12. MENINGITIS

Meningitis is an inflammation of the meninges, the thin lining that surrounds the brain and spinal cord. It can be caused by many bacteria and viruses. Viral infections are the most common cause of meningitis; bacterial infections are the second most common cause. Other rarer causes of meningitis include fungi, parasites, and non-infectious causes, including those related to drugs.

Severity of illness and treatment for meningitis differ depending on the cause. It is therefore important to know the specific cause of meningitis: bacterial meningitis is usually more severe than viral, fungal, or parasitic meningitis.

Implement Droplet Precautions for all suspect meningitis types until a type has been confirmed/diagnosis determined.

BACTERIAL MENINGITIS

12.1 Haemophilus influenzae type b (Hib) Meningitis

Cause/Epidemiology

Haemophilus meningitis is caused by Haemophilus influenzae serotype b. H. influenzae is a gram-negative coccobacillus. Haemophilus influenzae type b (Hib) has been identified as one of the three most common causes of bacterial meningitis (the others are Neisseria meningitidis and Streptococcus pneumoniae).

Risk factors for Hib meningitis include:

- Age younger than 5 years
- Compromised immune status
  - Immunologic illnesses (e.g., agammaglobulinemia, IgG2 subclass deficiency)
  - Illnesses or treatments that result in immunocompromise (e.g., neoplasms, AIDS, malnutrition, chemotherapy, radiotherapy, other forms of immunosuppression)
  - Splenic dysfunctions (e.g., sickle cell disease, asplenia)
- Lack of Hib immunization with conjugate vaccines
- Hib colonization at a vulnerable age

Clinical Presentation

Healthy adults are generally not susceptible to Hib meningitis. The onset can be sub-acute but is usually sudden. Initial manifestations of meningitis that follow in more than half of all cases include lethargy, fever (greater than 38.5°C), headache, photophobia, meningismus, irritability, anorexia, nausea, or vomiting.
Infants often present with bulging fontanelles, while older children present with stiff neck and back. Hib meningitis is often preceded by an upper respiratory illness or otitis media.

Disease caused by *H. influenzae* usually begins in the upper respiratory tract as pharyngitis. Invasive disease usually occurs after the organism enters the bloodstream. Meningitis is the most common clinical manifestation of invasive Hib disease.

The presentation of Hib meningitis may be considerably less severe than either meningococcal or pneumococcal meningitis, leading to misinterpretation of the initial symptoms or discounting of the significance of the somewhat more leisurely progression of illness. In such sub-acute cases, fever, irritability, and drowsiness may be the only reported initial signs and symptoms. These subtle signs may be mistakenly attributed to a preceding bout of otitis media or other form of upper respiratory illness.

Diagnosis is made through isolation of organisms from blood for culture and sensitivity, or lumbar puncture for cerebrospinal fluid (CSF) culture and sensitivity.

Immunization with Hib conjugate vaccine is recommended starting at 2 months of age. For the complete immunization schedule, refer to [http://www.gov.mb.ca/health/publichealth/cdc/fs/irg.pdf](http://www.gov.mb.ca/health/publichealth/cdc/fs/irg.pdf). Immunization is not routinely recommended for children over the age of 5.

**Incubation**

Unknown; probably 2 – 4 days

**Transmission**

Transmission is through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. Transmission may also occur intrapartum though aspiration of amniotic fluid or by contact with genital secretions containing the organism. The portal of entry is most commonly the nasopharynx. Humans are the only known reservoir for Hib. Hib is not communicable following 24 hours of effective antibiotic therapy.

**Infection Prevention and Control Practices**

Implement Droplet Precautions immediately for *Haemophilus influenza* type b meningitis. Droplet Precautions are to be maintained until after 24 hours of effective antimicrobial therapy. Refer to Droplet Precautions in the Additional Precautions section.
Occupational Health

Definition of Occupational Exposure
A healthcare worker who has had direct unprotected or indirect contact, (droplet and discharge), with discharge from the nose and throat of an infectious person during the infectious period (as long as the organism is present [which may be for a prolonged period even without nasal discharge] up to 24 hours after starting effective antibiotic therapy).

A Healthcare Worker Exposed to *Haemophilus influenzae* Meningitis
- Exposed healthcare workers shall contact Occupational Health for follow-up
- Exposed healthcare workers shall be referred for clinical management which may include chemoprophylaxis
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with *Haemophilus influenzae* Meningitis
- Physician confirmed diagnosis
- Healthcare workers shall be referred to Occupational Health for clinical management and work eligibility
- Inform Infection Prevention and Control immediately if a case is suspected or confirmed
- OESH must provide education to reinforce Routine Practices and respiratory etiquette
- Healthcare workers shall be excluded from work until 24 hours after the start of effective antibiotic therapy
References


12.2 Meningococcal meningitis (*Neisseria meningitidis*)

**Cause/Epidemiology**

Several different bacteria can cause meningitis; *Neisseria meningitidis* is one of the most important because of its potential to cause epidemics.

*Neisseria meningitidis* is a gram-negative diplococcus with 13 sero-groups, or sub-types; A, B, C, Y, and W135 are implicated most frequently.

Meningococcal meningitis is found worldwide, but the largest outbreaks occur in certain parts of sub-Saharan Africa, where the risk is higher during the dry season (December to June).

**Clinical Presentation**

The most common symptoms are stiff neck, high fever, sensitivity to light, confusion, headaches, and vomiting. Lethargy is frequently reported. Stupor or coma is less common; if coma is present, prognosis is poor. A petechial or purpuric rash usually is found on the trunk, legs, mucous membranes, and conjunctivae. Even when the disease is diagnosed early and adequate therapy instituted, 5 – 10% of patients die, typically within 24 – 48 hours of onset of symptoms.

Diagnosis of meningococcal meningitis is suspected by the clinical presentation and a lumbar puncture showing a purulent spinal fluid. The diagnosis is confirmed by growing the bacteria from a normally sterile site (e.g., blood, CSF, joint, pleural, pericardial fluid, petechial or purpuric lesion).

Several vaccines are available to prevent the disease. Vaccines exist against sero-groups A, C, Y, and W135 in various combinations. Vaccines may not provide adequate protection for 10 to 14 days following injection.

**Incubation**

The average incubation period is 4 days, ranging between two and ten days.

**Transmission**

Transmission is through droplet spread and direct contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. The portal of entry is most commonly the nasopharynx. The natural reservoir for meningococci is the mucosal surfaces of the nasopharynx and, to a lesser extent, the urogenital tract and anal canal. Approximately 5 to 10% of adults are
asymptomatic nasopharyngeal carriers, but that number increases to as many as 60 to 80% of members of closed population (e.g., military recruits in camps).

Close and prolonged contact facilitates the spread of the disease. The period of communicability persists until 24 hours of effective antibiotic therapy.

**Infection Prevention and Control Practices**

Implement Droplet Precautions immediately for *N. meningitidis*. Droplet Precautions are to be maintained until after 24 hours of effective antimicrobial therapy. Refer to Droplet Precautions in the Additional Precautions section.

**Occupational Health**

Definition of Occupational Exposure

A healthcare worker who has had direct unprotected contact of their oral mucous membranes with oral or nasopharyngeal secretions of an infectious person during the period of communicability (7 days before onset of illness and up to 24 hours after the start of effective therapy).

A Health Care Worker Exposed to Meningococcus

- Exposed healthcare workers shall contact Occupational Health for follow-up
- Exposed healthcare worker shall be referred for clinical management, which may include chemoprophylaxis within 10 days after the most recent exposure
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Meningococcus

- Physician confirmed diagnosis
- Healthcare workers shall be referred to Occupational Health for clinical management and work eligibility
- Inform Infection Prevention & Control immediately if a case is suspected or confirmed
- OESH must provide education to reinforce Routine Practices and respiratory etiquette
- Healthcare workers shall be excluded from work until 24 hours after the start of effective therapy

**References**


12.3 Pneumococcal Meningitis

Cause/Epidemiology

Pneumococcal meningitis is caused by the bacteria *Streptococcus pneumoniae*. The bacteria is the most common cause of meningitis in adults, and the second most common cause of meningitis in children older than age 6. *Streptococcus pneumoniae* is a gram-positive diplococcus found in the upper respiratory tract of healthy persons. Pneumococcal meningitis infection is rare with one or two cases per 100,000 people annually in Canada.

Clinical Presentation

Most cases of pneumococcal meningitis are in children under two years of age, elderly adults, and people with the following risk factors:
- Asplenia
- Suppression of immune system from cancer therapy, organ transplants, AIDS, or steroid treatment
- Chronic heart, lung, or kidney disease
- Diabetes
- Alcoholism or liver disease
- Smoking, second hand smoke
- Skull fractures, head surgery, or skull malformation
- Cochlear implants

The clinical presentation of pneumococcal meningitis frequently does not involve classic symptoms, diagnosis often proves difficult, seizures are common, and multiple interventions are often necessary. Mortality is high (7.7 – 17.0% in developed countries and 36 – 48% in those less developed), and neurological sequelae frequent (30 – 49% in developed countries). Brain damage and/or deafness occur in two out of every ten cases.

Diagnosis is made through isolation of organisms from blood for culture and sensitivity, or lumbar puncture for CSF culture and sensitivity.
- Early treatment of pneumonia and ear infections caused by pneumococcus may decrease the risk of meningitis. There are also two effective vaccines available to prevent pneumococcal infection. The following people should be vaccinated, according to current recommendations at [http://www.gov.mb.ca/health/publichealth/cdc/fs/irg.pdf](http://www.gov.mb.ca/health/publichealth/cdc/fs/irg.pdf).
  - Children
  - Everyone over age 65
  - People at high risk for pneumonia
Incubation

The incubation period may vary, but typically 1 – 3 days.

Transmission

Pneumococcal bacteria are carried in the back of the nose and throat, often without causing illness. Transmission is through droplet spread and contact with nasal or throat secretions of infected or colonized persons during the period of infectivity. *S. pneumoniae* is a human pathogen. The reservoir for pneumococci is presumably the nasopharynx of asymptomatic human carriers. Person-to-person transmission of pneumococcal bacteria is possible, but would generally result in colonization of the nasopharynx, rather than disease. Pneumococcal meningitis is not considered transmissible to others.

Infection Prevention and Control Practices

Follow Routine Practices for caring for a patient with pneumococcal meningitis. Refer to the Routine Practices section and/or the Routine Practices policy for specific information.

Occupational Health

Definition of Occupational Exposure

A healthcare worker who has had direct, unprotected oral contact by droplet spread, or indirect contact through articles freshly soiled with respiratory discharges. Illness among casual contacts is infrequent. Exposure to persons infected with pneumococcal meningitis frequently results in the contact developing nasopharyngeal colonization instead of infection. The contact person may continue to be healthy. Pneumococcal Meningitis is of greater frequency and/or increased severity if a cerebral spinal fluid (CSF) leak exists.

A Healthcare Worker Exposed to Pneumococcal Meningitis

- Exposed healthcare workers shall contact Occupational Health for follow-up
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Pneumococcal Meningitis

- Physician confirmed diagnosis
- Healthcare workers shall be referred to Occupational Health (OESH) for discussion of clinical management and work eligibility
- Inform Infection Prevention & Control immediately if a case is suspected or confirmed
• No specific medicines or antibiotics are used to treat pneumococcal meningitis
• Healthcare workers must stay off work for 24 – 48 hours post treatment
• OESH must provide education to reinforce Routine Practices and respiratory etiquette
• Person-to-person contact should be minimized by reducing situations of over crowding and increasing ventilation
• Prophylaxis not required for significant contacts

References


12.4 VIRAL MENINGITIS

Cause/Epidemiology

Viral meningitis can be caused by a variety of viruses and is more common than bacterial meningitis.

Gastrointestinal viruses such as Coxsackie and echoviruses are the most common causes of viral meningitis. Cases occur most often in the summer and autumn months.

Herpes can occasionally cause viral meningitis. The Herpes Simplex virus is widespread and infection may be associated with cold sores.

Vector-borne viruses such as West Nile can also cause viral meningitis.

Clinical Presentation

Viral meningitis can be very debilitating, but is generally less serious than bacterial meningitis, and rarely fatal. Viral meningitis is not usually associated with septicemia. The illness is usually mild and clears up in about a week.

Because the symptoms of viral meningitis are similar to those of bacterial meningitis, which is usually more severe and can be fatal, diagnosis should first exclude bacterial meningitis. Diagnosis of viral meningitis is usually done by laboratory tests of a patient's spinal fluid, which can reveal whether the patient is infected with a virus or a bacterium.

Symptoms are fever, headache, stiff neck, and tiredness. Rash, sore throat, and vomiting can also occur.

Incubation

The incubation period is dependent on the specific causative organism and can be up to three weeks.

Transmission

Although the viruses which cause these diseases tend to be highly infectious because the viruses are shed in respiratory secretions and/or feces, they rarely cause detectable cross infection resulting in meningitis. This is because most contacts will have a mild respiratory infection and will not have meningitis. Viruses can be transmitted by the fecal-oral route through direct or indirect contact, or the respiratory route.
Infection Prevention and Control Practices

Follow Routine Practices for any patient 6 years of age and older with viral diarrhea, unless he/she is incontinent and feces cannot be contained, or who contaminate the environment. Refer to the Routine Practices section and/or the Routine Practices policy for specific information.

Implement Contact Precautions for a child under 6 years old or for an adult patient who has incontinence and feces cannot be contained, or for adults who contaminate the environment. Refer to Contact Precautions in the Additional Precautions section.

Refer to the Clinical Presentation/Microorganism/Infectious Disease Table for specific disease/microorganism information.

Occupational Health

Definition of Occupational Exposure
A healthcare worker who has had direct unprotected contact with nasal and throat discharges, respiratory secretions, and in some cases, the feces of infected persons, as well as through droplet spread and insects such as mosquitoes.

A Healthcare Worker Exposed to Viral Meningitis
- Exposed healthcare workers shall contact Occupational Health for follow-up
- No modifications to work practices or work restrictions

A Healthcare Worker Symptomatic or Infected with Viral Meningitis
- Physician confirmed diagnosis
- Healthcare workers shall be referred to Occupational Health for clinical management and work eligibility
- No specific medicines or antibiotics are used to treat viral meningitis
- Inform Infection Prevention & Control immediately if a case is suspected or confirmed
- OESH must provide education to reinforce Routine Practices and respiratory etiquette
- Person-to-person contact should be minimized by reducing situations of over-crowding and by increasing ventilation
- Prophylaxis not required for significant contacts
References


