1-Viral infections

Measles (measles virus)

Rubella (rubella virus)

Mumps (mumps virus)

Influenza (influenza viruses)

Acute upper respiratory tract infection (rhinoviruses, reoviruses, enteroviruses)

Infectious mononucleosis (Epstein-Barr virus)

Chickenpox (varicella-zoster virus)

2-Bacterial infections

Tuberculosis (Mycobacterium tuberculosis)]

Pneumococal pneumonia (Streptococcus pneumoniae)

Other pneumonias (Streptococcus Pyogenes

Streptococcus aureus, Klebsiellapyeumoniae,

Haemophilusinfluenzae)

Psittacosis (Chlamydia pasittaci)

Atypical pneumonia (Mycoplasma pneumonia)

Meningococcal infection (Neisseriameningitidis)

Streptococcal infection, rheumatic fever (Streptococcus pyogenes)

Whooping cough (Bordatella pertussis)

Diphtheria (Corynebacteriumdiphtheriae)

Pneumonic plague (Yersinia pestis)**

3-Rickettsial infections

Q fever* (Coxiellaburnetii)

4-Fungal infections

Histoplasmosis (Histoplasmacapsulatum)

Infections ThroughThe Respiratory Tract

Infections:

Infections of the respiratory tract are acquired mainly by the inhalation of pathogenic organisms. Lower acute respiratory infections (ARI) are an important cause of death of children in the tropics.

Infective Agents

The infective agents that cause respiratory infections include viruses, bacteria, rickettsiae and fungi. The spread of infection from the respiratory tract may lead to the invasion of other organs of the body. Bacterial meningitis is often secondary to a primary focus in the respiratory tract, for example infections due to Streptococcus pneumonia, Haemophilus influenza or Mycobacterium tuberculosis. In the case meningoccocal infection, there are usually no local symptoms from the primary focus of infection in the nasopharynx.

These pathogens vary in their ability to survive in the environment. Some are capable of surviving for long periods in dust, especially in a dark, warm, moist environment, protected from the lethal effects of ultraviolet rays of sunshine. For example, M. tuberculosis can survive for long periods in dried sputum.

Humans are the reservoir of most of these infections but some have a reservoir in lower animals, for example plague in rodents.

Carriers play an important role in epidemiology of some these infections, for example in meningococcal infection carriers represent the major part of the reservoir.

Transmission

There are three main mechanisms for the transmission.

1-Air born Droplets

There are particles that are ejected by coughing, talking, sneezing, laughing and spitting. They may contain food debris and micro-organisms enveloped in saliva or secretions of the upper respiratory tract. Being heavy, droplets tend to settle rapidly. The transmission of infection by this route can only take place over a very short distance. Because of their relatively large size, droplets are not readily inhalable into the lower respiratory tract.

2-Droplet nuclei

These are produced by the evaporation of droplets before they settle. The small dried nuclei are light and are rapidly dispersed. The droplet nuclei are also usually small enough to pass through the bronchioles into the alveoli of the lungs.

3-Dust

Dust-born infections are important in relation to organisms that persist in dust for long periods and dust can act as reservoir for some of them. The organisms may be derived from sputum, or from settled droplets.

Host

Non-specific defenses :

A number of non-specific factors protect the respiratory tract of man. These include mechanical factors such as the mucous membrane, which traps small particles on its sticky secretions and cleans them out by the actions of its ciliates epithelium. In addition, the respiratory tract is also guarded by various reflex acts coughing and sneezing which are provoked by foreign bodies or accumulated secretions.

Immunity:

Specific immunity may be acquired by previous spontaneous infection or by

artificial immunization. For some of the infections, a single attack confers life-long immunity (e.g. measles) but in other cases, because there are many different antigenic strains of the pathogen, repeated attacks may occur (e.g. influenza).

Control of Air-Born Infection

Infective agent

-Elimination of human and animal reservoirs.

-Disinfection of floors and the elimination of dust.

Mode of transmission

-Air hygiene: good ventilation; air disinfection with ultraviolet light (in special cases).

- Avoid overcrowding bedrooms of houses and public halls.

- Personal hygiene avoid coughing, sneezing, spitting or talking directly at the face of other persons. Face masks should be worn by persons with respiratory infections to limit contamination of the environment.

Host

- Specific immunization: active immunization (e.g. measles, whooping cough, influenza); passive immunization in special cases (e.g. gamma globulin for the prevention of measles).

- Chemoprophylaxis (e.g. isoniazid in selected cases for the prevention of tuberculosis).

I. Viral Infections

1. Measles

Measles is an acute communicable disease which presents with fever, signs of inflammation of the respiratory tract (coryza, cough) and a characteristic skin rash. The presence of marked lesions (Koplik's spots) on the buccal mucosa may assist diagnosis in the early prodromal phase. Deaths occur mainly from complications such as secondary bacterial infection, with bronchopneumonia and skin sepsis. Post-measles encephalitis occurs in a few cases.

The incubation period is usually about 10 days. The skin rash usually appears 3-4 days after the onset of symptoms. The aetiological agent is the measles virus.

Epidemiology

Measles is a familiar childhood infection in most parts of the world, the disease is endemic in virtually all parts of the world.

Reservoir And Transmission

Humans are the reservoir of infection. Transmission is by droplets or by contact with sick children or with freshly contaminated articles such as toys or handkerchiefs.

Host Factors

The outcome of measles infection is largely determined by host factors, in particular the state of nutrition of the child. Measles tends to be a severe killing disease in malnourished children. It has been shown that measles has an immunosuppressive effect.

One attack confers lifelong immunity. Babies are usually immune during the first few months of life through the transplacental transmission of passive immunity from immune mothers.

Control

Isolation of children who have measles is of limited value in the control of the infection because the disease is highly infectious in the prodromal coryzal phase before the characteristic rash appears.

Active Immunization

Children should be vaccinated at 8 months, with one dose of live attenuated measles virus vaccine. The protection conferred appears to be durable for long time. During shipment and storage, prior to reconstitution, freeze-dried measles vaccine must be kept at a temperature between 2 and 8^0C and must be protected from light.

Passive Immunization

Measles infection may be prevented or modified by artificial passive immunization using immune gammaglobulin (immunoglobulins) . If the gammaglobulin (0.25ml/kg) is given early, within 3 days of exposure, the infection will be prevented, of a smaller dose (0.05ml/kg) is given 4-6 days after exposure, the infection may be modified, the child presenting with a mild infection which confers lasting immunity.

2. Rubella ('German Measles')

Rubella or German measles is an acute viral infection which presents with fever, mild upper respiratory symptoms, rash and lymphadenopathy usually affecting post auricular, post cervical and sub occipital lymph nodes. The illness is almost always mild, but infection with rubella during the first trimester of pregnancy is associated with a high risk (up to 20%) of congenital abnormalities in the baby. The incubation period is 2-3 weeks. The aetiological agent is the rubella virus.

Epidemiology

Rubella has a world distribution. Humans are the reservoir of infection which is spread from person to person by droplets or by contact, direct or through contamination of fomites. Infection results in lifelong immunity. Infection during early pregnancy may cause such abnormalities as cataract, deafmutism and congenital heart disease in the baby.

Control

The main interest is to prevent the infection of women who are in the early stages pregnancy, and thus avoid the risk of rubella-induced fetal injury. One practical approach is the deliberate exposure of prepubertal girls to infection with rubella or vaccinating them with a single dose of vaccine. Pregnant women should avoid exposure to rubella, especially during the first 4 months of pregnancy; those who have been in contact with the disease should be protected with human immunoglobulin.

3. Mumps

This is an acute viral infection which typically affects salivary glands, especially the parotids, but may also involve the submandibular or the sublingual salivary glands. Pancreatitis, orchitis, inflammation of the ovaries or meningo-encephalitis may complicate theinfection; some of the complications occasionally occur in the absence of obvious clinical symptoms or signs of salivary gland infection.

The incubation period varies from 2 to 4 weeks; The infectious agent is the mumps virus. Mumps has a worldwide distribution.

Humans are the reservoir of infection. The virus is present in the saliva of infected persons.

Transmission

The infection is transmitted by droplets or by contact, directly or indirectly, through fomites.

Host Factors

One infection, whether clinical or subclinical, confers lifelong immunity. Artificial active immunization with live or inactivated vaccine provides protection for a limited period of a few years.

Individual

The sick patient should be isolated, if possible, during the infectious phase; strict hygienic measures should be observed in the cleansing of spoons, cups and other utensils handled by the patient and also in the disposal of his or her soiled handkerchiefs and other linen.

A live attenuated mumps virus vaccine is available. Vaccination is of value in protecting susceptible young persons in residential institutions in which epidemics occur frequently.

4. Influenza

This is an acute respiratory infection that is characterized by systemic manifestations-fever, rigors, headache, malaise and muscle pains, and by local manifestations of coryza, sore throat and cough. Secondary bacterial pneumonia

is an important complication. The fatality rate is low but deaths tend to occur in debilitated persons, those with underlying cardiac, respiratory or renal disease, and in the elderly. The incubation period is usually 1-3 days.

There are three main types of the influenza virus-influenza A, B and C.Type A and B types consist of several serological strains. An important feature of the epidemiology of influenza is the periodic emergence of new antigenically distinct strains which account for massive pandemics. Most epidemic strains belong to type A.

Epidemiology

Massive epidemics of influenza periodically sweep throughout the world with attack rates as high as 50% in some countries. The pandemic may first appear in a specific focus (Asiatic 'flu, Hong Kong 'flu) from which it spreads from continent to continent. Rapid air travel has facilitated the global dissemination of this infection.

Reservoir And Transmission

Humans are the reservoir of infection of human strains of this influenza virus. The infection is transmitted by droplets, and also by contact, both direct and indirect, through the handling of contaminated articles.

All age groups are susceptible, but is the particular strain causing an epidemic is antigenically related to the cause of an earlier epidemic, the older age group with persisting antibodies may be less susceptible.

Control

Active immunization with inactivated influenza virus protects against infection with that specific strain. Polyvalent vaccines are also available but they are only effective if they contain the antigens of the particular strain causing the epidemic.

5. Acute Upper Respiratory Tract Infection

Acute infection of the upper respiratory tract is a common but mainly benign disease. The most typical manifestation, the common cold', presents with coryza, irritation of the throat, lacrimation and mild constitutional upset. Local complications may occur with secondary bacterial infection and involvement of the paranasal sinuses and the middle ear. Infection may spread to the larynx, trachea and bronchi. The incubation period is from 1 to 3 days.

Microbiology

These symptoms can be induced by infection with various viral agents, including the rhinoviruses, certain enteroviruses, influenza, para-influenza, adenoviruses, reoviruses and the respiratory syncitial virus. Superinfection with various bacteria may determine the clinical picture in the later stages of the illness.

Humans are the reservoir of these infections. Transmission is by air-borne spread, contact or by both.

II. Bacterial Infections:

1. Tuberculosis

Tuberculosis remains one of the major health problems in many tropical countries. An estimated 8-10 million people develop overt tuberculosis annually as a result of primary infection, endogenous reactivation or exogenous reinfection.

Drug-resistant tuberculosis is on the increase in many countries of the world.

Tuberculosis presents a wide variety of clinical forms, but pulmonary involvement is common and is most important epidemiologically as it is primarily responsible for the transmission of the infection.

Bacteriology

The causative agent is Mycobacterium tuberculosis, the tubercle bacillus. The human type produces most of the pulmonary lesions, also some extrapulmonary lesions.

Tubercle bacilli survive for long periods in dried sputum and dust.

Tuberculosis has a world distribution. Humans are the reservoir of the human strain and patients with pulmonary infection constitute the main source of infection.

Transmission of infection is mainly air-born by droplet nuclei and dust; thus it is enhanced by overcrowding in poorly ventilated accommodation.

Infection may also occur by ingestion, especially of contaminated milk and infection meat.

The host response is an important factor in the epidemiology of tuberculosis. A primary infection may heal, the host acquiring immunity in the process. In some cases the primary lesion progresses to produce extensive disease locally, or infection may disseminate to produce metastatic lesions. Lesions that are apparently may subsequently break down with reactivation of disease. Certain factors such as malnutrition, measles infection and HIV infection, use of corticosteroids predispose to progression and reactivation of the disease.

The control of tuberculosis can be considered at the following levels of prevention:

1- general health promotion

2- specific protection :- active immunization, chemoprophylaxis and control of animal reservoir
3- early diagnosis and treatment.
4- limitation of disability.
5- rehabilitation
6- surveillance.

General Health Promotion

Improvement in housing (good ventilation, avoidance of overcrowding) will reduce the chances of air-borne infections.

Specific Protection

Three measure are available:

1. active immunization with BCG (Bacillus Calmette Guerin).

2. Chemoprophylaxis.

3. control of animal tuberculosis.

BCG vaccine contains live attenuated tubercle bacilli of the bovine strain. It may be administered intradermally by syringe and needle or by the multiple-puncture technique. It confer significant but not absolute immunity, it protects against the disseminated lesions of tuberculosis and tuberculous meningitis.

Immunization strategy

BCG vaccination may be used selectively in tuberculin-negative persons who are at high risk, for example close contacts, doctors, nurses and hospital ward attendants.

Chemoprophylaxis

Isoniazid has proved an effective prophylacticagent in preventing infection and progression of infection to severe disease.

2. Meningococcal Infection

A variety of clinical manifestations may be produced when human beings are infected with Neisseria meningitides: the typical clinical picture is of acute pyogenic meningitis with fever, headach, nausea and vomiting, neck stiffness, loss of consciousness and a characteristic petechial rash is often present. The incubation period is usually 3-4 days, but may be 2-10 days.

N. meningitidis(meningitids) is a gramnegative, bean-shap, diplococcal organism. There are a worldwide distribution of this infection. Humans are the reservoir of infection.

Transmission

Transmission is by air-born droplets or from a nasopharyngeal carrier or less commonly from a patient through contact with respiratory droplets or oral secretions. It is a delicate organism, dying rapidly on cooling or drying, and thus indirect transmission is not an important route.

Control

There are four basic approaches to the control of meningococcal infections:

1. the management of sick patients and their contacts.

2. environmental control designed to reduce air-born infections.

3. immunization.

3. surveillance.

3. Rheumatic Fever

Rheumatic fever is a complication of infection with group A haemolytic streptococci. The initial infection may present as a sore throat or may be subclinical; the the onset of rheumatic fever is usually 2-3 weeks after the beginning of the throat infection. Apart from fever, the patient may develop pancarditis, arthritis, chorea, Residual damage in the form of chronic valvular heart disease may complicate clinical or subclinical cases of rheumatic fever; the complication is more liable to occur after repeated attacks.

Group A heamolytic streptococci may be isolated from the bacteriological swab of the throats of some of these patients but not from the heart or the joints, which are not directly invaded by the organism.

The control of rheumatic fever involves the control of streptococcal infections in the community generally and the prevention of recurrences by chemoprophylaxis after recovery from an attack of rheumatic fever.

4. Pertussis (whooping cough)

Infection with Bordetella pertussis leads to inflammation of the lower respiratory tract from the trachea to the bronchioles. Clinically, the infection is characterized by paroxysmal attacks of violent cough a rapid succession of coughs typically ends with a characteristic loud, high_ inspiratory crowing sound – the so-called 'whoop'.

The incubation period is usually 7-10 days but may be as long as 3 weeks. The pertussis organism is a gram-negative rod.

The disease has a worldwide distribution but there is falling morbidity and mortality following immunization programmes. Humans are the reservoir of infection. Transmission of infection may be air-born or by contact with freshly soiled articles.

Children under 1 year old are highly susceptible and most deaths occur in young infants.

Routine active immunization with killed vaccine is highly recommended for all infants. The pertussis vaccine is usually incorporated as a constituent of the triple antigen DPT (diphtheria-pertussis-tetanus), which is used for the immunization of children starting from 2 to 3 months. It provides immunity for about 12 years.

5. Diphtheria

This disease is caused by infection with Corynebacterium diphtheria. There may be acute infection of the mucous membranes of the tonsils, pharynx, larynx or nose, skin infections may also occur and are of particular importance in tropical countries. Much faucial swelling may be produced by the local inflammatory reaction and the membranous exudates in the larynx may cause respiratory obstruction. The exotoxin which is produced by the organism may cause nerve palsies or myocarditis.

The incubation period is 2-5 days. Diphtheria is usually included in the list of disease that arenotifiable nationally.

C. diphtheria is a gram-positive rod, with a characteristic bipolar metachromatic staining. Virulent strains produce a soluble exotoxin which is responsible for the systemic manifestation and the sequelae of the disease. Three major types, gravis, intermedius and mitis, have been differentiated, as associated with severe, moderately severe and mild clinical manifestation respectively.

Humans are the reservoir of infection; this includes clinical cases also carriers.

Transmission

The infective agents may be discharged from the nose and throat or from skin lesions. The transmission of the infection may be by:

1- air-born infection.

2- direct contact.

3- indirect contact through fomites.

4- ingestion of contaminated raw milk.

Active Immunization

Active immunization with diphtheria toxoid has proved a reliable measure for the control of this infection. It is usually administered in combination with pertussis vaccine and tetanus toxoid (DPT or triple antigen) from the age of 2 to 3 months.

A booster dose of diphtheria toxoid is recommended at school entry and this may be given in combination with typhoid vaccine.