

Microbiology of the central nervous system

- The CNS is sterile and has no normal microbiota.
- There are NO immune cells in the brain. When a pathogen reaches the CNS it will recruit immune cells to the site of infection & this immune response will cause damage to the CNS.

Meningitis

- Inflammation (Because there are **Infectious** "bacterial, viral, fungal and parasitic" & **non infectious** "drugs, malignancies, autoimmune diseases" causes) of the meninges and subarachnoid space → neurologic emergency.
- **Bacterial meningitis** is an acute purulent infection within the subarachnoid space that progresses within hours and is the most common form of suppurative CNS infection.
- **Causes of bacterial meningitis:**
 1. Neisseria meningitidis: Gram -ve diplococci.
 2. Streptococcus pneumoniae: Gram +ve.
 3. H. influenzae type b: Gram -ve.
- **Pathogenesis:** Attachment and colonization of the nasopharyngeal epithelium → crossing the mucosa & entering the blood → crosses the blood brain barrier and gain access to the cerebrospinal fluid, which is lacking in cellular and humoral immunity → replicates in the CSF and an immune response is initiated against it → damages the surrounding tissue.
- **Factors that increase the risk of acquiring meningitis:**
 1. Head injury/ basal skull fractures.
 2. Asplenia.
 3. Chronic otitis media/ mastoiditis.
 4. Complement deficiencies.
- **Vaccines:**
 1. Polyvalent meningococcal conjugate vaccines.
 2. Pneumococcal conjugate vaccine.
 3. H. influenzae type b conjugate vaccines.
- **Features:**
 1. Fever, headache, meningism (neck stiffness, photophobia, **positive Kernig's sign** "Stretching meninges through flexing the hip joint and extending the knee joint" & **Brudzinski's sign** "Passive neck flexing which may lead the patient to indicate pain through talking, or flexing his/her hip or knee joints").
 2. If the brain parenchyma is involved in the inflammatory reaction (meningoencephalitis) → Cerebral dysfunction (confusion and/ or reduced conscious level).

What are conjugate Vaccines?

Vaccines made of polysaccharides (antigens found in the capsules of capsulated organisms) that are conjugated to a protein, and such vaccines induce T-Cell dependent B-cell activation/ response.

3. Seizures.
 4. In meningococcal septicemia → petechial rash.
 5. In case of basal skull fracture → rhinorrhoea.
 6. Increased intracranial pressure (especially in Chronic Meningitis) secondary to meningitis → ocular symptoms like optic disc swelling (papilledema) and cranial nerve palsies.
- CSF examination and culture are important.
 - Blood should be collected when a spinal tap is contraindicated, or bacteremia suspected.

Test	Bacterial	Viral	Fungal	TB
Pressure	+		variable	variable
WBC	>1000	<100	variable	variable
Cells	PMNs	Lymphocytes	Lymphocytes	Lymphocytes
Protein	++	+	+	+++
Glucose	---	normal	-	-

- **Treatment & management:**
- Prompt empirical antibiotic therapy should be initiated before results of the CSF examination and culture.
- Adjunctive therapy with corticosteroids (dexamethasone) to lessen the inflammatory response.
- Reduction of raised intracranial pressure if present.
- Chemoprophylaxis should be given within 24h to household contacts (any person with contact to respiratory or oral secretions).
- **Outcome:**
- Neurological sequelae → focal neurological deficits, hearing loss, cognitive impairment and epilepsy.