HUMAN HEALTH AND DISEASES

1. Health

According to the World Health Organisation (WHO), health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity. Disease is defined as any disorder or hindrance that arises in normal functioning of the body and brain. Factors causing disease are called causative agents or pathogens or germs.

2. Diseases

These are caused by microorganisms like bacteria, virus, fungi, protozoans, etc., These can be classified as given below

A. **Congenital or Inherited Diseases** These are the diseases which are inherited from birth (from one generation to next), e.g. haemophilia, colour blindness, sickle-cell anaemia, etc.

B. **Acquired Diseases** These diseases develop after birth due to many factors like causative agent, deficiency of nutrients or hormones, etc., e.g. kwashiorkor, marasmus, night blindness, scurvy, cancer, addiction, arthritis, allergy, etc.

Acquired diseases are further classifed as

(i) **Infectious Diseases** (Communicable Diseases) These diseases can be transmitted from infected person to a healthy person, e.g. malaria, typhoid, cold, amoebiasis, AIDS, gonorrhoea, syphilis, hepatitis, etc.

(ii) **Non-Infectious Diseases** (Non-communicable Diseases) These diseases cannot be transmitted from person to person and are not caused by pathogens. They are caused by nutritional deficiency, malfunctioning of organs, etc., e.g. cancer, scurvy, etc.

3.Some Common Infectious Diseases in Humans

The infectious diseases are classified on the basis of pathogens involved, i.e. causative agents.

Some common diseases are given below

A. **Bacterial Diseases**

(i) Enteric fever or Typhoid is caused by bacterium Salmonella typhi. It enters the small intestine through contaminated food and water. Symptoms include fever (39-40°C), weakness, stomach pain, constipation, headache and loss of appetite. Widal test is used to diagnose typhoid fever.

(ii) Pneumonia The causative agents of pneumonia are Streptococcus pneumoniae and Haemophilus influenzae. Pneumonia infects the alveoli of the lungs due to which the alveoli get filled with fluid leading to breathing problems. Symptoms include fever, chills, cough with mucus and headache.

B. **Viral Diseases**

(i) **Common cold** is caused by rhinoviruses. These viruses majorly affect nose and respiratory tract but not the lungs. The infection is transmitted through droplets resulting from coughing or sneezing of an infected person. Symptoms include nasal congestion and discharge, sore throat, hoarseness, cough, headache, tiredness, etc.

(ii) **Chikungunya** is caused by chikungunya virus. It is transmitted by the bite of Aedes aegypti mosquito. Symptoms include sudden onset of fever, crippling joint pains, lymphodenopathy, etc. The fever is typically biphasic.

(iii) **Dengue** is caused by Flaviribo virus and transmitted by the bite of female Aedes and Culex mosquito. There is no proper treatment for dengue fever but analgesics are provided to reduce the effect of fever. Symptoms including high fever, headache, nausea, pain in joints and vomiting.

(iv) **AIDS** (Acquired Immuno Deficiency Syndrome) is a fatal disorder. It is caused by HIV (Human Immunodeficiency Virus) which is a member of group of viruses called retrovirus. It spreads from one person to other via body fluids.

- The patient becomes immunodeficient and cannot protect himself/herself from very common infections.
- HIV can be transmitted through sexual contact, sharing infected needles, transfusion of contaminated blood and from infected mother to foetus through placenta.
- HIV infection can be diagnosed by Enzyme Linked Immuno Sorbent Assay (ELISA), PCR (Polymerase Chain Reaction) and Western Blot.
- There is no treatment of HIV, use of antiviral drugs can only prolong the life of patient but cannot prevent death. Prevention and Control Some of the methods to prevent and control AIDS are as follows Blood banks should be screened for

HIV, use of disposable needles and syringes, use condoms during coitus and promote regular checkup for HIV.

C. Protozoan Diseases

(i) Malaria is caused by a protozoan, i.e. Plasmodium in the form of sporozoites. It has two hosts

(a) Primary host (for asexual cycle) is female Anopheles mosquito.

(b) Secondary host (for sexual cycle) is human. Different species of Plasmodium are P. ovale, P. falciparum, P. vivax and P. malariae.

- Haemozoin is released into blood during the infection of Plasmodium vivax at every 24 hours.
- Symptoms include shaking chills, headache, muscle pain, nausea, vomiting, diarrhoea and in severe cases anaemia and jaundice.

(ii) Amoebiasis (Amoebic Dysentery or Enteritis) This disease is caused by protozoan Entamoeba histolytica found in large intestine of human. This is a hostile parasite, whose infectious stage is trophozoid. It is transmitted by housefly. It transmits through the faecal-oral route. Symptoms include constipation, abdominal pain, cramps, stools with excess mucus and blood clots.

D. Helminthic Diseases

(i) **Ascariasis** This disease spreads by helminth parasite – Ascaris lumbricoides (unhostile), which is an intestinal parasite. It is transmitted through contaminated water, vegetables, fruits, etc. Symptoms include internal bleeding, muscular pain, fever, anaemia and blockage of intestinal passage.

(ii) **Filariasis** (Elephantiasis) This disease is caused by Wuchereria bancrofti and W. malayi. This is a digenetic parasite. Primary host is human and secondary host is female Culex fatigans mosquito. Symptoms include chronic inflammation that develops slowly when worms live for many years mostly in lymphatic vessels of the lower limbs. Genital organs are also affected.

E. Fungal Diseases

Ringworms are caused by fungi like Microsporum, Trichophyton and Epidermophyton. They are generally acquired by soil or by direct contact with contaminated articles used by infected person. Symptoms include dry scaly lesions on various parts of body such as skin, nails and scalp with intense itching.

4. Preventive Measures for Infectious Diseases

(i) **Personal Hygiene** Regular bathing, clean drinking water, clean food, etc.

(ii) **Public Hygiene** Proper disposal of waste and excreta, periodic cleaning and disinfection of water reservoirs, pools, etc.

(iii) **For vector borne diseases such as malaria** includes eradication of vectors and destroying their breeding sites by using mosquito nets and repellents, avoiding stagnation of water, introducing fishes like Gambusia in ponds that feeds on mosquito larvae and spraying of insecticides in open water bodies.

(iv) **For air-borne diseases** avoid direct contact with infected persons or their belongings.

(v) **Vaccination and immunisation** utilise the property of 'memory' of immune system. During vaccination, antigenic proteins or weakened pathogens are injected in the body, where they neutralise the causal agent. When immunisation is achieved by injecting preformed antibodies (e.g. snake bite), it is called **passive immunisation.**

5. Non-Infectious Diseases

(i) **Cancer** Cells show a property called contact inhibition by virtue of which contact with other cells stops its uncontrolled growth. Cancerous cells do not have this property due to which they continue to divide forming tumours or neoplasm.

(a) **Tumour** is a mass of cells formed due to the uncontrolled division of cells. These are of two types

- **Benign tumour** remain confined to its original location and does not spread in the entire body.
- **Malignant tumour** is the mass of proliferating cells, called neoplastic or tumour cells. These grow rapidly, invade and damage the surrounding normal cells.

(b) **Causes of Cancer** It is caused due to some agents called as carcinogens. These are as given below

- **Physical agents** include X-rays, γ-rays, UV-rays
- **Chemical agents** include tobacco smoke, benzene fumes, etc.

- **Biological agents** are cancer causing viruses called oncogenic viruses. These have genes called viral oncogenes. Other genes are called cellular oncogenes (c-onc) or proto-oncogenes.

(c) **Cancer Detection** It can be detected by following methods

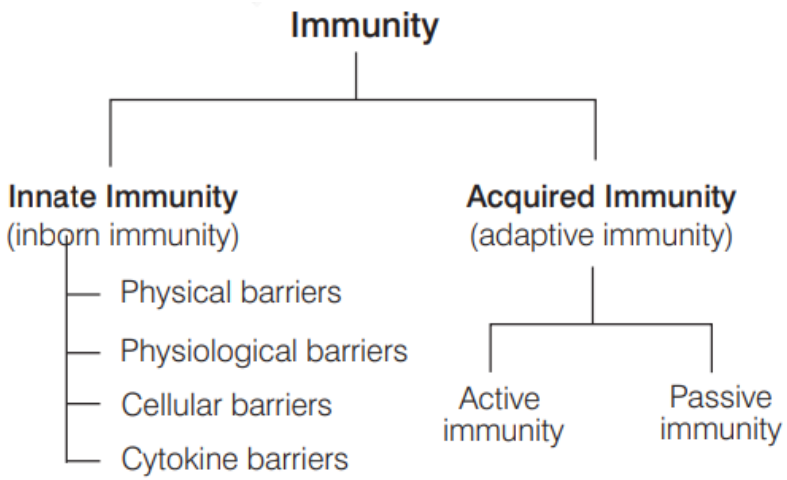
- Blood and bone marrow tests
- Biopsy
- Radiography
- Computed Tomography (CT) scan
- Magnetic Resonance Imaging (MRI)
- Monoclonal antibodies

(d) **Treatment of Cancer**The various methods involved in the treatment of cancer are given as

- Surgery
- Radiotherapy
- Chemotherapy

6. Immunity

It is the ability of the host to fight against the disease causing agents. It is of two types



Note • Interferon Small protein molecules synthesised in the body during viral infection are called interferons. They provide semi-specific protection to the body.

(i) **Innate immunity** refers to all defence elements with which an individual is born. It is non-specific.

(ii) **Acquired immunity** is pathogen specific immunity. It is not present from birth but develops during an individual's lifetime. It is further classified as

(a) **Active Immunity**It is the immunity developed by the body when exposed to the antigens which may be living or dead microbes or other proteins. Antibodies are produced by the body in this case. It may be artificial or natural.

(b) **Passive Immunity**It is the immunity bestowed by antibodies that are directly given to the body. It is fast but lasts only for few days. For example, antibodies (IgG) received by foetus from mother through placenta.

7. Immune Responses

Following are two major types of immune responses

(i) **Primary Response**It occurs when a body encounters a pathogen for the first time. It is of low intensity. After every primary response, cell memory stores the details of the encounter.

(ii) **Secondary/Anamnestic Response** Subsequent encounters with the same pathogen elicit secondary response.

It is highly intense and aided by the memory of the primary encounter. The primary and secondary responses are carried out with the help of T-lymphocytes and B-lymphocytes. The immune response mediated by B-lymphocytes is called humoral immune response, while the immune response mediated by T-lymphocytes is called Cell-Mediated Immunity (CMI).

8. Antigens and Antibodies

Antigens (immunogens) are substances which enter the body and stimulate the production of antibodies. These bind to antibody with the help of covalent bond. Antibodies are immunoglobulins (class of proteins) produced in response to antigenic stimulation. Different types of antibodies are IgG, IgA, IgM, IgE, IgD.

Note A vaccine is either a cell suspension or a byproduct excreted by the cell. The vaccines, when introduced into the body, stimulate the production of antibodies.

9. Allergies

The exaggerated or hypersensitive response of the immune system to certain agents present in the environment is called allergy and its causative agents are called allergens, e.g. dust, mites, pollens, animal dander (old skin scales which are constantly shed), etc. The antibodies produced in response to allergens are of IgE type.

10. Autoimmunity

It is the state where body loses the ability to distinguish between self and non-self cells. The body's immune system goes off the track and starts destroying self cells and molecules. This results in autoimmune diseases, e.g. rheumatoid arthritis, Addison's disease, Hashimoto's disease, etc.

11. Immune System in the Human Body

It consists of lymphoid organs, tissues, cells and antibodies.

(i) Primary lymphoid organs are bone marrow and thymus where immature lymphocytes differentiate and proliferate.

(ii) Secondary lymphoid organs are the sites for the interaction of lymphocytes with antigen, which then proliferate to become effector cells. These organs are spleen, lymph nodes and Mucosal Associated Lymphoid Tissue (MALT).

12. Adolescence

It refers to the period of rapid growth, physical and mental development from childhood to adulthood.

A. Some drugs which are commonly abused are

(i) **Opioids** are psychotropic drugs which can affect central nervous system and gastrointestinal tract, e.g. heroin, morphine.

(ii) **Cannabinoids** affect the cannabinoid receptors in brain, e.g. hemp, hashish, charas and ganja.

(iii) **Coca alkaloid or cocaine** (coke or crake) is obtained from Erythroxylum coca. It interferes with the transport of dopamine and produces a sense of euphoria and increased energy.

(iv) **Hallucinogens** are obtained from Atropa belladonna and Datura stramonium, e.g. Lysergic Acid Diethylamide (LSD) is obtained from Claviceps purpurea (fungus). They affect cerebrum and sense organs hence, also called psychedelic drugs.

(v) **Tobacco** is obtained from tobacco plant (Tabacum nicotiana) and has nicotine which stimulates adrenal gland.

B. **Effects of Drugs and Alcohol Abuse**The effects are as follows

(i) Behavioural changes unsocial attitude, lack of interest, insocial activities, violent, depression, withdrawal and isolation.

(ii) Lack of hygiene, appetite, weight loss, loss of interest in hobbies.

(iii) Drop in academic performance and absence from school and college.

(iv) Mental and financial crisis which leads to habit of stealing.

(v) Chronic damage to nervous system causes liver cirrhosis, cardiac problems and respiratory issues.

C. Prevention and Control

(i) Parents should understand their children.

(ii) Parents and teachers both should educate and counsel the child about the effects of drug abuses.

(iii) Affected person should seek professional help of psychologist, doctors and also go rehabilitation to get rid of problems.