

Meningitis: risk factors, pathophysiology and clinical manifestations



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Meningitis

Meningitis can be a life-threatening disease involving both the brain and spinal cord. The complexity of meningitis varies with the cause, which could be: viruses, bacteria, fungi or parasites (Janowski, 2017). The name meningitis describes inflammation of the meninges, which may include swelling of cerebrospinal fluid; the fluid that surrounds and protect the brain and spinal cord (Anna, 2017). Bacterial meningitis is the most fatal form of the disease because of the mental and physical impairment it can cause. The bacteria involved with meningitis is transmitted from person-to-person through droplets of respiratory or throat secretions from carriers. Also; prolonged contact such as coughing, sneezing or kissing with an infected person may also spread the disease. The common causes of bacterial meningitis stem from *Neisseria Meningitis (meningococcus)* & *Streptococcus pneumoniae* (Mei-Fang, 2017), once these pathogens spread they can colonize the mucosa of the nasopharynx and oropharynx. People who suffer from meningitis are usually symptomatic (showing symptoms); these symptoms may include stiff neck, nausea, and vomiting, seizures. Infants with meningitis may feel irritable or lethargic and have poor feeding. The most common method of diagnosis of meningitis is Lumbar puncture. Lumbar puncture includes sampling the cerebrospinal fluid, in which; the patient lumbar area is sterilized and a sterile needle is inserted to withdraw CSF. The testing of the lumbar puncture is crucial for determining if the patient has bacterial, viral or fungal meningitis (Koczula, 2017)

Etiology and Risk Factors

The causative agents causing bacterial meningitis are *Streptococcus pneumoniae* and *Neisseria meningitidis*. *S. pneumoniae* is a bacterium that invades the body and travels to the lower respiratory system, primarily the lungs. Once *S. pneumoniae* has reached the lungs, the bacteria then multiply, attacking lung tissue. *N. meningitidis* is an infection that affects only humans because there's no animal reservoir. The bacteria are transmitted through person to person droplet of respiratory secretions from carriers. When *N. meningitidis* is carried out within the throat, it sometimes overwhelms the body's defense, allowing the bacteria to spread through the bloodstream to the brain (Deidra, 2016). Age is a significant risk factor for Bacterial meningitis. Age is an extreme risk factor when acquiring bacterial meningitis, especially in neonatal & geriatrics patients because neonatal patients have an underdeveloped immune system and geriatric patients have a weakened immune system. Many underlying issues may increase the risk of an older person to acquire bacterially, for example; a transplant patient who's on immunosuppressants, or those who have experienced a bacterial infection in the past. Many of these epidemiological studies document that pneumonia, diabetes, renal or hepatic failure, or other chronic underlying diseases are associated with bacterial meningitis in older adults (Chester, 2016). At a cellular level, the bacteria penetrate the host cells to initiate a local infection, which causes systematic effects. When the bacteria reach the bloodstream, it will ultimately enter the brain to invade the central nervous system, once this occurs inflammation of the meninges will take place this will increase the permeability of the blood-brain barrier leading to cerebral spinal fluid pleocytosis and infiltration of the nervous system tissue.

Once the central nervous tissue is injured, there is a possible result of cerebral ischemia, edema and increased intracranial pressure (Kim, 2017).

Pathophysiology

Meningitis is mainly known to be caused by an infectious agent that takes over and colonizes an infection somewhere in the host. (Hasbun, 2018, para. 1)

1) The parts of the body that are susceptible and common for infection are the skin, respiratory tract, gastrointestinal tract and lastly the genitourinary tract. According to Medscape, the organism invades the sub mucosa in the body by bringing the defenses of that individual down first which then causes them to be more susceptible and weak, it does this by invading physical barriers, messing with the local immunity, and phagocytes or macrophages (Hasbun, 2018, para. 2). The type of agent that invades could be three different agents, bacteria, fungal, or a parasite. If it gains access to the central nervous system it causes meningeal disease through one of the three different major pathways which are: Invasion of the bloodstream, a retrograde neuronal or lastly a direct contiguous spread. According to Husbun, MD the most common form of spread is the invasion of the blood stream and subsequent seeding (Husbun, 2018, para. 3). The blood- brain barrier becomes disrupted and once the bacteria or other organisms have found their way into the brain they have a special effect and they isolate themselves from the immune system and they spread. Medscape explains how if the body tries to fight the infection it can make everything worse because the blood vessels become leaky and allow fluid, white blood cells and other particles that help fight infection to enter the meninges and the brain causing it to swell. The main source of swelling and inflammation of the <https://assignbuster.com/meningitis-risk-factors-pathophysiology-and-clinical-manifestations/>

body is due to the white blood cells and other fighting infection particles invading the brain. When there is inflammation, the body is weaker and susceptible for more damage. Brain swelling decreases blood flow to certain areas of the brain and this worsens the symptoms of infection. Meningitis causes increased intracranial pressure due to many proinflammatory molecules as well as mechanical elements.

Clinical Manifestations

Meningitis can be expressed by various signs and symptoms. When determining the presence of meningitis the patient may experience flu like symptoms, these symptoms include: high fever, intense headache, nuchal rigidity, photophobia, nausea, and back pain (Mayo Clinic, 2019). These signs are caused by meningeal irritation. In order to diagnosis a patient with meningitis, the patient will experience signs and symptoms of: leukocytosis, vomiting, irritability, seizures, and lethargy which can progress into a stupor. These signs and symptoms are indicators of increased intracranial pressure, the increased pressure is an indication that meningitis is present. Some potential complications of meningitis include hydrocephalus and cranial nerve damage. If the patient leaves these complications untreated it can cause severe disabilities and even death; the patient can also experience a deterioration of mental functioning, difficulty walking, and reduced conscious state. This is why it is best to treat this condition early on to avoid the complications.

Diagnosis

To determine if a patient has Meningitis, the patient has to be obtained by lumbar puncture, confirms the diagnosis (Hubert & VanMeter, 2018). To know when it is present, the CSF often shows a low sugar (glucose) level along with an increased white blood cell count and increased protein (Mayo Clinic, 2019). We can also find the causative agent in the blood which means that the patient blood needs to be cultured. A sample may also be placed on a slide and stained (Gram's stain), then studied under a microscope for the specific type of bacteria (Mayo Clinic, 2018). According to Heidi Moawad (2018), Funduscopic exam, Electroencephalogram, Spine MRI and so on are other ways to diagnose a patient if he or she has Meningitis.

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