HUMAN DISEASES

(Communicable diseases and non - communicable diseases)

Airborne Diseases:

Airborne diseases caused by virus				
Disease	**Causative Organism**	**Mode of Transmission**	**Tissue/ Organ Affected**	**Symptoms**
Common Cold	Rhino virus	Droplet infection	Upper respiratory tract (Inflammation of nasal chamber)	Fever, cough, running nose, sneezing and headache
Influenza	Myxovirus	Droplet Infection	Respiratory tract, (Inflammation of nasal mucosa, pharynx)	Fever, body pain, cough, sore throat, nasal discharge, respiratory congestion
Measles	Rubeola virus	Droplet infection, droplet nuclei and direct contact with infected person	Respiratory tract	Eruption of small red spots or rashes in skin, cough, sneezing, redness of eye (conjunctiva), pneumonia, bronchitis

Mumps	Myxovirus parotidis	Droplet infection, droplet nuclei and direct contact with infected person	Upper respiratory tract	Enlargement of parotid gland, movement of jaw becomes difficult
Chicken Pox	Varicella zoster virus	Droplet infection, droplet nuclei and direct contact with infected person	Respiratory tract	Eruptions of the skin, fever and uneasiness

Airborne diseases caused by bacteria

Disease	Causative Organism	Mode of Transmission	Tissue/ Organ Affected	Symptoms
Tuberculosis	Mycobacterium tuberculosis	Droplet infection from sputum of infected persons	Lungs	Persistent cough, chest pain, loss of weight and appetite
Diphtheria	Cornyebacterium diphtheriae	Droplet infection, droplet nuclei	Upper Respiratory tract (nose,	Fever, sore throat, choking of air passage

			throat)	
Whooping Cough	Bordetalla pertussis	Droplet infection, direct contact with infected person	Respiratory tract	Mild fever, severe cough ending in whoop (loud crowing inspiration)

Waterborne Diseases:

Waterborne diseases caused by virus

Disease	Causative Organism	Mode of Transmission	Tissue/Organ Affected	Symptoms	Preventive and Control Measures
Poliomyelitis	Polio virus	Droplet infection, sputum discharge, secretion from nose, throat, contaminated water, food and milk	Central nervous system	Paralysis of limbs	Salk's vaccine or Oral Polio Vaccine (OPV) is administered
Hepatitis A or Infectious Hepatitis	Hepatitis A virus (HAV)	Contaminated water, food and oral route	Inflammation of liver	Nausea, anorexia, acute fever and jaundice	Prevention of food contamination, drinking chlorinated boiled water, personal

					hygiene
Acute Diarrhoea	Rotavirus	Contaminated water, food and oral route	Intestine	Vomiting, fever, watery stools with mucus	Proper sanitation and hygiene

Waterborne diseases caused by bacteria

Disease	Causative Organism	Mode of Transmission	Tissue/ Organ Affected	Symptoms	Preventive and Control Measures
Cholera (Acute diarrhoeal disease)	Vibrio cholerae	Contaminated food, water, oral route and through houseflies	Intestinal tract	Acute diarrhoea with rice watery stools, vomiting, muscular cramps, nausea and dehydration	Hygienic sanitary condition, intake of Oral Rehydration Solution (ORS)
Typhoid (Enteric fever)	Salmonella typhi	Food and water contaminated with faeces of infected person and through houseflies	Small intestine	High fever, weakness, abdominal pain, headache, loss of appetite, rashes on chest and upper abdomen	Preventing contamination of food by flies and dust, improvement of basic sanitation, treatment with antibiotic drugs

Vector Borne Diseases:

Vector is an agent that acts as an intermediate carrier of the pathogen. Many insects and animals act as vectors. Diseases transmitted by vectors are called vector borne diseases. These vectors can transfer infecting agents from an infected person to another healthy person. Some of the insect vector borne diseases are Malaria, Filaria, Chikungunya, Dengue, and the diseases which are transmitted through animals are Bird flu and Swine flu.

1. Malaria

Malaria continues to be one of the major health problems of developing countries. Malaria is caused by protozoan parasite Plasmodium. Four species of Plasmodium namely, P.vivax, P.malariae, P.falciparum and P.ovale cause malaria. Malaria caused by Plasmodium falciparum is malignant and fatal. Approximately 300 million people around the world get infected with Malaria every year.

It spreads through the bite of an insect vector, the female Anopheles mosquito which feeds on human blood and usually lasts less than 10 days. A person affected by malaria will show symptoms of headache, nausea, muscular pain, chillness and shivering, followed by rapid rise in temperature. Fever subsides with profuse sweating. Use of Quinine drugs kills the stages of malaria parasite.

2. Chikungunya

Chikungunya is caused by virus. It is transmitted in humans by the bite of infected Aedes aegypti mosquito during the day time. It causes severe and persistent joint pain, body rashes, headache and fever. Joint pains can last for a very long time.

Incubation period of the virus is usually 2-12 days. Chillness, high fever, vomiting, nausea, headache, persistent joint pain and difficulty in walking are the common symptoms associated with this disease. The joints get inflamed and the person finds it difficult to walk. Paracetamol is given to relieve pain and reduce fever.

3. Dengue

Dengue is known as break bone fever. The name break bone fever was given due to the cause of intense joint and muscle pain. Dengue fever is caused by virus. It is transmitted by Aedes aegypti mosquito.

Incubation period of the virus is usually 5-6 days. Onset of high fever, severe headache, muscle and joint pain, rashes, haemorrhage, fall in blood platelet count are the symptoms associated with this disease. Vomiting and abdominal pain, difficulty in breathing, minute spots on the skin signifying bleeding within the skin are also associated with dengue fever. Paracetamol is given to reduce fever and body ache. Complete rest and increased intake of fluid is essential.

4 Filaria

Filariasis is a major health problem in India. This disease is caused by nematode worm Wuchereria bancrofti. The adult worms are usually found in the lymphatic system of man. It is transmitted by the bite of infected Culex mosquito.

Incubation period of filarial worm is 8-16 months and the symptoms include acute infection, fever and inflammation in lymph glands. In chronic infection the main feature is elephantiasis which affects the legs, scrotum and the arms.

Mosquitoes - Prevention and Control:

1. Prevention of mosquito bites by using mosquito nets, mosquito screens, mosquito repellents and ointments.
2. Elimination of breeding places by providing adequate sanitation, underground waste water disposable system and drainage of stagnant water.
3. Collection of water in any uncovered container such as water tank, pots, flower pots, discarded tyres should be avoided.
4. Control of mosquito larvae by spraying oil on stagnated water bodies.
5. Adult mosquitoes can be killed by spraying insecticides.
6. Application of citronella oil or eucalyptus oil on the exposed skin.

Diseases Transmitted by Animals:

i. Swine Flu

Swine Flu first originated from pigs. It is caused by virus that affects pigs and has started infecting humans. The virus spreads through air. It affects the respiratory system.

Influeuza virus H1N1 has been identified as the cause of this disease. It is transmitted from person to person by inhalation or ingestion of droplets containing virus from people sneezing or coughing. Fever, cough, nasal secretion, fatigue, headache, sore throat, rashes in the body, body ache or pain, chills, nausea, vomiting and diarrhoea, and shortness of breath are the symptoms associated with the disease.

Prevention and Control:

Administration of nasal spray vaccine.

Avoiding close contact with a person suffering from flu.

Intake of water and fruit juices will help prevent dehydration.

Plenty of rest will help the body to fight infection.

Always wash hands and practice good hygiene.

ii. Avian Influenza

Avian influenza is a contagious bird disease caused by viruses. Birds that can carry and spread avian influenza virus include poultry (chickens, turkeys or ducks), wild birds and pet birds.

It is caused by Influenza Virus H5N1. The incubation period of the virus is 2-7 days. People who have close contact with infected birds or surfaces that have been contaminated by the bird's secretion from mouth, eyes, mucus, nasal secretion or droppings (bird faeces) transmit this disease.

Fever, cough, sore throat, running nose, muscle and body aches, fatigue, headache, redness of eyes (conjunctivitis) and difficulty in breathing are the symptoms of this disease.

Prevention and Control:

Avoiding open air markets where infected birds are sold.

Avoiding contact with infected birds or consumption of infected poultry.

Proper cleaning and cooking of poultry.

Sexually Transmitted Diseases:

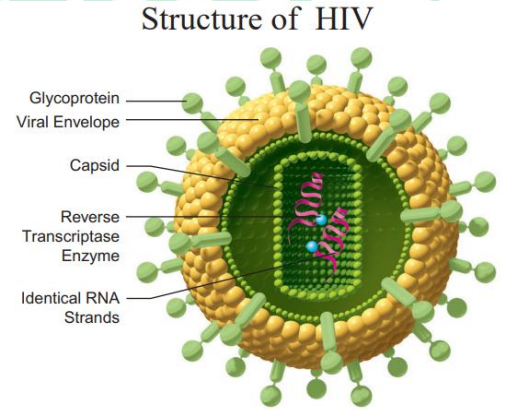
Some pathogens are transmitted by sexual contact from one partner to another and not by casual physical contact. A few sexually transmitted diseases are AIDS, Gonorrhea, Genital warts, Genital herpes and Syphilis.

i. AIDS

Acquired Immunodeficiency Syndrome (AIDS) is caused by retrovirus (RNA virus) known as Human Immunodeficiency Virus (HIV). The virus attacks the white blood cells or lymphocytes and weakens the body's immunity or self defence mechanism.

It is transmitted through sexual contact (from infected person to a healthy person), blood contact (transfusion of unscreened blood), by surgical equipments (infected needles and syringes), maternal – foetal transmission (from infected mother to the foetus).

Weight loss, prolonged fever, sweating at night, chronic diarrhoea are some of the important symptoms.



Prevention and Control:

1. Disposable syringes and needles should be used.
2. Protected and safe sexual contact.
3. Screening of blood before blood transfusion.
4. Avoid sharing shaving blades/razors.

5. People should be educated about AIDS transmission.

ii. Hepatitis -B or Serum Hepatitis

It occurs due to infection of hepatitis-B virus (HBV). The virus damages the liver cells causing acute inflammation and cirrhosis of liver. It is transferred from infected mother to their babies or by sexual contact. It is also transmitted by contact with infected person's secretions such as saliva, sweat, tears, breast milk and blood.

Symptoms observed are fever, loss of appetite, nausea vomiting, yellowness of eyes and skin, light coloured stools, itching of skin, headache and joint pain.

Prevention and Control:

1. Screening of blood donors before blood donation can prevent the transmission.
2. Injection of drugs to be prevented.
3. Having safe and protected sex.
4. Sharing of razors should be avoided.
5. The hepatitis B vaccine offers excellent protection against HBV. The vaccine is safe and highly effective.

Sexually transmitted diseases					
Infectious agent	**Disease**	**Causative Organism**	**Mode of Transmission**	**Tissue/ Organ Affected**	**Symptoms**
Bacteria	Gonorrhoea	Neisseria gonorrhoea	Sexual contact	Urethra is affected	Discharge from genital openings, pain during urination

	Syphilis	Treponema pallidum	Sexual contact	Minute abrasion on the skin or mucosa, of genital area	Ulceration on genitals, skin eruption
Virus	Genital Herpes	Herpes Simplex Virus	Sexual contact, entry through mucous membrane of genital region	Genital organs of male and female individuals	Painful blisters in mouth, lips, face and genital region
	Genital Warts	Human Papilloma virus	Sexual contact (skin to skin)	Genital areas of male and female individuals	Vaginal discharge, itching, bleeding and burning

Immunization

Immunization is a process of developing resistance to infections by administration of antigens or antibodies. Inoculation of vaccines into the body to prevent diseases is called as vaccination.

One effective way of controlling the spread of infection is to strengthen the host defenses. This is accomplished by immunization, which is one of the cost effective weapon of modern medicine.

When a large proportion of a community is immunized against a disease, the rest of the people in the community are benefited because the disease does not spread.

Vaccines and its Types:

Vaccines are preparation of living or killed microorganisms or their products used for prevention or treatment of diseases. Vaccines are of two types: Live vaccines and Killed vaccines

1. Live Vaccines: They are prepared from living organisms. The pathogen is weakened and administered. e.g. BCG vaccine, oral polio vaccine.

2. Killed Vaccines: Micro organisms (bacteria or virus) killed by heat or chemicals are called killed or inactivated vaccines. They require a primary dose followed by a subsequent booster dose. e.g. Typhoid vaccine, cholera vaccine, pertussis vaccine.

Fungal diseases:

Fungi was recognized as a causative agent of human diseases much earlier than bacteria. Dermatomycosis is a cutaneous infection caused by fungi belonging to the genera Trichophyton, Microsporum and Epidermophyton.

Ringworm is one of the most common fungal disease in humans. Appearance of dry, scaly lesions on the skin, nails and scalp are the main symptoms of the disease. Heat and moisture help these fungi to grow and makes them to thrive in skin folds such as those in the groin or between the toes. Ringworms of the feet is known as Athlete's foot caused by Tinea pedis. Ringworms are generally acquired from soil or by using clothes, towels and comb used by infected persons.

Helminthic diseases:

Helminthes are mostly endoparasitic in the gut and blood of human beings and cause diseases called helminthiasis. The two most prevalent helminthic diseases are Ascariasis and Filariasis.

Ascaris is a monogenic parasite and exhibits sexual dimorphism. Ascariasis is a disease caused by the intestinal endoparasite Ascaris lumbricoides commonly called the round worms. It is transmitted through ingestion of embryonated eggs through contaminated food and water. Children playing in contaminated soils are also prone to have a chance of transfer of eggs from hand to mouth. The symptoms of the disease are abdominal pain, vomiting, headache, anaemia, irritability and

diarrhoea. A heavy infection can cause nutritional defi ciency and severe abdominal pain and causes stunted growth in children. It may also cause enteritis, hepatitis and bronchitis.

Filariasis is caused by Wuchereria bancroft i, commonly called fi larial worm. It is found in the lymph vessels and lymph nodes of man. Wuchereria bancroft i is sexually dimorphic, viviparous and digenic. Th e life cycle is completed in two hosts, man and the female Culex mosquito. Th e female fi larial worm gives rise to juveniles called microfi lariae larvae. In the lymph glands, the juveniles develop into adults. Th e accumulation of the worms block the lymphatic system resulting in infl ammation of the lymph nodes.

In some cases, the obstruction of lymph vessels causes elephantiasis or fi lariasis of the limbs, scrotum and mammary glands.

Diseases and Disorders due to Lifestyle Modifications:

Diseases are prevalent in our society due to our improper way of living, conditions of stress and strain. These diseases are non-communicable and affect the person who are suffering from particular symptoms. It is an impairment of the body tissue or organ, disturbances in metabolic function which require modification of an individual's normal life.

Diabetes Mellitus:

Diabetes mellitus is a chronic metabolic disorder. In Greek (Diabetes – running through; mellitus- sweet). It is characterised by increased blood glucose level due to insufficient, deficient or failure of insulin secretion. This is the most common pancreatic endocrine disorder. The incidence of Type-1 and Type-2 diabetes is increasing worldwide.

Type-1 Insulin Dependent Diabetes Mellitus (IDDM):

IDDM accounts for 10 to 20% of the known diabetics. The condition also occurs in children (juvenile onset diabetes) and young adults, the onset is usually sudden and can be life threatening. This is caused by the destruction of β-cells of the pancreas.

It is characterized by abnormally elevated blood glucose levels (hyperglycemia) resulting from inadequate insulin secretion.

Causes: Genetic inheritance and environmental factors (infections due to virus, acute stress) are the cause for this condition.

Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM):

This is also called as adult onset diabetes and accounting for 80 to 90% of the diabetic population. It develops slowly, usually milder and more stable. Insulin production by the pancreas is normal but its action is impaired. The target cells do not respond to insulin. It does not allow the movement of glucose into cells.

Causes: The causes are multifactorial which include increasing age (affecting middle aged and older people), obesity, sedentary life style, overeating and physically inactive.

Symptoms:

Increased blood glucose level (Hyperglycemia)

Increased urine output (Polyuria) leading to dehydration

Loss of water leads to thirst (Polydipsia) resulting in increased fluid intake

Excessive glucose excreted in urine (Glycosuria)

Excess hunger (Polyphagia) due to loss of glucose in urine.

Fatigue and loss of weight

Factors	**Type-1 Insulin dependent diabetes mellitus (IDDM)**	**Type-2 Non-insulin dependent diabetes mellitus (NIDDM)**
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)

Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction of β-cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

Prevention and Control of Diabetes:

Diet, hypoglycemic drugs, insulin injection and exercise are the management options based on the type and severity of the condition. The overall goal of diabetes management is to maintain normal blood glucose level.

Dietary management: Low carbohydrate and fibre rich diets are more appropriate. Carbohydrates should be taken in the form of starch and complex sugars. Refined sugars (sucrose and glucose) should be avoided. Diet comprising whole grains, millets (jowar, bajra, ragi), green leafy vegetables, wheat and unpolished rice should be included in diet regularly.

Carbohydrates is maintained to about 50- 55% of the total calories. High protein content of 10-15% of the total intake is required to supply essential amino acids. Fat content in the diet should be 15-25% of the total calories. Saturated fat intake should be reduced. Polyunsaturated fatty acid content should be higher.

Management with insulin: Commercially available insulin preparations (short and long acting) are also used to maintain blood glucose levels.

Physical activity: Exercise plays an important role in facilitating a good control of diabetes, in addition to strengthening and toning up the muscles.

Education and Awareness: People with diabetics should be educated on the nature of disease they have and the possibility of complications of the disease, if blood

sugar is not kept under control. Instructions regarding diet, exercise and drugs should be explained.

Obesity:

Obesity is the state in which there is an accumulation of excess body fat with an abnormal increase in body weight. Obesity is a complex multifactorial chronic disease developing from influence of social, behavioural, psychological, metabolic and cellular factors.

Obesity occurs if intake of calories is more than the expenditure of energy. Over weight and obesity are conditions where the body weight is greater than the mean standard weight for age and height of an individual. Body mass index (BMI) is an estimate of body fat and health risk.

BMI = Weight (kg) / Height $(m)^2$

Causes and risk factors: Obesity is due to genetic factors, physical inactivity, eating habits (overeating) and endocrine factors. Obesity is a positive risk factor in development of hypertension, diabetes, gall bladder disease, coronary heart disease and arthritis.

Prevention and Control of Obesity:

Diet Management: Low calorie, normal protein, vitamins and mineral, restricted carbohydrate and fat, high fiber diet can prevent overweight. Calorie restriction for weight reduction is safe and most effective.

Physical exercise: A low calorie diet accompanied by moderate exercise will be effective in causing weight loss. Meditation, yoga and physical activity can also reduce stress related to overeating.

Heart Disease:

Cardiovascular disease (CVD) is associated with diseases of the heart and blood vessels. Coronary heart disease (CHD) is the most common form and is caused by deposition of cholesterol in the blood vessels.

It usually develops slowly over many years beginning from childhood, they may form a fatty streak to a fibrous complicated plaque. It leads to the narrowing of

blood vessels leading to atherosclerosis in the large and medium sized arteries that supply the heart muscle with oxygen. It leads to sudden ischemia (deficient blood supply to heart muscle) and myocardial infarction (death of the heart muscle tissue).

Risk factors: Hypercholesterolemia (High blood cholesterol) and high blood pressure (Hypertension) are the major causes and contributing factors for heart disease and if untreated may cause severe damage to brain, kidney and eventually lead to stroke.

Causes: Heredity (family history), diet rich in saturated fat and cholesterol, obesity, increasing age, cigarette smoking, emotional stress, sedentary lifestyle, excessive alcohol consumption and physical inactivity are some of the causes.

Symptoms: Shortness of breath, headache, tiredness, dizziness, chest pain, swelling of leg, and gastrointestinal disturbances.

Prevention and Control of Heart Disease:

Diet management: Reduction in the intake of calories, low saturated fat and cholesterol rich food, low carbohydrates and common salt are some of the dietary modifications. Diet rich in polyunsaturated fatty acids (PUFA) is essential. Increase in the intake of fibre diet, fruits and vegetables, protein, minerals and vitamin are required.

Physical activity: Regular exercise, walking and yoga are essential for body weight maintenance

Addictive substance avoidance: Alcohol consumption and smoking are to be avoided.

Cancer:

Cancer causes about 4 million deaths annually throughout the world. In India more than one million people suffer from cancer. Cancer is derived from Latin word meaning crab. The study of cancer is called Oncology (Oncos- Tumor).

Cancer is an abnormal and uncontrolled division of cells that invade and destroy surrounding tissue forming a tumor or neoplasm (new growth). It is a heterogenous group of cells that do not respond to the normal cell division.

The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called metastasis. The frequent sites of metastasis are lungs, bones, liver, skin and brain.

Types of Cancers:

Cancers are classified on the basis of the tissues from which they are formed.

Carcinomas arise from epithelial and glandular tissues. They include cancers of skin, lung, stomach and brain. About 85% of the tumours are carcinomas

Sarcomas are occur in the connective and muscular tissue. They include the cancer of bones, cartilage, tendons, adipose tissue and muscles. These form 1% of all tumours.

Leukaemia are characterized by an increase in the formation of white blood cells in the bone marrow and lymph nodes. Leukaemia are called blood cancers. Most common type of cancer which also affect children below 15 years of age.

Carcinogenic Agents:

Cancer causing agents are called carcinogens. They are physical, chemical agents, ionizing radiations and biological agents.

1. Physical Irritant: Heavy smoking causes lung cancer and cancers of oral cavity, pharynx (throat) and larynx. Betel and tobacco chewing causes oral cancer. Excessive exposure to sunlight may cause skin cancer.

2. Chemical agents: Nicotine, caffeine, products of combustion of coal and oil, pesticides, asbestos, nickel, certain dyes and artificial sweetners induce cancer.

3. Radiations: Ionizing radiations like X-rays, gamma- rays, radioactive substances and nonionising radiations like UV rays cause DNA damage leading to cancer.

4. Biological agents: Cancer causing viruses are called oncogenic viruses.

Treatment of Cancer:

The treatment of cancer involves the following methods:

1. Surgery: Tumours are removed by surgery to prevent further spread of cancer cells.

2. Radiation therapy: Tumour cells are irradiated by lethal doses of radiation while protecting the surrounding normal cells.

3. Chemotherapy: It involves administration of anticancerous drugs which prevent cell division and are used to kill cancer cells.

4. Immunotherapy: Biological response modifiers like interferons are used to activate the immune system and help in destroying the tumors.

Preventive measures for Cancer:

Cancer control programmes should focus on primary prevention and early detection. To prevent lung cancer tobacco smoking is to be avoided and protective measures to be taken against exposure to toxic pollutants of industries. Excessive exposure to radiation is to be avoided to prevent skin cancer.

COVID-19:

COVID-19 is the disease caused by a new corona virus called SARS-CoV-2. WHO first learned of this new virus on 31 December 2019, following a report of a cluster of cases of 'viral pneumonia' in Wuhan, People's Republic of China.

Origin:

Severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) is a novel severe acute respiratory syndrome corona virus. It was first isolated from three people with pneumonia connected to the cluster of acute respiratory illness cases in Wuhan. All structural features of the novel SARS-CoV-2 virus particle occur in related corona viruses in nature.

Symptoms:

The most common symptoms of COVID-19 are

Fever

Dry cough

Fatigue

Other symptoms that are less common and may affect some patients include:

Loss of taste or smell,

Nasal congestion,

Conjunctivitis (also known as red eyes)

Sore throat,

Headache,

Muscle or joint pain,

Different types of skin rash,

Nausea or vomiting,

Diarrhea,

Chills or dizziness.

Symptoms of severe COVID-19 disease include:

Shortness of breath,

Loss of appetite,

Confusion,

Persistent pain or pressure in the chest,

High temperature (above 38 °C).

Other less common symptoms are:

Irritability,

Confusion,

Reduced consciousness (sometimes associated with seizures),

Anxiety,

Depression,

Sleep disorders,

More severe and rare neurological complications such as strokes, brain inflammation, delirium and nerve damage.

Types of COVID-19 Tests:

COVID-19 tests can detect either SARS-CoV-2 or biomarkers of SARS-CoV-2, the virus that causes COVID-19, or antibodies that your body makes after getting COVID-19 or after getting vaccinated.

Tests for SARS-CoV-2 tell you if you have an infection at the time of the test. This type of test is called a "viral" test because it looks for viral infection. Antigen tests, Nucleic Acid Amplification Tests (NAATs) and other tests are viral tests.

Tests for antibodies may tell you if you have had a past infection with the virus that causes COVID-19. Your body creates antibodies after getting infected with SARS-CoV-2 or after getting vaccinated against COVID-19. These tests are called "antibody" or "serology" tests.

Viral Tests (RT-PCR):

A viral test tells you if you are infected with SARS-CoV-2, the virus that causes COVID-19, using samples that come from your nose or mouth. There are two types of viral tests: rapid tests and laboratory tests. COVID-19 testing is one of many risk-reduction measures, along with vaccination, masking, and physical distancing, that protect you and others by reducing the chances of spreading COVID-19.

Rapid Point-of-Care tests, test performed or interpreted by someone other than the individual being tested, can be performed in minutes and can include antigen tests, some NAATs, and other tests.

Self-tests are rapid tests that can be taken at home or anywhere, are easy to use, and produce rapid results. Laboratory tests can take days to complete and include RT-PCR and other types of NAATs.

Real-Time RT-PCR:

Real-Time RT-PCR (Reverse Transcription Polymerase Chain Reaction) is a sensitive and fast test used for detecting the presence of specific genetic materials within a sample. This genetic material can be specific to humans, bacteria, and viruses like SARS-CoV-2.

The foundation of Real-Time RT-PCR derives from Polymerase Chain Reaction (PCR); a laboratory technique developed by Nobel Prize-winner, Kary B. Mullis, in the 1980s, to allow researchers to amplify and detect specific DNA targets (1,2). This technology was later improved to allow "real-time" visualization and quantification of DNA targets as they undergo amplification. To visualize the amplification of DNA, Real-time PCR uses increases in the fluorescence intensity of a fluorogenic probe in proportion to the amount of amplified DNA. By measuring this fluorescence intensity, one can quantify the amount of genetic material inside the sample. A major limitation of PCR is that it detects only DNA templates. Thus, in order to apply Real-Time PCR on RNA samples (i.e. genetic material of SARS-CoV-2), researchers have to use a special enzyme – called Reverse Transcriptase – to convert RNA into DNA templates, also known as complementary DNA (cDNA). Altogether, these features contribute to the versatility and sensitivity of Real-Time RT-PCR as a diagnostic test for infectious diseases.

Real-Time RT-PCR Work:

Sample Collection: To start the diagnostic test, a trained healthcare worker will use a swab to collect nasopharyngeal specimens from the patient's nasopharynx. The sample is then placed into a sterile tube containing viral transport media to keep the virus viable.

Sample Preparation: Once the specimens arrive at the laboratory, researchers will use available commercial purification kits to extract RNA from the sample. Next, the RNA sample is added into one reaction mixture containing all the ingredients required to complete the diagnostic test, also known as "one-step RT-PCR". The ingredients inside this mixture includes DNA polymerase, reverse transcriptase, DNA building blocks, and specific fluorophore probes and primers that recognize SARS-CoV-2.

Reverse Transcription: As mentioned earlier, PCR only works on DNA templates. Thus, the role of reverse transcriptase inside the reaction mixture is to convert all

the RNA present within a given sample into cDNA. This includes human RNA, bacterial RNA, even other corona virus RNA and if present, SARS-CoV-2's RNA.

Step 1 – Denaturation/Separation: To begin, it is important to remember that DNA is a double-stranded structure. Thus, the next step is to unwind the DNA molecule into separate DNA stands. This is accomplished by heating the DNA to high temperatures (> 90°C) for amount 10 min.

Step 2 – Primer Annealing: Next, is the addition of short fragments of DNA, called primers. Primers are designed with high specificity and will attach to specific targets within cDNA of the SARS-CoV-2 RNA virus. The specific lower temperature is needed for primer annealing too. In general, there 7 common gene targets used for testing COVID-19; each gene target is essential to the virus' replication or structure(4). Those essential gene targets include RNA-dependent polymerase (RdRP), ORF1ab (SARS-CoV-2's conserved open reading frame), S gene (spike protein), N gene (nucleocapsid protein), E gene (envelope; virus' outer shell).

Step 3 – Primer Extension/Elongation: Since DNA is a double stranded structure, there are two primers in this reaction mix, each one is designed to target one of the two DNA strands. Once the primers attach to their target DNAs, they will direct the DNA polyermase on where to begin and finish amplification on the DNA segment. This step results in an identical DNA copy of the target DNA.

And Repeat: Real-Time PCR will repeat the cycle multiple times (usually for 40 cycles). Every time RT-PCR completes a cycle, it will double the target DNA. Additionally, there are also fluorescent probes that bind specifically to the DNA targets, downstream of each primer. Every time DNA polyermase amplifies the DNA target, it will activate the probe to release a fluorescence signal. Thus, as the amount of target DNA increases, the fluorescence intensity will also increase.

Antibody Tests:

An antibody test (also known as a serology test) can detect antibodies to SARS-CoV-2 in your blood. Antibodies are proteins that your immune system makes to help fight infection and protect you from getting sick in the future.

Antibody tests should not be used to diagnose a current infection, but they may indicate if you had a past infection. Antibody tests help learn about how human immune systems defend against the virus, as well as learn about population-level protection. If you get an antibody test after receiving a vaccine, you might test positive by some (but not all) antibody tests. This depends on which type of antibody the specific test detects.

Different between isolation and quarantine

ISOLATION	QUARANTINE
Isolation separates and restricts the movement of sick people so they can't spread disease to healthy people.	Quarantined people may or may not become sick.
Isolation is a routine procedure in hospitals and healthcare facilities.	Quarantined people may stay at home or another location so they don't spread disease to healthy people.
Isolation is usually voluntary, but in a public health emergency, officials have the authority to isolate people who are sick.	If you are quarantined and you become ill, you can seek medical treatment from a healthcare provider.
	Quarantine can be voluntary, but in a

	public health emergency, officials have the authority to quarantine people who have been exposed to an infectious disease.

Types of Vaccines:

Name of the vaccine	Developed by
Vaxzevria and Covishield	Oxford–AstraZeneca
mRNA vaccine	Pfizer–BioNTech
Janssen	Johnson & Johnson
Moderna (Spikevax)	National Institute of Allergy and Infectious Diseases
Sinopharm BIBP	China National Pharmaceutical Group
Sputnik V	Gamaleya Research Institute of Epidemiology and Microbiology
CoronaVac	Sinovac Biotech
Novavax	Novavax and the Coalition for Epidemic Preparedness Innovations
Covaxin	Bharat Biotech

VLA2001	Valneva SE and Dynavax Technologies
Sputnik Light	Russian Gamaleya Research Institute of Epidemiology and Microbiology
Convidecia	CanSino Biologics
Sinopharm WIBP	China National Pharmaceutical Group (Sinopharm)
Abdala	Center for Genetic Engineering and Biotechnology in Cuba
EpiVacCorona	Russian State Research Center of Virology and Biotechnology VECTOR
Zifivax	Anhui Zhifei Longcom Biopharmaceutical
Soberana 02	Finlay Institute in Cuba
CoviVac	Chumakov Centre at the Russian Academy of Sciences
QazCovid-in	Research Institute for Biological Safety Problems in Kazakhstan

Effects of vaccine:

1. Pain, Redness, or Swelling at the Injection Site
2. Fever or Headache
3. Fatigue or Muscle Pain

4. Chills
5. Nausea or Vomiting
6. Swollen Lymph Nodes

Benefits of vaccine:

1. Immunity (protection) from infection can vary depending on how mild or severe someone's illness was and their age.
2. Immunity from infection decreases over time.
3. Importantly, there is still no antibody test available that can reliably determine if a person is protected from further infection.

Difference between medical mask and respirator (like N95):

Medical Mask:

1. A triple layer medical mask is a disposable mask, fluid-resistant, provide protection to the wearer from droplets of infectious material emitted during coughing/sneezing/talking.
2. Surgical masks are a barrier to fluids, such as splashes, droplets, and sprays of bodily fluids.
3. Protects the patient from the wearer's respiratory emissions.

Respirator:

1. An N-95 respirator mask is a respiratory protective device with high filtration efficiency to airborne particles. To provide the requisite air seal to the wearer, such masks are designed to achieve a very close facial fit.
2. Such mask should have high fluid resistance, good breathability (preferably with an expiratory valve), clearly identifiable internal and external faces, duckbill/cup-shaped structured design that does not collapse against the mouth.
3. If correctly worn, the filtration capacity of these masks exceeds those of triple layer medical masks. Since these provide a much tighter air seal than triple layer medical masks, they are designed to protect the wearer from inhaling airborne particles.

4. Respirators protect from exposure to airborne particles. In healthcare, protects from exposure to biological aerosols including viruses and bacteria.

Plasma Therapy:

Plasma therapy is used for treating several infectious diseases. Convalescent-plasma therapy is a type of therapy in which blood plasma from recovered patients is administered to people who are currently suffering from the same disease. Convalescent-plasma therapy is being used in several clinical trials across the world for the treatment of COVID-19. In the list of countries using plasma therapy for treating corona virus patients, names like India, UK, USA, etc feature.

This is not the first time plasma therapy is being used for treating an infectious disease. The use of plasma therapy for corona virus was recently preceded by the use of this procedure for the treatment of the Ebola virus disease. In 2014, plasma therapy was recommended by the (WHO) World Health Organisation as a treatment for the Ebola virus.

Plasma therapy procedure

The plasma therapy procedure involves drawing blood from recovered patients of COVID 19. The plasma with the antibodies is separated from the blood. The blood is then returned to the body of the donor. Donors who have high concentrations of anti-SARS-CoV-2 antibodies in their plasma will be the most useful in this therapy. The plasma of the recovered patient is administered to the presently sick patients. This helps the patient fight the infection as antibodies are present in the body now. New antibodies are also formed.

How Plasma Therapy works in COVID-19 patients?

The most common corona virus symptoms include fever, dry cough, sore throat, tiredness, aches and pains, headaches, and loss of sense of taste and smell. There are two kinds of COVID-19 tests available in most countries. One is a viral test that reveals if the infection is present in the body at the time of testing. The other test is the antibody test that reveals if the person had the infection previously. The novel

corona virus has escalated into a global pandemic claiming thousands of lives. As there are no approved treatments for COVID-19 for critical patients yet, such patients are being put on ventilators. Treatments for COVID-19 are also decided based on individual cases and the health of the patient.

Plasma therapy involves introducing the blood plasma of a recovered corona virus patient into the body of a patient who is presently affected by the virus. The plasma of the recovered person has antibodies present that were created by the immune system to fight the virus. When the plasma with antibodies is introduced in the body of a sick person, passive immunization results in the body fighting against the virus more efficiently. This leads to a quicker recovery. Plasma therapy in COVID-19 is being touted as a potential cure for the deadly virus.

Risks and Side Effects for Covid-19 patients

Plasma therapy risk in COVID patients is a serious concern. Plasma transfusion can carry several risks such as transfusion-related acute lung injury (TRALI) which can cause respiratory failure, transfusion-associated circulatory overload (TACO) which can cause heart failure, anaphylactic shocks, and allergic reactions, hemolysis and other pathogens being acquired from the donor's blood.

Prevention methods of Covid – 19

1. Get Vaccinated and stay up to date on your COVID-19 vaccines
2. Wash your hands frequently and carefully
3. Avoid touching your face
4. Stop shaking hands and hugging people — for now
5. Don't share personal items
6. Cover your mouth and nose when you cough and sneeze
7. Clean and disinfect surfaces
8. Take physical (social) distancing seriously
9. Do not gather in groups
10. Avoid eating or drinking in public places
11. Wash fresh groceries

12. Wear a (homemade) mask
13. Some pointers to keep in mind:
14. Self-quarantine if sick

Waves of Covid-19

1st Wave:

COVID-19 was first reported in the UK at the end of January 2020 and lockdown announced on 23 March 2020. Many of us have uttered the words 'when this is over', but what does that really mean? As the first-, second- and third-order impacts of the virus manifest over different time frames, this pandemic will not necessarily be 'over' until we are through the impact of the 'third wave' of the COVID-19 pandemic.

We are currently experiencing the effects of the first wave, where deaths and disability are directly linked to COVID-19. Alongside the atrocious death toll, an as yet untold number of people are living with the lasting aftermath of a severe acute respiratory syndrome corona virus 2 infection—for some, even mild COVID-19 can be debilitating for months on end, even after they are clinically cured of the infection.

2nd Wave:

The second wave refers to those who will suffer in the medium-term due to measures taken to limit the spread of COVID-19. It includes, among many others, those who delay presenting to healthcare facilities for fear of COVID-19 infection; those with progressive diseases whose appointments are rescheduled; and those who miss routine screening. The question of how doctors, particularly those working in primary care, will navigate the backlog remains unanswered.

3rd Wave:

The third wave is the effect of virus on the social determinants of health, and its effects on the next generation.[2] The virus will worsen health inequalities through severe economic injury.[3] It is the sectors that rely on low-paid staff (often women, young people and Black, Asian and minority ethnic (BAME) people) that will take

longest to recover from the predicted deep economic recession.[3] The health impacts caused by this worsening of economic conditions will be complex, but it is likely that groups that are at the intersection between poverty and poor health that will suffer most.

Children have already been locked out of schools. Despite teachers' best efforts, there will be children who will never compensate for their months of lost education, who will be locked out of well-paid jobs and locked into a lifetime of poorer health as a result. Early reports suggest privately educated children have been able to continue learning from home, whereas their state-schooled counterparts are missing out. Of course, it is a lot easier to transition to online learning if you have your own laptop and your parents are able to keep an eye on your activities while they work from home.

Parental loss of income will impact on children's diets, housing and educational opportunities. Possible resultant cuts to public funding could lead to youth centres being shuttered; libraries never reopening; and the end of council-funded arts programmes (if they existed earlier). Children would lose even more spaces to socialise safely, potentially having to settle for obesogenic spaces such as fried chicken shops.

For vulnerable children living in temporary accommodation, losing access to routine check-ins from health services, legal advice and immigration support could have consequences that mark them for life. Lockdown means an increased risk of child abuse and domestic violence, both adverse childhood experiences with demonstrated repercussions in later life. Changes in law aimed at accommodating social distancing have also weakened statutory protections for some children: it is as yet unclear when these changes will be refined or reversed.

Even beginning to trace the lasting impacts of the COVID-19 pandemic can be overwhelming. Yet this is the meaning of a pandemic: the virus has got into everything. It's in our funding decisions, our legal protections, our hearts our

minds. The pandemic cannot be 'over' until it is reckoned with in every sphere of our lives.

But we mustn't lose sight of that crucial thing about the third wave—it's still far out at sea. The future is not foregone. We can act now, to mitigate economic injury, to priorities the return of libraries, youth and community centers. The third wave doesn't have to crash on undefended shores.

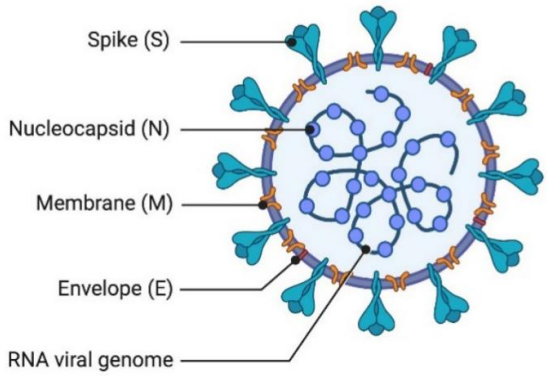
Structure and Organization of Covid-19

Many concerned over the corona virus outbreak may find it useful to understand more about corona viruses than is currently being communicated by media sources. As long-time structural biologists we offer below basic information on corona virus, that may be of assistance to those who have not studied virology.

All viruses are parasites which can only reproduce within cells. Thus, they are very different from bacteria and fungi, which are self-reproducing, often in soil, water, organic wastes, sewage, or within organisms.

Animal and plant viruses fall into two general classes, those in which the genetic material is long DNA molecules, and those in which the genetic material is RNA molecules. Among the DNA viruses are Herpes, Adenoviruses, and wart viruses. Corona viruses, named for their "sun-like" shape observed in the electron microscope, use RNA molecules to encode their genes, as do influenza viruses, HIV, and rhinoviruses (common cold). SARS-CoV-2, the virus that causes COVID-19, infects mammals and birds. It is closely related to the viruses causing the earlier SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome) outbreaks.

Coronavirus Structure



The corona virus particles are organized with long RNA polymers tightly packed into the center of the particle, and surrounded by a protective capsid, which is a lattice of repeated protein molecules referred to as coat or capsid proteins. In corona virus, these proteins are called nucleocapsid (N). The corona virus core particle is further surrounded by an outer membrane envelope made of lipids (fats) with proteins inserted. These membranes derive from the cells in which the virus was last assembled but are modified to contain specific viral proteins, including the spike (S), membrane (M), and envelope (E) proteins.

A key set of the proteins in the outer membrane project out from the particle and are known as spike proteins (S). It is these proteins which are recognized by receptor proteins on the host cells which will be infected.

Corona virus particles are rapidly inactivated – killed – by exposure to 70% ethanol or 90% isopropanol (rubbing alcohol), hydrogen peroxide solutions, hypochlorite bleach, soaps and detergents, as well as by UV light and the high temperatures of cooking.

Corona viruses primarily infect human lung cells through a receptor for an enzyme called Angiotensin Converting Enzyme 2 (ACE2). ACE2 is a member of the family of angiotensin converting enzymes that includes ACE, for which many Americans take blood pressure medicines composed of chemicals that act by inhibiting ACE. As the first step leading to viral infection, the virus spike protein recognizes and

binds to the ACE2 receptor. The virus is then incorporated into the lung cells and the viral RNA is released into the cytoplasm. The viral RNA molecules recruit the cellular apparatus to make thousands of copies of the viral RNA and also instruct the cells to synthesize hundreds of thousands of nucleocapsid, membrane, envelope, and spike proteins. These assemble into new virus particles which bud out of the cell surface membrane. The cells release the newly formed viral particles propagating the infection and eventually die.

Medicines of Covid-19:

1) Hydroxychloroquine (HCQ):

It was first developed in India for the treatment of malaria. Two Indian firms, Ipca Laboratories and Zydus Cadila Ltd, are the world's largest manufacturers of the drug. The Indian Council of Medical Research has also been using the drug to prevent infection among healthcare workers based on theoretical evidence that hydroxychloroquine does not allow the novel corona virus, or SARS-COV2, to attach to cells. HCQ was touted as a potential corona virus treatment by US President Donald Trump and some other global political leaders.

2) Covifor:

The Drug Controller General of India (DCGI) has given approval to Hetero for manufacturing 'Remdesivir' for the treatment of Covid-19. Hetero's generic version of Remdesivir will be marketed under the brand name 'Covifor' in India. It has been granted approval by DCGI for the treatment of suspected or laboratory-confirmed cases of Covid-19 in adults and children, hospitalized with severe symptoms of the disease. Covifor (Remdesivir) will be available in 100 mg vial (injectable) which has to be administered intravenously in a hospital setting under the supervision of a healthcare practitioner.

3) Fabiflu:

Glenmark Pharmaceuticals has launched antiviral drug Favipiravir, under the brand name FabiFlu, for the treatment of mild to moderate Covid patients. Priced

at ₹103 per tablet, the prescription-based drug will be available as a 200 mg tablet at an MRP of ₹3,500 for a strip of 34 tablets.

4) Cipremi:

Cipla has launched its own remedesivir under the name of Cipremi. Cipla said it will be commercialising remdesivir through its own facilities and partnered sites. The drug will be supplied through government and open market channels, to ensure equitable distribution. The drug is most effective on those who need oxygen support. Cipla is yet to disclose the pricing for the drug.

5) Methylprednisolone:

Indian doctors have been successfully using Methylprednisolone in handling moderate to severe cases of the disease. It reduces its overall mortality and is a more essential part of the treatment regimen. Also, it reduces the severity of symptoms, doctors claimed. Dexamethasone is supported by a large trial and is a cost-effective drug. It is of the same group as Methylprednisone.

6) Remdesivir (VEKLURY)

Remdesivir is an antiviral drug that was provisionally approved by the TGA in July 2020. Remdesivir can reduce the recovery time for people with COVID-19 infection.

It has been provisionally approved for use in adults and adolescent patients with severe COVID-19 symptoms who have been hospitalised and are severely unwell, requiring oxygen or high-level support to breathe.

14. Dengue

Dengue is a viral disease. It is transmitted by the infective bite of Aedes aegypti and Aedes albopictus mosquitoes. Man develops disease after 5-6 days of being bitten by an infective mosquito. It occurs in two forms: Dengue Fever and Dengue Haemorrhagic Fever (DHF). Dengue Fever is a flu-like illness

Dengue Haemorrhagic Fever (DHF) is a more severe form of disease, which may cause death. Person suspected of having dengue fever or DHF must attend the nearest medical facility

Signs & Symptoms:

1. Abrupt onset of high fever
2. Severe frontal headache
3. Pain behind the eyes which worsens with eye movement
4. Muscle and joint pains
5. Measles-like rash over chest and upper limbs
6. Nausea and vomiting
7. Bleeding from nose, mouth & gums and skin rashes
8. Frequent vomiting with or without blood
9. Sleepiness and restlessness
10. Patient feels thirsty and mouth becomes dry
11. Rapid weak pulse
12. Difficulty in breathing

Treatment of Dengue & DHF:

1. No drug or vaccine is available for the treatment of Dengue/DHF
2. There is no specific medication for treatment of a dengue infection. Persons who think they have dengue should use analgesics (pain relievers) with paracetamol and avoid those containing aspirin.
3. They should also rest, drink plenty of fluids and consult a physician.
4. Early reporting of the suspected dengue fever
5. Management of dengue fever is symptomatic & supportive
6. In dengue shock syndrome, the following treatment is recommended
7. Replacement of plasma losses
8. Correction of electrolyte and metabolic disturbances
9. Blood transfusion
10. The control of Aedes aegypti mosquito is the only method of choice

Indian System of Medicine-Siddha Medicine:

Papaya Leaf Juice

Malai Vembu Leaf (Hill Neem) Juice

Nilavembu Kudineer

Vector Control Measures:

1. Personal Prophylactic Measures:

Use of mosquito repellent creams, liquids, coils, mats etc.

Wearing of full sleeve shirts and full pants with socks

Use of bed nets for sleeping infants and young children during day time to prevent mosquito bite

2. Biological Control:

Use of larvivorous fishes in ornamental tanks, fountains, etc.

3. Chemical Control:

Use of chemical larvicides like Temephos 50% EC in big water holdings

Aerosol space spray during day time in and around the houses, market places, large campuses and buildings using Pyrethrum 2% Extract.

4. Environmental Management & Source Reduction Methods:

Identification and destruction of mosquito breeding sources

Management of roof tops, porticos and sunshades

The water storing containers should be scrubbed and washed with bleaching powder every week.

They should be properly covered with a cloth or sheet so as to prevent mosquito breeding in the water containers.

5. Health Education:

Impart knowledge to common people regarding the disease and vector through various media sources like T.V., Radio, Cinema slides, etc.

6. Dengue Fever Mobile App in Tamil:

Dengue Fever Tamil App provides complete pictorial information about the sources where Aedes mosquitoes breed along with an exhaustive Frequently Asked Questions.User can directly dial 108, 104 and 24 X 7 Public Health Control Room through this App.

7. Community Participation:

Sensitilizing and involving the community for detection of Aedes breeding places and their elimination.