Program	**:**	B. Pharmacy
Name of Unit	**:**	Preventive medicine
Subject /Course name	**:**	Social and Preventive Pharmacy
Subject/Course ID	**:**	BP802T
Class: B.Pharm. Semester	**:**	8th
Module	**:**	2
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Learning Outcome of Unit

LO	Learning Outcome (LO)	Course Outcome Code
LO1	To understand the concept of communicable and non-communicable diseases .	BP802.2
LO2	To learn the concept of various ways of the disease spreading.	BP802.2
LO3	To understand the diseases of respiratory tract.	BP802.2
LO4	To have the knowledge about the effect of stress on the human body.	BP802.2

Module Content Table

No.	Topic
1	General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.

PREVENTIVE MEDICINE

Most people agree that prevention is better than cure, in medicine or in anything else,- but what is first'. It is a science of study on the connection between the external environment and human prevention or preventive medicine? The main principle of preventive medicine is 'prevention health. It is summation which consists of the environmental and occupational hygiene, nutrition and food hygiene, community medicine, medical statistics and epidemiology. For e.g. preventive medicines for Hypertension are low salt diet, weight loss, and daily exercise, quit smoking, limiting alcohol, controlling stress etc.

The main goal of preventive medicine is the absence of disease by preventing the occurrence of a disease or by halting a disease. Preventive medicine can be practiced by governmental agencies, primary care physicians and the individual himself.

There are basic three levels of preventive care-primary, secondary, and tertiary. Primary prevention eliminates causes of disease or it also increases resistance to disease. Secondary prevention interrupts the disease process before it becomes symptomatic. Tertiary prevention limits the physical and social consequences of symptomatic disease.

1. Primary Prevention

Primary prevention is measures or steps to prevent self from getting ill, getting disease, avoid immunization, taking healthy diet, regular exercise, quitting substances known to be associated with disease to prevent health problems in future.

2. Secondary Prevention

It aims at screening of disease, detection of disease as early as possible before the appearance of signs and symptoms (Asymptomatic Stage). It also includes prevention of different condition from getting it worst. All these measures aim mainly on prevention of the spread of communicable diseases. Examples include screening for breast cancer (Mammography) and cervical cancer, regular blood pressure testing etc.

3. Tertiary Prevention

The goal of tertiary prevention is to reduce the negative impact of an already-established disease by restoring function and reducing disease-related complications. It manages post diagnosis

treatment to slow down progressive disease by different therapy and drugs. Examples include insulin therapy for Type II diabetes, chemotherapy, rehabilitation programs for brain stroke.

2.1.1 PRINCIPLES OF PREVENTION

The basic principles of preventive medicine include increasing control over any disease & improve health. This helps to strengthen the host through a variety of approaches. There are five basic principles for prevention and interventions:

Table 1: Principles of Prevention

Principles	Effectiveness
Health Education	Educate and instruct people to prevent large number of disease Encourage to take necessary precautions at time.
Environmental modifications	It non-clinical approach so does not require physician. Safe water, installation of sanitary latrines, control of insects & rodents, improvement of housing etc. are different approaches
Nutritional interventions	Nutrition and diet education Food distribution & fortification (IFPRI), child feeding programs; Exclusive breast feeding program:
Life style & behavioral changes	Organizational, political, social & economic modifications designed to facilitate environmental & behavioral changes Self-control over depression and other bad habits, health enhancing behaviors, positive approach toward life and strategizing your actions etc.
Specific Preventions	Immunization, Use of specific nutrients, Chemoprophylaxis, Protection against occupational hazards – carcinogens – allergens etc.

2.2 CHOLERA

Cholera is an acute, severe diarrheal infection caused by the ingestion of food or water contaminated with the bacterium ***Vibrio cholerae***. It is a major global public health threat, particularly in regions with inadequate sanitation and limited access to safe water, often acting as an indicator of inequity. While it can cause fatal dehydration within hours, it is easily treatable with prompt rehydration.

2.2.1 Causes and Transmission

- **Pathogen:** The disease is caused by *Vibrio cholerae*, specifically serogroups O1 and O139.
- **Transmission:** It spreads via the fecal-oral route, usually through drinking contaminated water or eating contaminated food.
- **Risk Factors:** Poor sanitation, lack of safe water, overcrowding, and natural disasters (floods, earthquakes) increase the risk of outbreaks

2.2.2 Symptoms:-

Symptoms can appear within hours to 5 days after infection.

- **Sudden, watery diarrhea:** Often pale or milky, frequently described as "rice-water stool".
- **Vomiting and nausea:** Commonly occur in the early stages.
- **Severe dehydration:** Rapid fluid loss can lead to muscle cramps, low blood pressure, rapid heart rate, dry skin, and sunken eyes.
- **Asymptomatic cases:** Many people infected with *V. cholerae* do not develop symptoms but can still shed the bacteria in their feces for 1–10 days, contributing to transmission.

2.2.3 Diagnosis

Diagnosis of cholera is a critical step in managing outbreaks and preventing mortality, focusing on identifying the bacterium *Vibrio cholerae* (typically serogroups O1 or O139) in stool samples. Because cholera can cause death from severe dehydration within hours, clinical diagnosis is often used to start treatment immediately, without waiting for laboratory confirmation.

1. Clinical Diagnosis (Initial Assessment)

- In areas where cholera is known to exist or during an active outbreak, doctors suspect cholera based on symptoms, especially: Sudden onset of profuse, watery diarrhea often described as "rice-water stool" (pale, milky, with fishy odor).
- Vomiting, typically occurring early in the illness.
- Rapid dehydration (sunken eyes, dry mouth, extreme thirst, wrinkled skin).
- Absence of high fever.

2. Laboratory Diagnosis (Confirmation)

Confirmation is required to officially report cases and identify the strain for antimicrobial susceptibility testing.

- **Stool Culture (Gold Standard):** A fresh stool sample or rectal swab is placed on selective media, typically thiosulfate-citrate-bile salts-sucrose (TCBS) agar. *Vibrio cholerae* grows as yellow colonies, which are then confirmed via biochemical and serological tests.
- **Transport Media:** If samples cannot be immediately cultured, they are transported in Cary-Blair medium.
- **Polymerase Chain Reaction (PCR):** Used to detect the genetic material of *V. cholerae* and specific toxin genes (e.g., *ctxA*). It is faster and more sensitive than culture but requires specialized laboratory equipment.

3. Rapid Diagnostic Tests (RDTs)

- RDTs are invaluable in field settings, refugee camps, or rural areas with limited laboratory infrastructure.
- **Method:** These are dipstick tests (e.g., Crystal VC, Cholkit) that detect *V. cholerae* O1 or O139 antigens in stool samples within 15–30 minutes.
- **Usage:** They are useful for screening and initial outbreak detection but have lower sensitivity than culture. Positive RDT results should ideally be confirmed by culture.

4. Other Diagnostic Methods

- **Darkfield Microscopy:** Fresh, watery stool is examined under a microscope to observe the "shooting star" motility of the vibrios. It is highly specific but requires a skilled microscopist and fresh samples.
- **Blood and Urine Tests:** Serum electrolytes, blood urea nitrogen (BUN), and creatinine levels may be measured to evaluate the severity of dehydration, kidney function, and acidosis.

2.2.4 Treatment

Cholera is highly treatable if action is taken immediately.

- Oral Rehydration Therapy (ORT): The primary treatment is Oral Rehydration Salts (ORS) to replace lost fluids and electrolytes.
- Intravenous (IV) Fluids: Severely dehydrated patients require rapid IV fluids.
- Antibiotics: Recommended for severe cases to reduce the volume and duration of diarrhea.
- Zinc Supplementation: Often recommended for children to reduce diarrhea severity.

2.2.5 Prevention

- **Safe Water and Sanitation (WASH):** Ensuring access to clean, boiled, or chlorinated water and proper sewage disposal.
- **Hygiene Practices:** Frequent handwashing with soap, particularly before preparing food.
- **Food Safety:** Cooking food thoroughly and eating it hot, and avoiding raw, unpeeled fruits and vegetables.
- **Vaccination:** Oral cholera vaccines (OCV) are safe and effective tools for preventing and controlling outbreaks, particularly in high-risk areas.

2.3 SARS (SEVERE ACUTE RESPIRATORY SYNDROME)

Severe acute respiratory syndrome (SARS) is a contagious illness caused by a corona virus. It′s a disease that affects the lungs and airways, also called a respiratory illness. The corona virus that causes SARS is called SARS-CoV-1. It first appeared in November 2002. Within a few months, the SARS-CoV-1 virus spread worldwide. It mainly passed from person to person.

2.3.1 Symptoms

SARS usually starts with flu-like symptoms, including:

- Fever of 100.4 degrees Fahrenheit (38 degrees Celsius) or higher.
- Chills.
- Muscle aches.
- Headache.
- Sometimes diarrhea.

SARS symptoms are often severe and resemble influenza or pneumonia. The incubation period is typically 2 to 10 days, with an average of 4–6 days.

- **Initial Symptoms (Days 1–7):** High fever (>100.4°F or 38°C), body aches, headaches, and sometimes diarrhea.
- **Respiratory Symptoms (Day 7+):** Dry cough, sore throat, and severe breathing problems (shortness of breath) that can lead to acute respiratory distress syndrome (ARDS). After about a week, symptoms can include a dry cough and shortness of breath.

2.3.2 Causes

SARS is caused by SARS-CoV-1, a strain of corona virus. Corona viruses are the family of viruses that also cause the common cold. A different strain of corona virus, called SARS-CoV-2, causes COVID-19.

Corona viruses can cause serious disease in animals. That's why scientists suspect that the SARS-CoV-1 virus might have started in animals and crossed to humans. It now seems likely that one or more animal viruses evolved into the new strain.

2.3.3 How the SARS virus spreads

Most viruses that cause respiratory illnesses, including SARS, spread when infected people cough, sneeze or talk. Tiny liquid particles from the nose or mouth enter the air. Healthy people

nearby breathe in those particles. Most experts think the virus that causes SARS spreads mainly through close personal contact. For instance, a healthy person could get infected while taking care of someone who has SARS.

The virus also can spread on objects such as doorknobs, telephones and elevator buttons. Touching an object that has the virus on it and then rubbing the nose, eyes or mouth could cause an infection.

2.3.4 Transmission

- **Mode:** Primarily spreads through respiratory droplets when an infected person coughs, sneezes, or talks.
- **Surfaces:** The virus can survive on surfaces for up to several days.
- **Super spreading:** Certain infected individuals ("superspreaders") were responsible for transmitting the virus to large numbers of people, particularly in hospital settings.
- **Contagious Period:** Individuals are most contagious during the second week of illness

2.3.5 Diagnosis

Diagnosis is challenging because symptoms are similar to other atypical pneumonias, and early laboratory tests are often negative.

The diagnosis of SARS requires a combination of clinical symptoms, epidemiological, and laboratory findings.

1. Clinical and Epidemiological Criteria

WHO and CDC define cases based on a "suspect" or "probable" case definition:

- **Fever:** History of fever > 38°C (100.4°F).
- **Respiratory Symptoms:** Cough, shortness of breath, or difficulty breathing.
- **Epidemiological Linkage:** Close contact with a suspect/probable case, or recent travel to a SARS-affected area within 10 days of symptom onset.
- **Progression:** Rapidly progressive respiratory illness or pneumonia.

2. Laboratory Diagnosis (Virological Methods)

Laboratory confirmation is essential for a definitive diagnosis. The virus can be detected in respiratory, stool, and blood samples.

- **Reverse Transcriptase Polymerase Chain Reaction (RT-PCR):** The primary, highly specific method. It detects viral RNA. Sensitivity varies: it is lower in the first week (approx. 32% on day 3) but rises to over 90% in stool samples by day 14.
- **Antibody Testing (Serology):** Detects IgG/IgM against SARS-CoV using ELISA or immunofluorescence (IFA). This requires 28 days to reach over 90% sensitivity, making it useful for confirming cases later in the illness.
- **Viral Culture:** Direct isolation of the virus. This requires Biosafety Level 3 (BSL-3) containment.

3. Radiological Findings

Imaging is crucial for identifying lower respiratory tract involvement, even when physical exam findings are minimal.

- **Chest X-ray/CT Scan:** Typically shows ground-glass opacities, focal consolidations, or patchy shadowing, often in the peripheral and lower lobes.
- **Progression:** Over 20% of patients have normal chest radiographs upon presentation, but progress to abnormal findings later. HRCT is more sensitive for early detection.
- 4. Other Laboratory Findings
- **Lymphopenia:** A common feature, showing decreased lymphocytes (CD4 and CD8).
- **Thrombocytopenia:** Low platelet counts.
- **Elevated Liver Enzymes:** High ALT/LDH and CPK.

2.3.6 Prevention

Researchers are working on various vaccines for SARS. But none has been tested in humans. If infections caused by the SARS virus happen again, follow some safety measures. The following tips are key if you care for someone who may have SARS:

- **Wash your hands.** Clean your hands often with soap and hot water. Or use an alcohol-based hand rub made with at least 60% alcohol.
- **Wear disposable gloves.** Put them on if you might have contact with an infected person′s body fluids or feces. Throw the gloves away right after you use them. Then wash your hands well.
- **Wear a surgical mask.** Use it to cover your mouth and nose when you′re in the same room as a person with SARS. Or you could wear a device called an N95 respirator. It

also can help block the spread of the SARS virus. Wearing eyeglasses may offer some protection too.

- **Wash personal items.** Use soap and hot water to wash the utensils, towels, bedding and clothing of someone with SARS.
- **Disinfect surfaces.** Use a household disinfectant. Clean any surfaces that may have been in contact with sweat, saliva, mucus, vomit, stool or urine. Wear disposable gloves while you clean. Throw the gloves away when you're done. Then wash your hands.

Follow these steps for at least 10 days after the person's fever has gone away and any breathing symptoms have gotten better. The Centers for Disease Control and Prevention recommends that an infected person stay home from work or school during this time. Call your healthcare team right away if a fever or other symptoms start within 10 days of close contact with someone who has SARS.

2.3.7 Treatment

There is no specific, universally proven treatment for SARS.

- **Management:** Care is largely supportive, including oxygen therapy, antiviral medication (sometimes used based on similar corona viruses), steroids, and ventilator support for critical cases.

2.4 EBOLA VIRUS

Ebola disease (EBOD) is a rare but severe illness in humans . It is often fatal. Ebola disease is caused by viruses that belong to the *Orthoebolavirus* genus of the *filoviridae* family. Six species of Orthoebolaviruses have been identified to date, with three known to cause large outbreaks:

- Ebola virus (EBOV) causing Ebola virus disease (EVD)
- Sudan virus (SUDV) causing Sudan virus disease (SVD)
- Bundibugyo virus (BDBV) causing Bundibugyo virus disease (BVD).

Ebola disease first occurred in 1976 in two simultaneous outbreaks: one outbreak was of Sudan virus disease in Nzara in what is now South Sudan, and the other outbreak was of Ebola virus disease in Yambuku, in what is now the Democratic Republic of the Congo. The latter occurred in a village near the Ebola River, from which the disease takes its name.

While there are licensed vaccines and therapeutics for Ebola virus disease, there is no approved vaccine or treatment for other Ebola diseases, such as SVD or BVD. Candidate products are in development. Early intensive supportive care including rehydration and treatment of specific symptoms, can improve survival. Seeking early care can be lifesaving.

2.4.1 Transmission

It is thought that fruit bats of the *Pteropodidae* family are natural hosts of the Orthoebolavirus. The virus can get into the human population when people have close contact with the blood, secretions, organs or other bodily fluids of infected animals such as fruit bats, chimpanzees, gorillas, monkeys, forest antelope or porcupines found ill or dead or in the rainforest.

People can get infected with the virus from another person by direct contact (through broken skin or mucous membranes) with:

- the blood or body fluids of a person who is sick with or has died from Ebola disease; and
- objects or surfaces that have been contaminated with body fluids (like blood, feces, vomit) from a person sick with the disease or who has died from the disease.

People cannot transmit the disease before they have symptoms, and they remain infectious as long as their blood contains the virus. Health and care workers have frequently been infected while treating patients with Ebola disease. This occurs through close contact with patients when infection control precautions are not strictly practiced. Burial ceremonies that involve direct contact with the body of a person who has died can also contribute to the transmission of Ebola disease.

2.4.2 Symptoms

The incubation period or interval from infection to onset of symptoms varies from 2 to 21 days.

The symptoms of Ebola disease can be sudden and include

- fever,
- fatigue,
- malaise,
- muscle pain,
- headache
- sore throat.

These are followed by vomiting, diarrhoea, abdominal pain rash, and symptoms of impaired kidney and liver functions. It is important for health and care workers to be on the lookout for these symptoms.

Despite a perception that bleeding is a common symptom, this is less frequent and can occur later in the disease. Some patients may develop internal and external bleeding, including blood in vomit and faeces, bleeding from the nose, gums and vagina. Bleeding at the sites where needles have punctured the skin can also occur.

The impact on the central nervous system can result in confusion, irritability and aggression.

2.4.3 Diagnosis

It can be difficult to clinically distinguish Ebola disease from other infectious diseases such as malaria, typhoid fever, shigellosis, meningitis and other viral haemorrhagic fevers because symptoms at early stage of the disease are similar.

Confirmation that the person has an Ortho ebola virus infection is made using the following diagnostic methods:

- reverse transcriptase polymerase chain reaction (RT-PCR) assay
- antibody-capture enzyme-linked immunosorbent assay (ELISA)
- antigen-capture detection tests
- virus isolation by cell culture.

Samples collected from patients are an extreme biohazard risk; laboratory testing on non-inactivated samples should be conducted under maximum biological containment conditions. All non-inactivated biological specimens should be packaged using the triple packaging system when transported nationally and internationally See Diagnostic testing for Ebola and Marburg diseases.

2.4.4 Treatment

Over the years, WHO and partners have developed guidance and training that outline how to provide the best possible care for patients and increase their chance of survival, whether or not specific treatments are being used. Called optimized supportive care, this covers the relevant tests to administer, how to manage pain, nutrition and co-infections (such as malaria), and other approaches that put the patient on the best path to recovery.

For Ebola virus disease, WHO made strong recommendations for treatment with mAb114 (ansuvimab^{TM}) or REGN-EB3 (Inmazeb^{TM}) that are both monoclonal antibodies. For other Ebola diseases, such as SVD or BVD, there are no approved therapeutics, but candidate products are under development and a CORE protocol for clinical trials is available.

2.4.5 Vaccines

For Ebola virus disease:

- Two vaccines are approved: Ervebo (Merck & Co.) and Zabdeno and Mvabea (Janssen Pharmaceutica). Ervebo vaccine is recommended as part of outbreak response, see SAGE recommendations of July 2024.
- In case of a confirmed Ebola virus disease outbreak, Ervebo vaccines can be accessed through the International Coordinating Group on vaccine provision.
- For preventive vaccination of health-care and frontline workers, request of Ervebo vaccines can be made through Gavi Preventive Ebola vaccination.

For other Ebola diseases, such as SVD:

- Several candidate vaccines are at different stages of development.
- As part of outbreak response, a CORE protocol to evaluate the safety, tolerability, immunogenicity, and efficacy of vaccine candidates is available.

2.4.6 Prevention and control

Community engagement is key to successfully controlling any outbreak. Outbreak control relies on using a range of interventions, such as clinical care, surveillance and contact tracing, laboratory services, infection prevention and control in health facilities, safe and dignified burials, vaccination (only for Ebola virus disease) and social mobilization.

Raising awareness of risk factors and protective measures that individuals can take is an effective way to reduce human transmission. Risk reduction messaging should focus on several factors:

- Reduce the risk of wildlife-to-human transmission from contact with infected fruit bats or monkeys/apes and the consumption of their raw meat.
- Reduce the risk of human-to-human transmission arising from direct or close contact with infected people, particularly with their body fluids. Close physical contact with Ebola patients should be avoided. Patients should be isolated in a designated treatment center for early care and to avoid transmission at home.

- Communities should be well informed, both about the disease itself and how to control the outbreak. This is done best when they are involved in the response and there is open discussion.
- Outbreak containment measures include safe and dignified burial of the deceased, identifying people who may have been in contact with someone infected with Ebola disease and monitoring their health for 21 days, separating the healthy from the sick to prevent further spread and providing care to confirmed patients. Maintaining good hygiene and a clean environment are also important.

2.5 INFLUENZA

Influenza, commonly known as the **flu**, is an infectious disease caused by influenza viruses. Symptoms range from mild to severe and often include fever, runny nose, sore throat, muscle pain, headache, coughing, and fatigue. These symptoms begin one to four (typically two) days after exposure to the virus and last for about two to eight days. Diarrhea and vomiting can occur, particularly in children. Influenza may progress to pneumonia from the virus or a subsequent bacterial infection. Other complications include acute respiratory distress syndrome, meningitis, encephalitis, and worsening of pre-existing health problems such as asthma and cardiovascular disease.

2.5.1 **Types of Influenza:**

- *Influenza A virus*, genus *Alphainfluenzavirus*
- *Influenza B virus*, genus *Betainfluenzavirus*
- *Influenza C virus*, genus *Gammainfluenzavirus*
- *Influenza D virus*, genus *Deltainfluenzavirus*

Sr. No.	Basis	Type A	Type B	Type C
1	Symptoms	Moderate to Severe	Mild	Mild
2	Age Group	All	Primarily children	All
3	Affect	Humans and Animal	Affects human only	Affects human only
4	Divided	Subdivided based on antigenic differences	Not divided into sub types	Not divided into sub types
5	Epidemics	Widespread	Regional	Don't cause
6	Experienced	Mostly	Less Common than type A	Rarely Reported

2.5.2 Symptoms

The symptoms of influenza are similar to those of a cold, although usually more severe and less likely to include a runny nose The time between exposure to the virus and development of symptoms (the incubation period) is one to four days, most commonly one to two days. Many infections are asymptomatic. The onset of symptoms is sudden, and initial symptoms are predominantly non-specific, including fever, chills, headaches, muscle pain, malaise, loss of appetite, lack of energy, and confusion. These are usually accompanied by respiratory symptoms such as a dry cough, sore or dry

throat, hoarse voice, and a stuffy or runny nose. Coughing is the most common symptom. Gastrointestinal symptoms may also occur, including nausea, vomiting, diarrhea, and gastroenteritis, especially in children. The standard influenza symptoms typically last for two to eight days. Some studies suggest influenza can cause long-lasting symptoms ("long flu") in a similar way to long COVID.

2.5.3 Transmission

People who are infected can transmit influenza viruses through breathing, talking, coughing, and sneezing, which spread respiratory droplets and aerosols that contain virus particles into the air.

Influenza is usually transmissible from one day before the onset of symptoms to 5–7 days after. In healthy adults, the virus is shed for up to 3–5 days. Children ages 2–17 are considered to be the primary and most efficient spreaders of influenza. A variety of factors likely encourage influenza transmission, including lower temperature, lower absolute and relative humidity, less ultraviolet radiation from the sun, and crowding. Influenza viruses that infect the upper respiratory tract like H1N1 tend to be more mild but more transmissible, whereas those that infect the lower respiratory tract like H5N1 tend to cause more severe illness but are less contagious.

2.5.4 Diagnosis

Serological assays can be used to detect an antibody response to influenza after natural infection or vaccination.

Direct fluorescent or immuno- fluorescent antibody (DFA/IFA) tests involve staining respiratory epithelial cells in samples with fluorescently-labeled influenza-specific antibodies, followed by examination under a fluorescent microscope.

2.5.5 Treatment:

Most people with influenza who are healthy do not need special drugs or treatments and they recover within 1-2 weeks but some patient may develop secondary infections e.g. bacterial pneumonia and in that case they need proper supportive care and treatment. Normal treatment is to take rest and plenty of liquids.

- **Anti-viral therapy:** There are two ways to tackle with the disease by anti-viral medications: Treating the symptoms and attacking the virus. The symptoms can be alleviated with drugs to reduce fever and pain such as paracetamol. Antiviral

drugs can be effective against influenza but must be administered within the first 2 days of symptoms appearing. Oseltamivir and zanamivir are used sometimes.

- In some cases such as, bacterial pneumonia some prophylactic antibiotics may also be given for supportive treatment.
- Also Intravenous Hydration, Hemodynamic support and oxygen therapy are other secondary treatment in treating influenza.
- **Vaccines:** Influenza (flu) vaccines cause antibodies to develop in the body about two weeks after vaccination. A quadrivalent influenza vaccine is designed to protect against four different flu viruses. Also here are cell based flu vaccines and other high dose flu vaccines are available.

2.5.6 PREVENTION

The only proven method for preventing influenza is a yearly vaccination approximately 2 weeks before the "flu season" begins although there are several minor steps which can prevent you from getting infected. The main objective of all these measures is just to make barrier between your mucosal membrane and infective viral particles. The general preventive steps are as follows:

- Avoid bad ventilated place
- Avoid close contact with people and keep safe distancing
- When you are at risk stay at home and keep yourself isolated. Avoid overcrowded place
- Maintain proper hand hygiene. During coughing and sneezing cover your nose and mouth.
- Frequent hand washing can protect you from germs.
- Avoid touching eyes, nose and mouth and Use three layered surgical mask
- Hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic hand wash after having contact with respiratory secretions and contaminated objects/materials.
- Get plenty of sleep, be physically active, manage your stress, drink plenty of fluids, and eat nutritious food.
- Quit smoking, alcohol and take your regular medicines routinely.

2.6 ACUTE RESPIRATORY INFECTIONS (ARI)

Acute respiratory infection is an infection that may interfere with normal breathing. It can affect just your upper respiratory system, which starts at your sinuses and ends at your vocal chords, or just your lower respiratory system, which starts at your vocal chords and ends at your lungs.

This infection is particularly dangerous for children, older adults, and people with immune system disorders.

2.6.1 SYMPTOMS:

The symptoms you experience will be different if it's a lower or upper respiratory infection. Symptoms can include:

- congestion, either in the nasal sinuses or lungs
- runny nose
- cough
- sore throat
- body aches
- fatigue
- a fever over 103˚F (39˚C) and chills
- difficulty breathing
- dizziness
- loss of consciousness

2.6.2 CAUSES:

There are several different causes of acute respiratory infection.

Causes of upper respiratory infection:

- acute pharyngitis
- acute ear infection
- common cold

Causes of lower respiratory infection:

- bronchitis
- pneumonia
- bronchiolitis

2.6.3 DIAGNOSIS:

In a respiratory exam, the doctor focuses on your breathing. They will check for fluid and inflammation in the lungs by listening for abnormal sounds in your lungs when you breathe. The doctor may peer into your nose and ears, and check your throat.

If your doctor believes the infection is in the lower respiratory tract, an X-ray or CT scan may be necessary to check the condition of the lungs.

Lung function tests have been useful as diagnostic tools. Pulse oximetry, also known as pulse ox, can check how much oxygen gets into the lungs. A doctor may also take a swab from your nose or mouth, or ask you to cough up a sample of sputum (material coughed up from the lungs) to check for the type of virus or bacteria causing the disease.

2.6.4 TREATMENT:

With many viruses, there are no known treatments. Your doctor may prescribe medications to manage your symptoms while monitoring your condition. If your doctor suspects a bacterial infection, they may prescribe antibiotics.

2.6.5 PREVENTION:

- Getting the MMR (measles, mumps, and rubella) and pertussis vaccine will substantially lower your risk of getting a respiratory infection. You may also benefit from influenza vaccination and pneumovax.
- Wash your hands frequently, especially after you've been in a public place.
- Always sneeze into the arm of your shirt or in a tissue. Although this may not ease your own symptoms, it will prevent you from spreading infectious diseases.
- Avoid touching your face, especially your eyes and mouth, to prevent introducing germs into your system.
- One should also avoid smoking and make sure you include plenty of vitamins in your diet, such as vitamin C, which helps boost your immune system. Vitamin C is maintained in immune cells, and a deficiency has been linked to higher susceptibility to infection.

2.7 MALARIA

Malaria is a severe, potentially life-threatening disease caused by a parasite, *Plasmodium*, which is transmitted to humans through the bite of an infected female *Anopheles* mosquito. It thrives in tropical and subtropical regions, particularly in hot and humid climates, making it a major public health challenge, with about 95% of cases and deaths occurring in sub-Saharan Africa.

2.7.1 STAGES OF MALARIA

Malaria progresses through distinct stages:

1. **Liver (Pre-erythrocytic) Stage**: After a mosquito bite, the malaria parasite initially enters the liver cells, where it multiplies silently. This stage can last from **7 to 14 days** and is typically asymptomatic.
2. **Blood (Erythrocytic) Stage)**: After the liver stage, the parasites enter the bloodstream, infecting red blood cells. This is when classic malaria symptoms such as fever, chills, headaches, and body aches become apparent.
3. **Gametocyte Stage**: In the final stage, certain malaria parasites develop into gametocytes, the sexual form of the parasite. These gametocytes can then be picked up by another mosquito, continuing the malaria transmission cycle.

Understanding these **malaria stages** is essential for timely diagnosis and effective treatment.

2.7.2 DIFFERENT TYPES OF MALARIA PARASITES:

There are over 150 species of Plasmodium parasites, but only five infect humans and cause malaria. Here's a breakdown of the five main types of malaria parasites:

a) **Plasmodium Falciparum:** This is the most deadly and prevalent species, particularly in sub-Saharan Africa. It can cause severe complications and is responsible for the majority of malaria-related deaths globally.

b) **Plasmodium vivax:** Though less deadly than P. falciparum, P. vivax is the most geographically widespread species, found across Asia, Latin America, and parts

of Africa. It can cause relapses months or even years after the initial infection due to its ability to remain dormant in the liver.

c) **Plasmodium Malariae:** This species typically causes a milder form of malaria and is commonly found in parts of Africa. Infections can persist for extended periods, often without noticeable symptoms.

d) **Plasmodium Ovale:** Similar to P. vivax, P. ovale can cause relapses due to its ability to remain dormant in the liver. It is primarily found in West Africa and some regions of Asia and the Pacific.

e) **Plasmodium Knowlesi:** This parasite primarily infects macaque monkeys but can occasionally infect humans, particularly in Southeast Asia. P. knowlesi infections can cause severe malaria and have been increasingly reported in recent years.

Each of these malaria parasites has unique characteristics and geographic distributions, contributing to the complexity of malaria transmission and control efforts worldwide.

2.7.3 TANSMISSION CYCLE:

Malaria has a specific transmission cycle involving both humans and mosquitoes:

- ✓ **Mosquito Infection:** The malaria life cycle begins with an infected female Anopheles mosquito. When this mosquito bites a person infected with malaria, parasites enter the mosquito's body.
- ✓ **Parasite Development:** Within the mosquito, malaria parasites undergo a complex development process lasting about a week, maturing and multiplying within the gut.
- ✓ **Human Infection:** After development, the mature parasites migrate to the mosquito's salivary glands. When the infected mosquito bites another person, the parasites are injected into the person's bloodstream via the mosquito's saliva.
- ✓ **Liver Invasion:** The injected malaria parasites travel through the bloodstream to the liver, where they multiply further and mature within liver cells.

- ✓ **Red Blood Cell Infection:** After a period (depending on the species), mature parasites leave the liver and invade red blood cells, where they rapidly reproduce, causing the infected red blood cells to burst.

2.7.4 SYMPTOMS:

The bursting of red blood cells releases toxins and infected red blood cells into the bloodstream, causing typical malaria symptoms like fever, chills, and fatigue. If a mosquito bites an infected person at this stage, the transmission cycle continues, spreading malaria further. There is a range of **malaria parasite symptoms,** which typically develop within 7 to 30 days of being bitten by an infected mosquito. Common malaria symptoms include:

- ❖ **Fever:** Fever is often the first and most prominent symptom of malaria. It can be intermittent or continuous and may spike to high temperatures.
- ❖ **Chills:** Chills usually accompany fever and can be severe, leading to shaking or rigours.
- ❖ **Headache:** A common that can range from mild to severe.
- ❖ **Muscle and Joint Pain:** Patients may experience generalised body aches, including muscle and joint pain.
- ❖ **Fatigue:** Profound weakness and fatigue are common, often accompanied by a feeling of overall malaise.
- ❖ **Nausea and Vomiting:** Nausea and vomiting may occur, particularly in the early stages of the illness.
- ❖ **Sweating:** Profuse sweating, especially following a fever episode, is characteristic of malaria.
- ❖ **Abdominal Pain:** Some individuals may experience abdominal pain, diarrhoea, or other digestive symptoms.

In severe cases, additional malaria parasite symptoms and complications may arise, including:

- **Severe Anaemia:** A marked decrease in red blood cell count can lead to symptoms such as pallor, weakness, and shortness of breath.
- **Respiratory Distress:** Severe malaria can cause difficulty breathing due to fluid accumulation in the lungs.
- **Cerebral Malaria:** Infection of the brain with malaria parasites can lead to neurological symptoms, including confusion, seizures, and coma.
- **Organ Failure:** Severe malaria can result in dysfunction of vital organs such as the kidneys or liver, leading to complications that may be life-threatening.

2.7.5 CAUSES

Various species of Plasmodium parasites can cause malaria in humans, with Plasmodium falciparum being the most deadly. Transmission occurs when infected mosquitoes bite humans, injecting the parasites into the bloodstream. Environmental factors, mosquito behaviour, and human activities all influence the spread of malaria.

2.7.6 DIAGNOSIS

Malaria diagnosis relies on detecting the presence of the Plasmodium parasite in a person's blood. Here's a breakdown of the most common methods:

a) **Blood Smear Microscopy:** This is the gold standard for diagnosing malaria, especially in resource-limited settings.. This test can identify the specific Plasmodium species and estimate the parasite density in the blood.

b) **Rapid Diagnostic Tests (RDTs):** Quick, easy-to-use tests that can be conducted at clinics or in the field. RDTs use immunochromatographic technology to detect specific proteins from the Plasmodium parasite in a blood sample. These tests provide results within 15–30 minutes and are highly sensitive for detecting P. falciparum, the most dangerous type.

c) **Molecular Diagnostics (PCR):** Polymerase Chain Reaction (PCR) tests are highly sensitive and specific for detecting malaria parasites. These tests can identify the parasite's DNA even in cases with low parasite density. However,

PCR tests are more expensive and complex than blood smears or RDTs and require specialised equipment, limiting their availability in some settings..

2.7.7 TREATMENT

Malaria is treated with antimalarial medications that target the malaria parasites in the patient's bloodstream. The choice of treatment depends on factors such as the species of parasite, illness severity, patient age and medical history, and regional drug resistance.

1. **Antimalarial Medications**

a) **Artemisinin-based Combination Therapies (ACTs):** ACTs are currently the most effective treatment for uncomplicated malaria caused by Plasmodium falciparum, the most deadly malaria parasite. They combine an artemisinin derivative with another antimalarial drug to provide fast and effective parasite clearance.

b) **Chloroquine:** Previously, chloroquine was widely used for chloroquine-sensitive *Plasmodium* species. However, due to widespread drug resistance, it is no longer recommended as a first-line malaria treatment in many regions. Chloroquine may still be effective in areas where the malaria parasites remain susceptible to the drug.

c) **Other antimalarial drugs:** Depending on the specific circumstances, other malaria medications may be used for treatment. These drugs are often reserved for cases of severe malaria, infections with drug-resistant parasites, or individuals unable to tolerate first-line therapies.

2. Supportive Care

Along with antimalarial medications, supportive care is essential for managing symptoms and preventing complications. This might include:

a) **Fluids and Electrolytes:** Intravenous fluids are often needed to manage dehydration caused by fever and vomiting.

b) **Pain Relievers:** Medications like paracetamol can help reduce fever and relieve muscle aches.

c) **Blood transfusions:** In severe cases with severe anaemia, blood transfusions might be needed.

d) **Anticonvulsants:** Used to control seizures in cases of cerebral malaria.

2.7.8 PREVENTION

Malaria prevention is crucial, especially if you live in or are travelling to an area with a high risk of infection. Here are some key strategies for malaria prevention:

- ✓ **Malaria vaccine:** The malaria vaccine is a vital component of efforts to prevent malaria. Currently, the RTS,S/AS01 (RTS,S) vaccine, known as Mosquirix and not yet available in India, is the first and only vaccine approved for malaria prevention.
- ✓ **Use of Insecticide-Treated Bed Nets (ITNs):** Sleeping under ITNs can provide significant protection against mosquito bites, particularly during the hours when Anopheles mosquitoes are most active (usually from dusk to dawn).
- ✓ **Indoor Residual Spraying (IRS):** Involves applying insecticides on the interior walls of houses and other structures, killing kill mosquitoes upon contact. This approach can help reduce mosquito populations and prevent indoor transmission of malaria.
- ✓ **Personal protection measures:** In addition to bed nets, individuals can protect themselves from mosquito bites by wearing long-sleeved clothing, pants, and socks, especially during peak mosquito activity hours.
- ✓ **Environmental Management:** This includes draining stagnant water, covering or treating water storage containers, and clearing vegetation where mosquitoes may breed.
- ✓ **Chemoprophylaxis:** Travellers visiting malaria-endemic areas may take antimalarial medications as a preventive measure to reduce the risk of infection.

2.8. CHIKUNGUINEA

Chikungunya is a viral illness transmitted to humans through the bite of infected *Aedes* mosquitoes. The disease is characterized by a sudden onset of high fever and severe, often debilitating, joint pain, frequently causing a stooped posture, which is the origin of its name in the Makonde language—"to become contorted". While rarely fatal, it can lead to chronic, long-term health issues and has emerged as a global public health concern.

2.8.1 CAUSES AND TRANSMISSION

- **Viral Agent:** The disease is caused by the chikungunya virus (CHIKV), an RNA virus that belongs to the *Alphavirus* genus of the *Togaviridae* family.
- **Vector:** It is primarily transmitted by the *Aedes aegypti* and *Aedes albopictus* mosquitoes. These mosquitoes are active during the daytime, with peak biting activity occurring early in the morning and late in the afternoon.
- **Transmission Cycle:** Humans act as the main reservoir for the virus during epidemics. A mosquito becomes infected by feeding on a person with viremia (virus in the blood) and then transmits it to other humans. It is not directly contagious from person to person, although rare instances of mother-to-child transmission during childbirth have been documented.
- **Geographical Distribution:** Originally found in Africa and Asia, outbreaks have now been reported in over 110 countries across Africa, Asia, Europe, and the Americas.

2.8.2 SYMPTOMS AND CLINICAL FEATURES

Symptoms typically appear 3 to 7 days after the bite of an infected mosquito, with a range of 1 to 12 days.

- **Acute Phase:** Sudden high fever (often >102°F or 39°C) and severe polyarthralgia (joint pain) are the most common symptoms. The joint pain is generally bilateral and symmetric, often affecting the hands, wrists, ankles, and knees.
- **Other Symptoms:** Muscle pain, headache, nausea, fatigue, and a maculopapular rash.

- **Chronic Phase:** Although most symptoms resolve within 7–10 days, severe joint pain can persist or recur for weeks, months, or even years.

2.8.3 DIAGNOSIS

Chikungunya is diagnosed through blood tests, such as RT-PCR (Reverse Transcription-Polymerase Chain Reaction) during the first week to detect the virus directly, or ELISA (Enzyme-linked immunosorbent assay) to detect IgM antibodies after the first week.

- **Differential Diagnosis:** Because symptoms overlap with dengue and Zika, laboratory confirmation is important, particularly in areas where these diseases coexist.

2.8.4 TREATMENT

There is no specific antiviral drug or cure for chikungunya. Management is supportive and focuses on relieving symptoms, including:

- **Rest:** Adequate rest to support the body.
- **Fluids:** Drinking plenty of fluids to prevent dehydration.
- **Medication:** Paracetamol or acetaminophen is used for fever and pain.
- **NSAIDs Caution:** Non-steroidal anti-inflammatory drugs (NSAIDs) like ibuprofen or aspirin should *not* be taken until dengue fever is ruled out to avoid the risk of bleeding.

2.8.5 PREVENTION AND CONTROL

Prevention centers on avoiding mosquito bites and controlling mosquito populations.

- **Personal Protection:** Use insect repellent (DEET, picaridin), wear long-sleeved shirts and pants, and use window/door screens.
- **Environmental Control:** Eliminate stagnant water in containers (pots, tires, gutters) where mosquitoes breed.
- **Vaccines:** In late 2023, the US FDA approved **Ixchiq**, the first chikungunya vaccine for adults at high risk of exposure. Another vaccine, **Vimkunya**, is also available in some regions.

2.9. DENGUE

Dengue (break-bone fever) is a viral infection that is spread from mosquitoes to people. It is more common in tropical and subtropical than in temperate climates.

Most people who get dengue do not have symptoms. For those who do, the most common symptoms are high fever, headache, body aches, nausea and rash. Most get better in 1–2 weeks. Some develop severe dengue and need care in a hospital. In severe cases, dengue can be fatal. You can lower your risk of dengue by avoiding mosquito bites, especially during the day. Dengue is treated through pain management as there is no specific treatment currently.

2.9.1 TRANSMISSION

- **Vector:** The disease is transmitted by the bite of an infected female *Aedes aegypti* mosquito, and to a lesser extent, *Aedes albopictus*. These mosquitoes are daytime feeders, with peak activity in early morning and before dusk.
- **Transmission Cycle:** Mosquitoes become infected when they bite a person who is already infected with the virus. The virus then replicates in the mosquito for about 8–12 days before it can be transmitted to another human.
- **Risk Factors:** Nearly 3.9 billion people are at risk, with an estimated 100-400 million infections occurring annually. It is endemic in over 100 countries, with the highest burden in the Americas, Southeast Asia, and Western Pacific.

2.9.2 SYMPTOMS

Most people with dengue have mild or no symptoms and will get better in 1–2 weeks. Rarely, dengue can be severe and lead to death.

If symptoms occur, they usually begin 4–10 days after infection and last for 2–7 days. Symptoms may include:

- high fever (40°C/104°F)
- severe headache
- pain behind the eyes
- muscle and joint pains
- nausea
- vomiting
- swollen glands
- rash.

Individuals who are infected for the second time are at greater risk of severe dengue. The symptoms of severe dengue often come after the fever has gone away and may include:

- severe abdominal pain
- persistent vomiting
- rapid breathing
- bleeding gums or nose
- fatigue
- restlessness
- blood in vomit or stool
- being very thirsty
- pale and cold skin
- feeling weak.

People with these severe symptoms should seek care immediately. After recovery, people who have had dengue may experience fatigue for several weeks.

2.9.3 CLINICAL PHASES

The illness generally follows three phases:

1. **Febrile Phase:** Characterized by a sudden, high fever, severe headaches, pain behind the eyes, joint/muscle aches, vomiting, and a rash.
2. **Critical Phase:** Occurs around day 3–7, often as the fever subsides. This is a high-risk period where plasma leakage can lead to severe dengue. **Warning signs** indicating this

phase include severe abdominal pain, persistent vomiting, mucosal bleeding (gums or nose), rapid breathing, and extreme fatigue.

3. **Recovery Phase:** The body absorbs the excess fluid, and the patient recovers.

2.9.4 DIAGNOSTICS AND TREATMENT

- ✓ The diagnostic algorithms, testing strategies and test methodologies employed vary, depending on the capabilities of national laboratory systems.
- ✓ The wide range of available tests – including nucleic acid amplification tests (NAATs), enzyme-linked immunosorbent assays (ELISAs) and rapid diagnostic tests (RDTs) – vary significantly in quality and performance.
- ✓ Laboratory testing for arboviruses can be accomplished through either direct detection methods such as virus isolation, molecular detection of nucleic acid or antigen testing, including rapid diagnostic tests (RDTs) within the first week of illness.
- ✓ There is no specific treatment for dengue, although pain can be managed with medication such as paracetamol (acetaminophen). Non-steroidal anti-inflammatory medicines such as ibuprofen and aspirin should be avoided as they can increase the risk of bleeding.
- ✓ For people with severe dengue, hospitalization is often necessary.

2.9.5 PREVENTION

- ✓ **Vector Control:** The primary prevention method is reducing mosquito habitats by removing standing water in containers (tyres, pots, buckets) around homes.
- ✓ **Personal Protection:** Using mosquito repellents (DEET), wearing long-sleeved clothes, and sleeping under nets are crucial.
- ✓ **Vaccines:** While some vaccines exist (e.g., Dengvaxia), they are typically recommended for specific age groups and those with a confirmed previous infection in high-transmission areas.

2.10. LYMPHATIC FILARIASIS

Lymphatic filariasis (LF), commonly known as **elephantiasis**, is a neglected tropical disease (NTD) caused by parasitic, thread-like worms that inhabit the human lymphatic system. It is transmitted by mosquitoes and causes severe, permanent disability, social stigma, and significant economic hardship in tropical and subtropical regions.

2.10.1 CAUSATIVE AGENTS AND TRANSMISSION

- **Parasites:** The disease is caused by microscopic, thread-like nematodes (roundworms):
  - ✓ *Wuchereria bancrofti* (responsible for 90% of cases).
  - ✓ *Brugia malayi* (causes most of the remaining cases).
  - ✓ *Brugia timori*.
- **Transmission Vector:** Transmitted to humans through the bites of infected mosquitoes, including *Culex* (urban/semi-urban), *Anopheles* (rural), and *Aedes*.
- **Life Cycle:** Infected mosquitoes deposit larvae on the skin, which enter the body. These larvae migrate to the lymphatic system and develop into adult worms, which can live for 6–8 years, releasing millions of immature larvae (microfilariae) into the blood.
- **Nocturnal Periodicity:** In most areas, microfilariae circulate in the blood only at night, coinciding with the peak biting activity of the mosquito vector.

2.10.2 CLINICAL MANIFESTATIONS (SYMPTOMS)

Many infected individuals remain asymptomatic, yet they still experience subclinical damage to the lymphatic system and kidneys, along with weakened immunity.

Many infected individuals remain asymptomatic, yet they still experience subclinical damage to the lymphatic system and kidneys, along with weakened immunity.

When symptoms develop, they often appear years after the initial infection:

- **Acute Attacks (Adenolymphangitis):** Episodic attacks of fever, severe pain, and inflammation of lymph nodes and vessels. These are often caused by the body's immune response to adult worms or secondary bacterial infections.

- **Lymphedema/Elephantiasis:** Chronic, severe swelling of limbs (usually legs, sometimes arms), breasts, or genital areas. The skin becomes thick, hard, and discolored (hyperkeratosis).
- **Hydrocele:** Swelling of the scrotum, which is a common and disfiguring manifestation in men.
- **Chyluria:** Presence of lymph in urine, causing a milky appearance.
- **Tropical Pulmonary Eosinophilia (TPE):** A rare, severe reaction causing chronic cough, wheezing, and fever.

2.10.3. **DIAGNOSIS**

- **Microscopic Examination (Night Blood Smear):** The traditional method, where blood is collected at night to detect circulating microfilariae.
- **Antigen Detection Tests (Rapid Tests):** The Alere Filariasis Test Strip (FTS) is now the preferred "gold standard" for detecting *W. bancrofti* antigens, which can be done anytime, day or night.
- **Antibody Detection:** Tests to detect IgG4 antibodies (useful for Brugia species).
- **Ultrasound:** Used to visualize live adult worms ("filarial dance sign") in lymphatic vessels.

2.10.4. TREATMENT AND MANAGEMENT

Treatment aims to eliminate the parasite and manage symptoms to prevent disability.

- **Antifilarial Medication (Mass Drug Administration - MDA):** Annual, single-dose, community-wide treatment using:
- **IDA:** Ivermectin + Diethylcarbamazine (DEC) + Albendazole (used to accelerate elimination).
- **DA:** DEC + Albendazole.
- **IA:** Ivermectin + Albendazole (used in areas co-endemic with onchocerciasis).
- **Individual Treatment:** DEC is the drug of choice, though it kills only microfilariae and some adult worms. Doxycycline (4–6 weeks) is sometimes used to kill *Wolbachia*, an endosymbiotic bacteria necessary for the worm's survival.
- **Morbidity Management (MMDP):**

- **Lymphedema Management:** Daily washing of affected limbs, skin care to prevent secondary infections, elevation of limbs, and exercise.
- **Hydrocele Surgery:** Surgical removal of fluid-filled scrotal sacs.

2.10.5. PREVENTION AND CONTROL

- **Vector Control:** Using insecticide-treated mosquito nets, indoor residual spraying, and reducing breeding sites (stagnant water).
- **Personal Protection:** Using insect repellents and wearing protective clothing.
- **Global Elimination Programs:** The World Health Organization (WHO) launched the Global Programme to Eliminate Lymphatic Filariasis (GPELF) in 2000, aiming to eliminate it as a public health problem by 2030.
- **Success Status:** As of 2023, 21 countries (e.g., Bangladesh, Thailand, Sri Lanka, Egypt) have been validated as having eliminated LF.

2.11 PNEUMONIA

Pneumonia is a serious infection and inflammation of the lung parenchyma, specifically affecting the tiny air sacs known as **alveoli**. It causes these sacs to fill with pus, fluid, and other infectious materials, making it difficult for oxygen to reach the bloodstream. Pneumonia can range from mild (walking pneumonia) to life-threatening, causing significant mortality, especially in children under 5, adults over 65, and those with weakened immune systems.

2.11.1 CAUSES AND CLASSIFICATION

Pneumonia is classified by its cause (bacterial, viral, fungal) or where it was contracted (community- or hospital-acquired).

- **Bacterial Pneumonia:** The most common cause, with *Streptococcus pneumoniae* being the top pathogen. It can occur on its own or after a viral cold or flu.
- **Viral Pneumonia:** Caused by viruses like influenza, respiratory syncytial virus (RSV), and SARS-CoV-2 (COVID-19).
- **Mycoplasma Pneumonia ("Walking Pneumonia"):** A milder bacterial infection often affecting school-aged children and young adults, allowing them to continue daily activities.
- **Fungal Pneumonia:** Occurs mostly in individuals with severely weakened immune systems (e.g., HIV/AIDS or chemotherapy patients).
- **Aspiration Pneumonia:** Occurs when bacteria from food, liquid, vomit, or saliva are inhaled into the lungs.
- **Hospital-Acquired Pneumonia (HAP):** Acquired 48 hours or more after hospital admission, often caused by drug-resistant bacteria.

2.11.2 SYMPTOMS

Symptoms can develop slowly or suddenly and include:

- **Cough:** Productive, often producing green, yellow, or bloody phlegm (sputum).
- **Fever:** Often with shaking chills and heavy sweating.
- **Respiratory Distress:** Shortness of breath or rapid breathing, often accompanied by stabbing chest pain that worsens with deep breaths.
- **Systemic Symptoms:** Fatigue, loss of appetite, and nausea or vomiting.

- **Older Adults:** May present with fewer symptoms, lower-than-normal temperature, or sudden confusion.
- **Babies:** May show irritability, restlessness, or lack of energy.
- Diagnosis
- Healthcare providers diagnose pneumonia through:
- **Physical Exam:** Listening for crackling, bubbling, or rumbling sounds in the lungs with a stethoscope.
- **Chest X-ray:** Confirms the presence, location, and extent of inflammation.
- **Pulse Oximetry:** Measures oxygen saturation in the blood.
- **Laboratory Tests:** Blood tests (to look for infection), sputum tests (to identify the germ), and sometimes CT scans.

2.11.3 TREATMENT

Treatment depends on the cause and severity of the pneumonia:

- **Bacterial:** Treated with antibiotics. It is vital to finish the entire course, even if symptoms improve.
- **Viral:** Antibiotics do not treat viruses. Treatment focuses on rest, fluids, and antiviral medication if necessary.
- **Fungal:** Treated with antifungal medication.
- **Supportive Care:** OTC medications to reduce fever (Tylenol/ibuprofen), cough medicine, and oxygen therapy in severe cases.

2.11.4 RISK FACTORS AND PREVENTION

While anyone can get pneumonia, high-risk groups include children under 2, adults over 65, and those with chronic diseases (asthma, COPD, diabetes) or smoking habits.

- **Prevention:** Vaccination is the primary preventive measure (pneumococcal vaccine, flu shot, COVID-19 vaccine).
- **Hygiene:** Frequent handwashing and avoiding close contact with sick people help prevent the spread of infection.

2.11.5 COMPLICATIONS

Untreated or severe pneumonia can lead to serious conditions:

- **Bacteremia/Sepsis:** Bacteria spread from the lungs to the bloodstream, causing septic shock and organ failure.
- **Lung Abscess:** Pockets of pus in the lungs, which may require drainage.
- **Pleural Effusion:** Fluid buildup around the lungs, which can become infected.
- **Respiratory Failure:** The inability of the lungs to oxygenate the blood, requiring a ventilator.

2.12. HYPERTENSION

Hypertension, or high blood pressure, is a chronic medical condition characterized by persistently elevated force of blood against the arterial walls. Often termed the "silent killer," it frequently causes no symptoms while gradually damaging the heart, brain, and kidneys. It is the leading global risk factor for cardiovascular disease-related death.

2.12.1 CLASSIFICATION

Blood pressure is recorded using two numbers: **Systolic** (pressure when the heart beats) and **Diastolic** (pressure when the heart rests).

- **Normal:** Less than 120/80 mmHg.
- **Elevated:** 120–129 systolic and <80 diastolic.
- **Stage 1 Hypertension:** 130–139 systolic or 80–89 diastolic.
- **Stage 2 Hypertension:** $\ge$140 systolic or $\ge$90 diastolic.
- **Hypertensive Crisis:** >180 systolic and/or >120 diastolic.

2.12.2 TYPES OF HYPERTENSION

1. **Primary (Essential) Hypertension:** The most common form (90-95% of cases), it has no single identifiable cause but is linked to genetics, aging, and lifestyle factors.
2. **Secondary Hypertension:** Caused by an underlying condition (e.g., kidney disease, thyroid disorders, apnea) or medications, it often appears suddenly.
3. **Resistant Hypertension:** Blood pressure remains high despite using three or more different classes of medications.
4. **White Coat Hypertension:** High readings in a clinic, but normal at home.
5. **Masked Hypertension:** Normal readings in a clinic, but high at home.

2.12.3 CAUSES AND RISK FACTORS

- **Unmodifiable Risk Factors:** Family history (genetics), aging (arteries stiffen), and race (higher prevalence in Black adults).

- **Modifiable Risk Factors:** High salt intake, obesity, lack of physical activity, smoking, excess alcohol, and high stress levels.
- **Secondary Causes:** Chronic kidney disease, sleep apnea, adrenal gland tumors, and medications such as decongestants or birth control pills.

2.12.4 SYMPTOMS AND COMPLICATIONS

Hypertension is usually asymptomatic until it causes significant damage. Severe hypertension (crisis) may cause headaches, nosebleeds, vision changes, and dizziness. Long-term untreated, it can lead to:

- **Heart Attack/Heart Failure:** Thickening and weakening of the heart muscle.
- **Stroke:** Blocked or burst arteries in the brain.
- **Kidney Failure:** Damage to the blood vessels in the kidneys.
- **Vision Loss:** Damage to the blood vessels in the eyes.
- **Dementia/Cognitive Decline:** Reduced blood flow to the brain.

2.12.5 DIAGNOSIS

Diagnosis is based on an average of two or more readings taken on separate occasions.

- **Office Reading:** Validated by a professional.
- **Ambulatory/Home Monitoring (HBPM):** Often preferred to exclude white coat hypertension and to measure blood pressure during normal activity, including sleep.
- Management and Treatment
- Treatment aims to reduce blood pressure to <130/80 mmHg, depending on overall cardiovascular risk.
- **Lifestyle Changes (First-Line):**
    - **Diet:** Adopt the DASH diet (high in vegetables, fruits, low-fat dairy) and limit sodium to <1,500mg daily.
    - **Exercise:** 150 minutes of moderate-intensity aerobic exercise per week.

- **Weight Loss:** Maintaining a healthy body weight.
- **Habits:** Quit smoking and limit alcohol consumption.

- **Medication:** Common types include ACE inhibitors, Angiotensin II receptor blockers (ARBs), Calcium channel blockers, and Diuretics.
- **Emergency Care:** A hypertensive emergency (180/120+ with symptoms) requires immediate medical attention.

2.13 DIABETES MELLITUS

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by consistently high blood glucose levels (hyperglycemia). This condition results from the body's inability to produce enough insulin or to effectively use the insulin it makes. Insulin is a vital hormone produced by the pancreas that acts as a "key" to allow glucose from food to enter cells and produce energy. When this mechanism fails, glucose builds up in the bloodstream, leading to serious, long-term health complications if left untreated.

2.13.1 TYPES OF DIABETES MELLITUS

There are several types of diabetes, each with distinct causes:

- **Type 1 Diabetes:** An autoimmune disease where the immune system attacks and destroys insulin-producing cells (beta cells) in the pancreas. It generally develops in children or young adults, though it can appear at any age. It requires lifelong insulin therapy.
- **Type 2 Diabetes:** The most common form (90–95% of cases), characterized by insulin resistance, where cells do not respond properly to insulin. It is often associated with obesity, sedentary lifestyle, and genetics.
- **Gestational Diabetes:** Develops during pregnancy due to hormonal changes that cause insulin resistance. It usually resolves after childbirth but increases the risk of developing Type 2 diabetes later in life.
- **Prediabetes:** A warning stage where blood glucose levels are higher than normal, but not yet high enough for a Type 2 diagnosis. It is reversible with lifestyle changes.
- **Other Specific Types:** Including Monogenic diabetes (inherited genetic mutation) and Type 3c diabetes (caused by pancreatic damage from pancreatitis or surgery).

2.13.2 SYMPTOMS

Symptoms of diabetes mellitus can develop quickly in Type 1 and gradually in Type 2. Common signs include:

- **Polyuria:** Frequent urination (due to kidneys trying to remove excess sugar).
- **Polydipsia:** Excessive thirst.
- **Polyphagia:** Increased hunger (even after eating).
- **Unexplained weight loss** (more common in Type 1).
- **Fatigue and weakness.**
- **Blurred vision.**
- **Slow-healing wounds or sores.**
- **Tingling or numbness in feet/hands** (nerve damage).
- Causes and Risk Factors
- **Genetics/Family History:** A strong risk factor for Type 2 and to a lesser extent, Type 1.
- **Obesity:** Especially excess abdominal fat, which contributes to insulin resistance.
- **Sedentary Lifestyle:** Lack of physical activity reduces insulin sensitivity.
- **Unhealthy Diet:** High intake of processed foods and sugary beverages.
- **Autoimmune Reaction:** The underlying cause for Type 1.

2.13.3 DIAGNOSIS

Diabetes is diagnosed through blood tests that measure glucose levels:

- **Fasting Blood Sugar (FBS):** 126 mg/dL or higher indicates diabetes.
- **Random Blood Sugar Test:** 200 mg/dL or higher suggests diabetes.
- **HbA1c Test:** Measures average blood sugar over 2–3 months; 6.5% or higher indicates diabetes.

2.13.4 COMPLICATIONS

Uncontrolled diabetes can cause severe damage to various organs and tissues:

- **Cardiovascular Disease:** High risk of heart attack, stroke, and atherosclerosis.

- **Neuropathy (Nerve Damage):** Causes numbness, pain, or tingling, particularly in the feet, leading to high amputation risk.
- **Nephropathy (Kidney Damage):** Can lead to kidney failure and the need for dialysis.
- **Retinopathy (Eye Damage):** Can cause blindness.
- **Diabetic Ketoacidosis (DKA):** A dangerous, high-acid condition common in Type 1, requiring immediate care.

2.13.5 MANAGEMENT AND TREATMENT

While there is no cure, diabetes can be managed with:

- **Lifestyle Changes:** A balanced, healthy diet and regular physical activity (at least 150 minutes a week).
- **Blood Sugar Monitoring:** Frequent checks to keep levels within a target range.
- **Medication:**
  - **Type 1:** Daily insulin injections or pump.
  - **Type 2:** Oral medications (like Metformin) to improve insulin sensitivity, sometimes supplemented with insulin.

2.13.6. PREVENTION

- **Type 1:** Cannot be prevented.
- **Type 2:** Largely preventable or delayable by maintaining a healthy weight, eating nutritious food, exercising regularly, and not smoking.

2.14. CANCER

Cancer is a broad term for a large group of diseases—more than 200 different types—characterized by the uncontrolled growth and spread of abnormal cells in the body. Unlike normal cells, which grow, divide, and die in a regulated manner, cancer cells ignore signals to stop dividing or to die (apoptosis). These abnormal cells can form masses called tumors, or in the case of blood cancers like leukemia, circulate and interfere with normal blood cell function.

2.14.1. HOW CANCER DEVELOPS

Cancer is fundamentally a genetic disease—it is caused by changes (mutations) to the DNA within cells that control how they grow and divide.

- **Genetic Mutations:** These mutations can be inherited from parents or, more commonly, acquired during a person's lifetime due to errors in cell division or damage to DNA caused by environmental exposures.
- **Tumor Suppressor Genes:** When these genes are damaged, they fail to stop uncontrolled cell growth.
- **Oncogenes:** These genes turn on when they shouldn't, telling cells to divide rapidly.
- **Metastasis:** A key feature of malignant (cancerous) tumors is their ability to break away from the original tumor, travel through the blood or lymphatic system, and form new tumors in other organs.

2.14.2. MAIN TYPES OF CANCER

Cancers are typically named based on where they start (the primary site) and the type of tissue they affect.

- **Carcinoma:** The most common type, originating in the epithelial cells that line the skin or internal organs (e.g., lung, breast, prostate, colon).
- **Sarcoma:** Develops in bone, cartilage, fat, muscle, blood vessels, or other connective or supportive tissue.

- **Leukemia:** Cancer that begins in the blood-forming tissue of the bone marrow, causing high numbers of abnormal white blood cells to enter the blood.
- **Lymphoma & Myeloma:** Cancers that start in the immune system, specifically in lymphocytes or plasma cells.

2.14.3. CAUSES AND RISK FACTORS

While not all cancers have a clear cause, many are linked to avoidable risk factors, with 30% to 50% of cancer deaths potentially preventable.

- **Tobacco Use:** Smoking is the single largest risk factor, responsible for roughly 1 in 5 cancer deaths globally.
- **Lifestyle Factors:** High alcohol consumption, poor diet (high in red/processed meat, low in fruits/vegetables), obesity, and lack of physical activity.
- **Environmental Factors:** Exposure to UV radiation (sunlight/tanning beds), chemical carcinogens (asbestos, benzene), and ionizing radiation (radon, X-rays).
- **Infections:** Certain viruses and bacteria, such as Human Papillomavirus (HPV) (linked to cervical cancer) and Hepatitis B or C (linked to liver cancer).
- **Age:** The risk increases with age, as damage to DNA accumulates over time.

2.14.4. SYMPTOMS OF CANCER

Cancer is sometimes called a "great imitator" because its symptoms often mimic other, less serious conditions. General signs include:

- Unexplained, significant weight loss.
- Persistent fatigue that does not improve with rest.
- Lumps or areas of thickening under the skin.
- Changes in skin color or moles (yellowing, darkening, new moles).
- Chronic cough, hoarseness, or difficulty swallowing.
- Persistent fever or night sweats.

- Unusual bleeding or bruising.

2.14.5. DIAGNOSIS AND STAGING

- **Diagnosis:** Doctors use imaging (CT scan, MRI, PET scan), lab tests (blood/urine tests), and biopsies (removing a small tissue sample for examination under a microscope) to confirm cancer.
- **Staging (TNM System):** This determines how far the cancer has spread.
- **T (Tumor):** Size of the primary tumor.
- **N (Node):** Whether it has spread to lymph nodes.
- **M (Metastasis):** Whether it has spread to other parts of the body.
- Stages range from 0 (earliest) to IV (metastatic/advanced).

2.14.6. TREATMENT APPROACHES

Cancer treatment is often a combination of approaches, tailored to the specific type and stage.

- **Surgery:** Physically removing the tumor.
- **Chemotherapy:** Using drugs to kill fast-growing cancer cells throughout the body.
- **Radiation Therapy:** Using high-energy rays to kill cancer cells in a specific area.
- **Immunotherapy:** Boosting the body's natural immune system to fight the cancer.
- **Targeted Therapy:** Drugs that target specific molecular changes in cancer cells.
- **Hormone Therapy:** Blocking the hormones that some cancers (e.g., breast, prostate) need to grow.

2.15. DRUG ADDICTION- DRUG ABUSE

Drug abuse and addiction are serious, intertwined problems affecting public health globally. While often used interchangeably, they represent different stages of substance use disorders.

- **Drug Abuse (Substance Misuse):** Refers to the use of illegal drugs or the inappropriate use of legal drugs (prescription or over-the-counter) in excessive amounts, or for purposes other than those intended. It is characterized by willful, though reckless, misuse, often with the ability to stop voluntarily initially.

- **Drug Addiction (Substance Use Disorder - SUD):** A chronic, relapsing brain disease characterized by compulsive drug seeking and use despite devastating, adverse consequences. It is marked by a physical and psychological need to take the substance, where the ability to self-control is compromised.

2.15.1 CAUSES AND RISK FACTORS

No single factor determines whether a person will become addicted. It is usually a combination of factors:

- **Environmental Factors:** Unhappy home life, lack of parental supervision, peer pressure, and easy accessibility of drugs.
- **Genetics:** Heredity accounts for 40-60% of an individual's vulnerability to addiction.
- **Developmental Stage:** Early use (during adolescence) is a strong indicator of future addiction because the brain is still developing.
- **Mental Health Disorders:** Individuals with untreated depression, anxiety, or ADHD may use drugs to self-medicate.

2.15.2. PHYSICAL AND MENTAL EFFECTS

Drugs change the brain's reward system (releasing high levels of dopamine), making them harder to resist over time.

National Institute on Drug Abuse (NIDA) (.gov)

- **Brain Changes:** Loss of rational decision-making, poor judgment, memory loss, and loss of self-control.
- **Physical Effects:** Cardiovascular diseases (heart attacks), liver/kidney damage, infections (HIV/AIDS or Hepatitis C from shared needles), and death from overdose.

- **Behavioral/Social Effects:** Strained relationships, financial ruin, legal troubles, and abandonment of responsibilities.

2.15.3. SIGNS AND SYMPTOMS

Signs vary by substance but generally include:

- Intense urges to use drugs daily or multiple times a day.
- **Tolerance:** Needing more of the drug to get the same high.
- **Withdrawal Symptoms:** Feeling sick, anxious, shaky, or having cravings when not using.
- Neglecting appearance and hygiene.
- Secretive behavior, stealing, or lying to maintain the drug supply.

2.15.4. TREATMENT AND RECOVERY

Drug addiction is treatable. Successful treatment often involves a combination of methods, rather than willpower alone.

- **Detoxification:** Medically supervised stopping of drug use to manage withdrawal symptoms safely.
- **Behavioral Therapy:** Individual, family, or group counseling (e.g., Cognitive Behavioral Therapy) to identify triggers and learn coping mechanisms.
- **Medication-Assisted Treatment (MAT):** Medicines used to help with cravings and re-establish normal brain function.
- **Support Groups:** Programs like Narcotics Anonymous (NA) provide a community to support long-term recovery.

2.15.5. PREVENTION

Prevention programmes are essential and should focus on educating youth about the risks.

- **Family Bonding:** Strong, supportive relationships at home reduce the risk of youth drug use.
- **Peer Refusal Skills:** Teaching young people to resist peer pressure.
- **Education:** Creating awareness about the lasting physical and mental impacts of drug abuse.