
Lec.6: Upper respiratory tract infections

Upper respiratory tract infections (URTI) :are the illnesses caused by an acute infection which involves the upper respiratory tract: nose, sinuses, pharynx or larynx. This commonly includes: tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, and the common cold.

Common URTI terms are defined as follows:

- Rhinitis - Inflammation of the nasal mucosa
- Rhinosinusitis or sinusitis - Inflammation of the nares and paranasal sinuses, including frontal, ethmoid, maxillary, and sphenoid
- Nasopharyngitis (rhinopharyngitis or the common cold) - Inflammation of the nares, pharynx, hypopharynx, uvula, and tonsils
- Pharyngitis - Inflammation of the pharynx, hypopharynx, uvula, and tonsils
- Epiglottitis (supraglottitis) - Inflammation of the superior portion of the larynx and supraglottic area
- Laryngitis - Inflammation of the larynx
- Laryngotracheitis - Inflammation of the larynx, trachea, and subglottic area
- Tracheitis - Inflammation of the trachea and subglottic area

Symptoms of URTIs commonly include cough, sore throat, runny nose, nasal congestion, headache, low grade fever, facial pressure and sneezing. Onset of symptoms usually begins 1–3 days after exposure. The illness usually lasts 7–10 days. Pain and pressure of the ear caused by a middle ear infection (Otitis media) and the reddening of the eye caused by viral Conjunctivitis are often associated with upper respiratory infections

Major of etiological factors in respiratory diseases:

| Etiological factor | Disease |
|--------------------|---|
| Genetic | Cystic fibrosis Antitrypsin deficiency Some asthma |
| Smoking | Lung cancer Chronic bronchitis Emphysema Susceptibility to infection |
| Air pollution | Chronic bronchitis Susceptibility to infection |
| Occupation | Pneumoconiosis Asbestosis Mesothelioma Lung cancer |
| Infection | Influenza Measele Bacterial pneumonia Tuberculosis |

symptom comparison of URI, seasonal allergies and influenza:

| Symptoms | Allergy | URI | Influenza |
|--------------------|----------------------------|---|--|
| Itchy, watery eyes | Common | Rare (conjunctivitis may occur with adenovirus) | Soreness behind eyes, sometimes conjunctivitis |
| Nasal discharge | Common | Common | Common |
| Nasal congestion | Common | Common | Sometimes |
| Sneezing | Very common | Very common | Sometimes |
| Sore throat | Sometimes (postnasal drip) | Very common | Sometimes |
| Cough | Sometimes | Common (mild to moderate, hacking) | Common (dry cough, can be severe) |
| Headache | Uncommon | Rare | Common |
| Fever | Never | Rare in adults, | Very common (100-102 °F) |

| | | | |
|-----------------------------|-----------|----------------------|---|
| | | possible in children | (or higher in young children), lasting 3–4 days; may have chills) |
| Malaise | Sometimes | Sometimes | Very common |
| Fatigue, weakness | Sometimes | Sometimes | Very common, can last for weeks, extreme exhaustion early in course |
| Muscle pain | Never | Slight | Very common, often severe |

Cause

Over 200 different viruses have been isolated in patients with URIs. The most common virus is called the rhinovirus. Other viruses include the coronavirus, parainfluenza virus, adenovirus, enterovirus, and respiratory syncytial virus.

Up to 15% of acute pharyngitis cases may be caused by bacteria, most commonly *Streptococcus pyogenes* a Group A streptococcus in Streptococcal pharyngitis . Other bacterial causes are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Corynebacterium diphtheriae*, *Bordetella pertussis*, and *Bacillus anthracis*.

The diagnosis of upper respiratory infection is typically made based on review of symptoms, physical examination, and laboratory tests.

In physical examination of an individual with upper respiratory infection, a doctor may look for swollen and redness inside wall of the nasal cavity (sign of inflammation), redness of the throat, enlargement of the tonsils, white secretions on the tonsils (exudates), enlarged lymph nodes around the head and neck, redness of the eyes, and facial tenderness (sinusitis). Other signs may include bad breath (halitosis), cough, voice hoarseness, and fever.

Inflammatory disorder of upper respiratory tract:

- **Rhinitis** is an irritation and inflammation of the mucous membrane inside the nose. Common symptoms of rhinitis are a stuffy nose, runny nose, and post-nasal drip. The most common kind of rhinitis is allergic rhinitis, which is usually triggered by airborne allergens such as pollen and dander. Allergic rhinitis may cause additional symptoms, such as sneezing and nasal itching, coughing, headache, fatigue, malaise, and cognitive impairment. The allergens may also affect the eyes, causing watery, reddened, or itchy eyes and puffiness around the eyes. Rhinitis is very common. Allergic rhinitis is more common in some countries than others; in the United States, about 10%–30% of adults are affected annually.

In rhinitis, the inflammation of the mucous membrane is caused by viruses, bacteria, irritants or allergens. The inflammation results in the generation of large amounts of mucus, commonly producing a runny nose, as well as a stuffy nose and post-nasal drip. In the case of allergic rhinitis, the inflammation is caused by the degranulation of mast cells in the nose. When mast cells degranulate, they release histamine and other chemicals, starting an inflammatory process that can cause symptoms outside the nose, such as fatigue and malaise. In the case of infectious rhinitis, it may occasionally lead to pneumonia, either viral pneumonia or bacterial pneumonia. Sneezing also occurs in infectious rhinitis to expel bacteria and viruses from respiratory system.

- **Sinusitis** is an inflammation, or swelling, of the tissue lining the sinuses. Normally, sinuses are filled with air, but when sinuses become blocked and filled with fluid, germs (bacteria, viruses, and fungi) can grow and cause an infection. Conditions that can cause sinus blockage include the common cold, allergic rhinitis (swelling of the lining of the nose), nasal polyps (small growths in the lining of the nose), or a deviated septum (a shift in the nasal cavity).

There are different types of sinusitis, including:

- **Acute sinusitis:** A sudden onset of cold-like symptoms such as runny, stuffy nose and facial pain that does not go away after 10 to 14 days. Acute sinusitis typically lasts 4 weeks or less.
- **Subacute sinusitis:** An inflammation lasting 4 to 8 weeks.
- **Chronic sinusitis:** A condition characterized by sinus inflammation symptoms lasting 8 weeks or longer.
- **Recurrent sinusitis:** Several attacks within a year.

Patients with acute bacterial rhinosinusitis experience symptoms for more than 1 to 2 weeks after a common cold, including unilateral facial pain, maxillary toothache, headache, and excessive purulent nasal discharge.

- **Laryngitis** is an inflammation of the larynx, especially the vocal cords, and bronchitis is an inflammation of the bronchi. Bacterial or viral infection can move from the upper respiratory tract to cause laryngitis or bronchitis. Bronchitis is also often caused by continually breathing air containing harmful chemicals, such as those found in cigarette smoke.
- **Otitis media** is a group of inflammatory diseases of the middle ear often associated with generalized upper respiratory tract infections. In young children this may result in pulling at the ear, increased crying, and poor sleep. Decreased eating and a fever may also be present. OME is typically not associated with symptoms. Occasionally a feeling of fullness is described. It is defined as the presence of non-infectious fluid in the middle ear for more than three months. Chronic suppurative otitis media is middle ear inflammation of greater than two weeks that results in episodes of discharge from the ear. It may be a complication of acute otitis media. Pain is rarely present. All three may be associated with hearing loss.

Diagnosis

Laboratory Tests

Because viruses cause most URIs, the diagnostic role of laboratory investigations and radiologic studies is limited. Viral culture, rapid antigen detection, or polymerase chain reaction (PCR) assay of influenza virus on a nasopharyngeal

swab is indicated in patients for whom specific antiviral therapy is recommended. Similar tests are also available for adenovirus, respiratory syncytial virus, human metapneumovirus and parainfluenza virus. Experience with the use of reverse-transcriptase PCR for the diagnosis of enterovirus and rhinovirus infections is growing, but it is not currently available for daily clinical care. Serologic tests for viruses that can cause a mononucleosis-type illness should be considered in the appropriate clinical setting. Influenza serologies have epidemiologic value only and should not be used for clinical care. A pharyngeal swab for rapid antigen detection of GABHS is 90% sensitive and 95% specific in adults. Increased antistreptolysin O titer is not helpful during the acute illness, and is usually detected several days later. Cultures obtained by paranasal sinus puncture or sinus endoscopy should be reserved only for severely ill patients with acute sinusitis and intracranial or orbital complications. In patients with acute bronchitis, a normal C-reactive protein level can reasonably exclude pneumonia, but may be elevated with several other infectious and noninfectious conditions. Procalcitonin is another biomarker that has been used successfully to guide antibiotic use for acute respiratory tract infections in primary care.

Imaging Studies

A lateral neck radiograph should be taken in a patient with stridor to assess the airways. However, this should not deviate attention from close monitoring for patency of the airways if epiglottitis is clinically suspected. Chest radiography should be reserved for patients with acute tracheobronchitis who have other comorbid conditions, those with abnormal vital signs or signs of consolidation on chest examination, or those with persistent symptoms for longer than 3 weeks. Plain radiography has been largely replaced by computed tomography (CT) in the evaluation of sinusitis, particularly in preparation for corrective surgery. Complete opacification and air-fluid level are the most specific findings for acute sinusitis. However, a large proportion of patients with the common cold have radiologic abnormalities on CT. Imaging should be considered for patients who do not respond to treatment with antibiotics, but is not advised for the diagnosis of uncomplicated sinusitis. Mastoiditis and other intracranial complications of URIs should be evaluated by CT or magnetic resonance imaging.

Only those experienced in endotracheal intubation should perform laryngoscopic examination of patients with suspected epiglottitis. Paranasal sinus endoscopy is not indicated for patients with uncomplicated acute sinusitis, and endoscopic cultures obtained from the middle meatus should be interpreted with caution because of potential contamination with nasal secretions.

Diphtheria

Diphtheria is an upper respiratory tract infection caused by the bacterium *Corynebacterium diphtheria*. Signs and symptoms may vary from mild to severe. They usually start two to five days after exposure. It classically results in a sore throat, low fever, and an adherent membrane (a pseudomembrane) in the throat or nose. They can block the airway and create symptoms like croup. A form of diphtheria that involves the skin also exists. Diphtheria causes a thick covering in the back of the throat. It can lead to difficulty breathing, heart failure, paralysis, and even death. Vaccines are recommended for infants, children, teens and adults to prevent diphtheria. Complications may include myocarditis and peripheral neuropathy.

Diphtheria is usually spread by direct contact or breathing the airborne secretions of infected individuals. Some people carry the bacteria without having symptoms; however, can still spread the disease to others. There are three main types of *C. diphtheriae* which causes different severities of disease. The symptoms are due to a toxin produced by the bacteria.

Causes

Diphtheria spreads through respiratory droplets (such as from a cough or sneeze) of an infected person or someone who carries the bacteria but has no symptoms.

The bacteria most commonly infects nose and throat. The throat infection causes a gray to black, tough, fiber-like covering, which can block airways. In some cases, diphtheria infects your skin first and causes skin lesions.

Once you are infected, the bacteria make dangerous substances called toxins. The toxins spread through your bloodstream to other organs, such as the heart and brain, and cause damage. Because of widespread vaccination (immunization) of

children, diphtheria is now rare in many parts of the world. Risk factors for diphtheria include crowded environments, poor hygiene, and lack of immunization.

Diphtheria toxin is produced by *C. diphtheriae* only when infected with a bacteriophage that integrates the toxin-encoding genetic elements into the bacteria.

Symptoms

Symptoms usually occur 1 - 7 days after the bacteria enter your body:

- Bluish coloration of the skin
- Bloody, watery drainage from nose
- Breathing problems, including difficulty breathing, fast breathing, high-pitched breathing sound (stridor)

- Chills
- Croup-like (barking) cough
- Drooling (suggests airway blockage is about to occur)
- Fever
- Hoarseness
- Painful swallowing
- Skin sores (usually seen in tropical areas)
- Sore throat (may range from mild to severe)
- foul-smelling bloodstained nasal discharge .
- lymphadenopathy.
- Symptoms can also include cardiac arrhythmias, myocarditis, and cranial and peripheral nerve palsies.

Note: There may be no symptoms.

Pathology:

Diphtheria is a composite of a local inflammation and a systemic intoxication. Toxin produced locally by toxogenic strains of *Corynebacterium diphtheriae* is responsible for an inflammatory reaction on body surface at the site of infection (usually the oral pharynx, from which the process often extends to the nose or larynx). Occasionally the tracheal, esophageal, or gastric mucosa is

involved as well. Less commonly, but particularly in the tropics, cutaneous trauma or burns may be the site of diphtheria. The umbilical cord (in diphtheria neonatorum), the genital tract, and the conjunctivae are rare sites.

Unlike streptococcal tonsillitis, diphtheria is often insidious in onset and may be preceded by 2 to 3 days of listlessness, malaise, and headache before local symptoms occur. Cervical adenopathy seems out of proportion to the pharyngeal lesion.

Soon small gray or white patches of exudates appear on the pharyngeal mucosa, usually over the tonsils. These enlarge and coalesce and, with the accumulation of blood, become gray or black. This exudate constitutes the characteristic diphtheritic membrane, which consists of leukocytes and numerous bacteria enmeshed in a dense network of fibrin. The epithelial surface becomes necrotic and densely adherent to the overlying membrane. This adherence explains why raw bleeding points are exposed when the membrane is forcibly removed.

If particularly extensive cases, the local process may produce mechanical respiratory obstruction, stridor, and even asphyxiation. The local inflammatory process and its mechanical consequences are less important in the evolution of diphtheria than is the profound toxemia that characterizes the infection.

Diphtheria toxin, produced by *Corynebacterium diphtheriae* in response to infection of that organism by a specific bacteriophage, is a potent inhibitor of cellular protein synthesis.

It is readily absorbed from the point of production into the blood stream, and its effects are noted in many organs and systems throughout the body.

Clinically, apparent weakness or paralysis of limbs is rare. Neuropathic manifestations of diphtheria are usually temporary and disappear within 2 or 3 months if the patient survives.

Exams and Tests

The health care provider will perform a physical exam and look inside your mouth. This may reveal a gray to black covering (pseudomembrane) in the throat, enlarged lymph glands, and swelling of the neck or larynx.

Tests used may include:

- Gram stain or throat culture to identify the diphtheria bacteria
- Toxin assay (to detect the presence of the toxin made by the bacteria)
- Electrocardiogram (ECG)

Other infections:

- Flu (influenza) is a viral infection of the respiratory system and does not affect the digestive system as is commonly assumed. Flu is characterized by chills, fever, headache, and muscular aches, in addition to respiratory symptoms. There are several strains of flu viruses. The mortality rate from flu is approximately 1%, and most of those deaths are among the very old and very young. During a flu epidemic the infection rate is so rapid and the disease is so widespread that the the total number of deaths is substantial, even though the percentage of deaths is relatively low. Flu vaccines can provide protection against the flu.
- Whooping cough (pertussis) is a bacterial infection. The infection causes a loss of cilia of the respiratory epithelium. Mucus accumulates, and the infected person attempts to cough up the mucous accumulations. The coughing can be severe. A vaccine for whooping cough is part of the normal vaccination procedure for children in the United States.
- A number of fungal diseases, such as histoplasmosis and coccidioidomycosis ,affect the respiratory system. The fungal spores usually enter the respiratory system through dust particles. Spores in soil and feces of certain animals make the rate of infection higher in farm workers and in gardeners. The infections usually result in minor respiratory infections, but in some cases they can cause infections throughout the body.