

Upper Respiratory Tract Infections

Infections of the upper respiratory tract are very common, but vary greatly in aetiology, pathogenesis, anatomical site of infection and severity. The spectrum of severity ranges from self-limiting viral infections that resolve without medical consultation to life threatening systemic bacterial illness or acute airway compromise.

Acute pharyngitis, tonsillitis (including glandular fever)

Definition: Acute inflammation of the pharynx and/or tonsils, usually caused by infection. **Aetiology:** Streptococcus pyogenes and occasionally other b-haemolytic streptococci (groups C and G).

Approximately 5–10% of the population carry Streptococcus pyogenes in the pharynx; carriage rates are higher among children, particularly during the winter. Spread is by aerosol and direct contact, and is common within families.

Investigations:

Routine throat swabbing is **not recommended**.

Direct antigen detection tests are available for rapid diagnosis of group A streptococcal pharyngitis, **but are not recommended for routine use because of poor specificity**.

Throat swabs should be sent for culture when unusual pathogens are suspected, e.g. Neisseria gonorrhoea, and the laboratory informed.

Serology (detection of anti-streptolysin O antibodies – ‘ASO titres’) may be useful in patients presenting with post-streptococcal complications (rheumatic fever, glomerulonephritis).

Epiglottitis

Definition: Acute inflammation of the epiglottis caused by infection, usually bacterial. **Aetiology:** include non-capsulated H. influenzae, S. pneumoniae and b-haemolytic streptococci.

A rare infection, more common in children, usually less than 5 years. Adults are occasionally affected. Direct infection of the epiglottis by pathogenic bacteria results in swelling of the epiglottis, which can cause fatal airway obstruction and usually causes severe systemic illness.

Diphtheria

Definition: An acute upper respiratory tract or skin infection, caused by toxin-producing strains of *Corynebacterium diphtheriae* with central nervous system and cardiac complications.

Laboratory diagnosis: by isolation of the microorganism from throat swabs, followed by demonstration of toxin production by the Elek test, or more recently detection of toxin genes by PCR. PCR may also be used to detect toxin genes directly from throat swabs. Demonstrating toxin or the presence of the toxin gene is essential, because nontoxin-producing strains of *C. diphtheriae* do not cause diphtheria.

Acute otitis media

Definition: Acute inflammation of the middle ear caused by infection.

Aetiology and pathogenesis Upper respiratory tract infection may result in oedema and blockage of the eustachian tube, with subsequent impaired drainage of middle-ear fluid, predisposing to viral or bacterial infection (acute otitis media).

About 50% are caused by respiratory viruses; common bacterial causes include *Streptococcus pneumoniae*, *H. influenzae*, group A beta-haemolytic streptococci and *S. aureus*.

Epidemiology It occurs worldwide and is most common in children aged less than 5 years, with an increased incidence in winter months.

Laboratory diagnosis Acute otitis media is a clinical diagnosis, but if there is a purulent ear discharge, this can be cultured.

Otitis externa

Infections of the external auditory canal are frequently caused by *S. aureus* and *P. aeruginosa*. Topical treatment with antibiotic-containing eardrops may be required in severe cases.

Acute sinusitis: Acute sinusitis is often part of the common cold syndrome and resolves spontaneously. Secondary bacterial infection of the sinuses by pathogens such as *S. pneumonia* or *H. influenza* may complicate viral upper respiratory tract infections.

Lower Respiratory Tract infections

Pneumonia

Definition It is an infection of the lung substance with focal chest signs and radiological shadowing. The most clinically useful classification is:

- community-acquired pneumonia;
- hospital-acquired pneumonia;
- pneumonia in immunocompromised individuals;
- aspiration pneumonia.

Community-acquired pneumonia

Specific causes

***Streptococcus pneumoniae*:** The most common cause of community-acquired pneumonia (30–50%) and occurs **in all age groups**. Patients with chronic lung disease, splenectomised patients and immunocompromised individuals (including HIV infection) are most at risk.

Laboratory diagnosis is by sputum and blood culture and urine antigen detection. Conjugate vaccine is available for children and polysaccharide vaccine for other risk groups.

Mycoplasma pneumoniae

Incidence vary (<1-20%) as a result of epidemics; occurs primarily in **young adults**. Generalised symptoms may precede a dry cough, thus resembling influenza. Extrapulmonary complications can dominate the clinical findings (rash, arthralgia, myocarditis, meningoencephalitis). Laboratory diagnosis is by serology or PCR.

Haemophilus influenzae

H. influenzae type b (Hib) vaccine has considerably reduced this cause of pneumonia in all age groups. Most cases are now caused by non typable strains. Laboratory diagnosis is by sputum culture.

Staphylococcus aureus Most common **after influenza and in intravenous drug users**. An important cause of severe pneumonia. Laboratory diagnosis is by sputum and blood culture.

Legionella species

L. pneumophila. It is transmitted via aerosols from contaminated sources, e.g. air conditioning systems or showers. **Less than 5%** of pneumonias are caused by *L. pneumophila* but incidence varies according to outbreaks. Hospital and community outbreaks may occur. Sporadic cases can be associated with recent travel. **Smokers and the immunocompromised are particularly at risk.**

Laboratory diagnosis is by urine antigen detection (*L. pneumophila* serogroup 1 only). Direct immunofluorescence on BAL specimens, sputum culture and serology may also be used.

Chlamydomphila pneumoniae

C. pneumoniae is transferred from person to person mainly in age groups of **5–35 years**. Symptoms are similar to those of *Mycoplasma pneumoniae*. Laboratory diagnosis is by serology.

Chlamydomphila psittaci This is associated with contact with infected birds, including pigeons. Laboratory diagnosis is by serology.

Mycobacterium tuberculosis May mimic bacterial pneumonia, but patients usually have a longer duration of symptoms.

Hospital-acquired pneumonia (HAP)

Aetiology Commonly *Streptococcus pneumoniae* and *Haemophilus influenzae* in early-onset infections (first 4 days of admission), thereafter Gram-negative bacteria (e.g. *Escherichia coli*, *Klebsiella* and *Serratia* spp.) and in ventilator-associated pneumonia especially methicillin-resistant *Staphylococcus aureus* (MRSA) and multiresistant Gram-negative bacteria, including *Acinetobacter* and *Pseudomonas aeruginosa*.

Epidemiology: HAP is a pneumonia **presenting two or more days after admission to hospital. Pneumonia is one of the most common nosocomial infections, affecting about 0.5% of hospitalised patients.** **Risk factors** include endotracheal intubation and ventilation, immune compromise and pre-existing pulmonary disease.

Ventilator-associated pneumonia (VAP) is a subtype of hospital acquired pneumonia, which occurs in people who are on mechanical ventilation through an endotracheal or tracheostomy tube for at least 48 hours.

Investigations Sputum and blood cultures. For VAP, bronchoscopically-collected respiratory secretions or blind bronchoalveolar lavage.

Pneumonia in immunocompromised patients:

Immunocompromised means having an immune system that has been impaired by disease or treatment, resulting in an increased risk of infection. **Patient immunity may be impaired temporarily or permanently as a result of** either an **immunodeficiency state** (congenital or acquired) or **induced immunosuppression**, due to a disease state or its management using cytotoxic, immunosuppressive or radiation therapy.

Aetiology: These patients may become infected with classic chest pathogens, e.g. *S. pneumoniae*, *M. pneumoniae*, or the important opportunistic lung pathogens

Investigations:

Early bronchoscopy for BAL fluid to be examined by: microscopy (Gram and Ziehl–Neelsen stains); culture; direct immunofluorescence (*Legionella* spp.); serology (e.g. *M. pneumoniae* and *L. pneumophila*).

Aspiration pneumonia

Patients may aspirate oropharyngeal or gastric contents into their upper and lower airways. The initial insult is a chemical pneumonitis, but infection may develop later.