Complications and prognosis

• Viral meningitis: children usually recover completely with only supportive treatment, without
Septicemia is one of the most feared complications, especially in bacterial meningitis. It is characterized by a very severe inflammation due to uncontrolled infection throughout the body, that can affect virtually any organ and lead even to death.

Meningococcal meningitis and septicemia remain the leading infectious cause of death for children under five in the UK.

Other long-term complications are usually associated with severe cases, especially of bacterial cause:
- deafness
- developmental delay, learning difficulties
- muscle paralysis, weakness or spasms
- seizures
- kidney failure
- partial amputation of limbs due to necrosis

How is meningitis treated?

- **Bacterial meningitis is a medical emergency** which must be treated as soon as possible and aggressively with antibiotics and other drugs to minimize the risk of complications and even death.

- Even the most remote suspicion of a bacterial cause requires empirical treatment (which means treating even before identifying the bacteria or before ruling out a bacterial cause), because even when treated promptly and appropriately, some patients will still have serious sequelae, so the sooner the treatment is administered, the better.

- The treatment can only be done in the hospital setting.

- Antibiotics are the most important part of the treatment and should be started immediately after obtaining samples for cultures. Usually, high-spectrum antibiotics are used at the beginning, and even combinations of 2 or 3 antibiotics at the same time. The treatment is later adjusted depending on the clinical course and the results from the cultures.

- Corticosteroids may be required as an anti-inflammatory treatment, depending on the cause.

- Intravenous fluids may be needed to maintain adequate hydration or a normal blood pressure.

- Depending on the severity, special intensive treatments to help the child breathe, to maintain the blood pressure, sedation, dialysis, transfusions and other treatments may be needed. These situations are usually managed in an Intensive Care Unit, or ICU.

- Viral meningitis generally requires only supportive treatment, meaning measures to control the symptoms and help the body until the immune system “kills” the virus and controls the infection and the inflammation. This includes oral or intravenous fluids, drugs like ibuprofen, paracetamol or metamizole to control the fever and the pain, rest etc.

How can meningitis be prevented?

- Through proper hygiene measures, like hand washing and isolation from the affected individuals.

- Through vaccination:
  - **Pneumococcal vaccines** (like Prevenar13): they protect against the invasive forms of infection by pneumococcus, like meningitis, not against otitis media or pneumonia.
Meningococcal vaccines (like Menactra, Mencevax etc): they protect against invasive disease produced by meningococcus. Depending on the vaccine, coverage against 1 to 4 strains of meningococcus is achieved. Different countries have different immunizations programs depending on economical reasons, but also on the epidemiology or local importance of the disease. In the UAE, Menactra is the vaccine of choice, as this is a high-risk area for meningococcal disease, since it protects against 4 serotypes of Neisseria meningitidis (A, C, Y, W-135). A new vaccine against the type B meningococcus (Bexsero) has recently become available, although not yet in the UAE.

Haemophilus influenzae type B (HiB) vaccine (usually contained in polyvalent vaccines given at routine immunizations): also protects against invasive infections produced by this bacterium

Many viruses can cause meningitis, so the vaccines that protect against them also protect against meningitis. This is the case for the measles, mumps, chickenpox, polio, flu, or the Rotavirus vaccines.

Antibiotic prophylaxis (taking antibiotics before getting sick, after contact with an infected person) to prevent getting sick and also to decrease the spread of the disease, is recommended in certain types of bacterial meningitis, depending also on the type of exposure, age or immune status.

What are the alarm signs? When to seek immediate medical attention?

- Any child with even a minimal suspicion of meningitis should be seen immediately or as soon as possible by a pediatrician.
- Bad general state
- Extreme irritability, fussiness
- Lethargy, extreme sleepiness, coma
- Abnormal skin color, like extreme paleness
- Petechiae or purpura, especially if associated with fever or bad general state
- Signs of dehydration
- Refusal to eat, especially if taking less than one third of usual quantity per day or persisting for more than half a day
- Fever or headache that don’t respond to medication
- Seizures
- Rapid breathing or difficulty in breathing
- Any fever in infants younger than 3 months
- Any unusual, unexplainable or too severe symptom that may suggest meningitis

References

- Sheldon L Kaplan, Cecilia Di Pentima. Patient information: Meningitis in children (Beyond the Basics). UpToDate, available online at http://www.utdol.com