

Infectious diseases remain a major global health concern, affecting millions of individuals every year. They are caused by microorganisms such as bacteria, viruses, fungi, and parasites, each capable of triggering a wide range of clinical symptoms. The severity of infectious illnesses varies widely and depends on the organism involved, the host's immune response, environmental factors, and access to treatment. Over the past few decades, several infectious conditions have emerged or re-emerged due to changing travel patterns, antimicrobial resistance, and ecological shifts. Understanding the biology, transmission, and prevention of these diseases plays a vital role in controlling outbreaks and improving patient outcomes.

**Tuberculosis (TB)** is one of the oldest known infectious diseases and continues to be a leading cause of mortality in many low- and middle-income countries. It is caused by *Mycobacterium tuberculosis*, a slow-growing bacterium that primarily affects the lungs but can involve almost any organ system. TB spreads through airborne droplets when an infected person coughs or sneezes. Symptoms may include persistent cough, fever, night sweats, weight loss, and fatigue. Some individuals develop latent TB infection, where the bacteria remain dormant without symptoms. Effective management requires long-term antibiotic therapy, and poor adherence to treatment has contributed to drug-resistant strains.

**Malaria** is another major infectious disease, caused by *Plasmodium* parasites transmitted through the bites of infected *Anopheles* mosquitoes. Unlike TB, which spreads from person to person, malaria requires a mosquito vector. It commonly presents with cycles of fever, chills, headache, and muscle pain. Severe cases can lead to organ failure, anemia, or cerebral malaria. Prevention typically involves mosquito control measures, insect-treated nets, and antimalarial medications. Although global incidence has decreased due to public health interventions, malaria remains endemic in parts of Africa, Asia, and South America.

**Influenza** is a highly contagious viral illness that appears annually in outbreaks of varying intensity. It is caused by influenza A and B viruses, which mutate frequently, making new strains appear regularly. Symptoms include abrupt onset of fever, cough, sore throat, body aches, and fatigue. Although many individuals recover within a week, the flu can lead to serious complications in the elderly, young children, and those with chronic illnesses. Seasonal vaccination remains the most effective method of prevention.

**Dengue fever** is a mosquito-borne viral disease affecting tropical and subtropical regions. It is caused by the dengue virus, which has four distinct serotypes. Infection leads to high fever, severe joint pain, rash, headache, and retro-orbital pain. In some cases, dengue can progress to severe dengue, characterized by plasma leakage, bleeding tendencies, and organ impairment. Since there is no specific antiviral treatment, supportive care and fluid management are crucial for recovery. Preventing mosquito breeding and minimizing exposure are essential strategies for reducing transmission.

**Hepatitis B** is a viral liver disease caused by the hepatitis B virus (HBV). It spreads through contact with infected blood or bodily fluids. The infection may be acute or chronic; chronic hepatitis B can lead to liver cirrhosis, hepatocellular carcinoma, or liver failure. Many individuals remain asymptomatic until significant liver damage has occurred. Vaccination is highly effective and remains the primary preventive measure worldwide. Antiviral medications help suppress viral replication in chronic cases, improving long-term outcomes.

**Sickle cell disease** is an inherited hemoglobin disorder caused by a mutation that alters the structure of red blood cells. Instead of maintaining a flexible disc shape, the cells become rigid and crescent-shaped. These sickled cells block blood vessels, leading to painful

crises, anemia, and organ complications. The condition is more common in individuals of African, Middle Eastern, and Mediterranean ancestry. Management focuses on preventing crises, treating infections early, and managing chronic complications. Hydroxyurea and, in some cases, bone marrow transplantation are significant therapeutic options. **Hemophilia** is another genetic disorder involving impaired blood clotting due to deficiency of clotting factors VIII or IX. Patients typically experience prolonged bleeding after injuries, spontaneous internal bleeding, and frequent bruising. Severe cases may lead to joint damage due to repeated hemarthrosis. Treatment consists of replacement therapy using clotting factor concentrates and, more recently, gene therapy approaches aimed at providing long-term correction.

**Phenylketonuria (PKU)** is a metabolic disorder caused by a deficiency of the enzyme needed to break down phenylalanine. Without treatment, phenylalanine accumulates and leads to intellectual disability and neurological impairment. However, early diagnosis through newborn screening programs and strict dietary management enable individuals with PKU to lead normal, healthy lives.

Specialized low-protein diets and medical formulas help regulate phenylalanine levels. Autoimmune diseases occur when the immune system mistakenly attacks the body's own cells and tissues. These conditions often develop gradually and may involve multiple organs.

The exact causes remain unclear, but genetic, hormonal, and environmental factors play contributory roles. **Rheumatoid arthritis (RA)** is one of the most common autoimmune disorders. It primarily affects the joints, causing inflammation, stiffness, pain, and progressive joint deformity. RA can also involve the heart, lungs, and eyes. Early diagnosis and disease-modifying antirheumatic drugs (DMARDs) such as methotrexate can slow disease progression. Biologic agents targeting specific immune pathways have also revolutionized RA therapy.

**Systemic lupus erythematosus (SLE)** is a complex autoimmune disease that can affect the skin, joints, kidneys, nervous system, and blood cells. Symptoms vary widely and may include fatigue, rash, fever, joint pain, and photosensitivity. Severe lupus can result in kidney inflammation (lupus nephritis) or neurological complications. Treatment typically involves corticosteroids and immunosuppressive medications. **Multiple sclerosis (MS)** is an autoimmune disorder in which the immune system attacks the protective myelin sheath around nerve fibers in the central nervous system. This disrupts nerve transmission and leads to symptoms such as muscle weakness, vision problems, numbness, and difficulty with coordination.

Disease-modifying therapies help reduce relapses and slow progression. **Coronary artery disease (CAD)** is a leading cause of death worldwide. It occurs when plaque builds up in the coronary arteries, reducing blood flow to the heart. Symptoms may include chest discomfort, shortness of breath, and fatigue. Risk factors include high cholesterol, smoking, hypertension, diabetes, and obesity. Treatment includes lifestyle changes, medications, and interventional procedures such as angioplasty.

**Chronic bronchitis** is a long-term respiratory condition characterized by inflammation of the bronchial tubes and persistent productive cough. It is one of the two main forms of chronic obstructive pulmonary disease (COPD). The primary cause is long-term exposure to irritants such as cigarette smoke or air pollutants. Management focuses on reducing exposure, improving lung function, and preventing exacerbations.

**Pulmonary embolism (PE)** is a serious condition caused by a blood clot that travels to the lungs, blocking a pulmonary artery. Symptoms include sudden shortness of breath, chest pain, rapid heartbeat, and dizziness. PE may develop from deep vein thrombosis (DVT), and risk factors include immobility, surgery, cancer, and clotting disorders. Treatment involves anticoagulation to prevent

further clot formation. **Epilepsy** is a neurological disorder characterized by recurrent seizures due to abnormal electrical activity in the brain. Seizures vary from brief lapses in awareness to full-body convulsions. The condition affects people of all ages and has many possible causes, including brain injury, infections, genetic predisposition, or developmental abnormalities. Most patients respond well to antiepileptic drugs, though some require surgery or neurostimulation therapies. **Parkinson's disease** is a progressive neurological disorder caused by degeneration of dopamine-producing neurons in the brain. Symptoms include tremors, muscle rigidity, slowed movement, and balance problems. While there is no cure, medications such as levodopa improve symptoms significantly. Advanced therapies like deep-brain stimulation can be beneficial for certain individuals. **Celiac disease** is an autoimmune condition in which ingestion of gluten triggers an immune response that damages the small intestine. This leads to malabsorption, diarrhea, abdominal pain, weight loss, and nutrient deficiencies. The only effective treatment is lifelong adherence to a strict gluten-free diet. Early diagnosis prevents long-term complications such as osteoporosis or anemia.