RNA Enveloped Virus

1- Orthomyxoviridae:-

The four genera of Influenza virus that infect vertebrates, which are identified by antigenic differences in their nucleoprotein and matrix protein, are as follows:

- *Alphainfluenzavirus* infects humans, other mammals, and birds, and causes all flu pandemics
- *Betainfluenzavirus* infects humans and seals
- *Deltainfluenzavirus* infects pigs and cattle
- *Gammainfluenzavirus* infects humans, pigs, and dogs.

Viruses of the family Orthomyxoviridae contain six to eight segments of linear negative-sense single stranded RNA.

Influenza, commonly known as "**the flu**", is an infectious disease caused by an influenza virus. Symptoms can be mild to severe. The most common symptoms include: high fever, runny nose, sore throat, muscle and joint pain, headache, coughing, and feeling tired. These symptoms typically begin two days after exposure to the virus and most last less than a week. The cough, however, may last for more than two weeks. In children, there may be diarrhea and vomiting, but these are not common in adults. Diarrhea and vomiting occur more commonly in gastroenteritis, which is an unrelated disease and sometimes inaccurately referred to as "stomach flu" or the "24-hour flu". Complications of influenza may include viral pneumonia, secondary bacterial pneumonia, sinus infections, and worsening of previous health problems such as asthma or heart failure.

Three of the four types of influenza viruses affect humans: Type A, Type B, and Type C, Type D has not been known to infect humans, but is

believed to have the potential to do so. Usually, the virus is spread through the air from coughs or sneezes. This is believed to occur mostly over relatively short distances. It can also be spread by touching surfaces contaminated by the virus and then touching the eyes, nose, or mouth.

Frequent hand washing reduces the risk of viral spread, as does wearing a surgical mask. Yearly vaccinations against influenza are recommended by the World Health Organization (WHO) for those at high risk, and by the Centers for Disease Control and Prevention (CDC) for those six months of age and older. The vaccine is usually effective against three or four types of influenza. It is usually well tolerated.

A vaccine made for one year may not be useful in the following year, since the virus evolves rapidly. Antiviral medications such as the neuraminidase inhibitor oseltamivir, among others, have been used to treat influenza. The benefit of antiviral medications in those who are otherwise healthy do not appear to be greater than their risks. No benefit has been found in those with other health problems.

Structure of the influenza virion:-

The hemagglutinin (HA) and neuraminidase (NA) proteins are shown on the surface of the particle. The viral RNAs that make up the genome are shown as red coils inside the particle and bound to ribonucleoproteins (RNP).

In virus classification, influenza viruses are negative sense RNA viruses that make up four of the seven genera of the family Orthomyxoviridae:

- Influenzavirus A
- Influenzavirus B
- Influenzavirus C

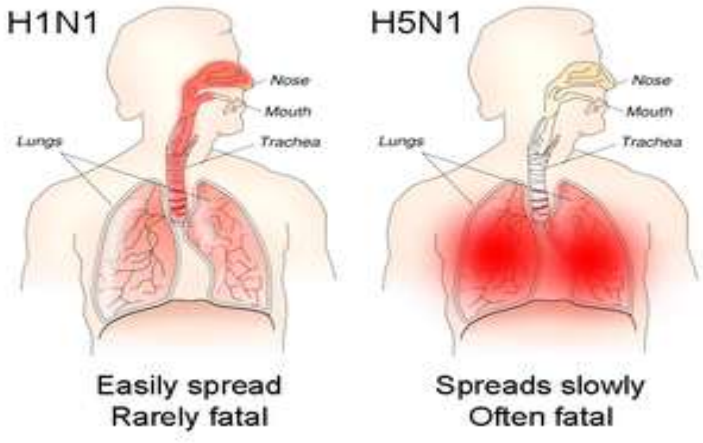
- Influenzavirus D

These viruses are only distantly related to the human parainfluenza viruses, which are RNA viruses belonging to the paramyxovirus family that are a common cause of respiratory infections in children such as croup, but can also cause a disease similar to influenza in adults.

Influenzavirus A

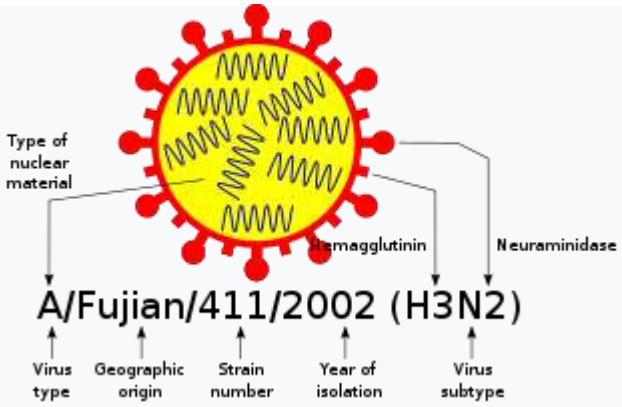
This genus has one species, influenza A virus. Wild aquatic birds are the natural hosts for a large variety of influenza A. Occasionally, viruses are transmitted to other species and may then cause devastating outbreaks in domestic poultry or give rise to human influenza pandemics. The influenza A virus can be subdivided into different serotypes based on the antibody response to these viruses. The serotypes that have been confirmed in humans are:

- H1N1, which caused Spanish flu in 1918, and Swine Flu in 2009
- H1N2, endemic in humans, pigs and birds
- H2N2, which caused Asian Flu in 1957
- H5N1, which caused Bird Flu in 2004



The different sites of infection (shown in red) of seasonal H1N1 versus avian H5N1. This influences their lethality and ability to spread.

Influenzavirus B



Influenza virus nomenclature (for a Fujian flu virus)

This genus has one species, influenza B virus. Influenza B almost exclusively infects humans, and is less common than influenza A. and consequently is less genetically diverse, with only one influenza B serotype. As a result of this lack of antigenic diversity, a degree of immunity to influenza B is usually acquired at an early age. However, influenza B mutates enough that lasting immunity is not possible. This reduced rate of antigenic change, combined with its limited host range (inhibiting cross species antigenic shift), ensures that pandemics of influenza B do not occur.

Influenzavirus C

This genus has one species, influenza C virus, which infects humans, dogs and pigs, sometimes causing both severe illness and local epidemics. However, influenza C is less common than the other types and usually only causes mild disease in children.

Influenzavirus D

This genus has only one species, influenza D virus, which infects pigs and cattle. The virus has the potential to infect humans, although no such cases have been observed.

Transmission:-

When an infected person sneezes or coughs more than half a million virus particles can be spread to those close by. In otherwise healthy adults, influenza virus shedding (the time during which a person might be infectious to another person). Children are much more infectious than adults and shed virus from just before they develop symptoms until two weeks after infection. In immunocompromised people, viral shedding can continue for longer than two weeks.

Influenza can be spread in three main ways: by direct transmission (when an infected person sneezes mucus directly into the eyes, nose or mouth of another person); the airborne route (when someone inhales the aerosols produced by an infected person coughing, sneezing or spitting) and through hand-to-eye, hand-to-nose, or hand-to-mouth transmission, either from contaminated surfaces or from direct personal contact such as a handshake.

How long influenza survives in airborne droplets seems to be influenced by the levels of humidity and UV radiation, with low humidity and a lack

of sunlight in winter aiding its survival; ideal conditions can allow it to live for an hour in the atmosphere.

Vaccination

The influenza vaccine is recommended by the World Health Organization (WHO) for high-risk groups, such as pregnant women, children aged less than five years, the elderly, health care workers, and people who have chronic illnesses such as HIV/AIDS, asthma, diabetes, heart disease, or are immunocompromised among others. The United States Centers for Disease Control and Prevention (CDC) recommends the influenza vaccine for those aged six months or older who do not have contraindications. In healthy adults it is modestly effective in decreasing the amount of influenza-like symptoms in a population. In healthy children over the age of two years, the vaccine reduces the chances of getting influenza by around two-thirds, while it has not been well studied in children under two years. In those with chronic obstructive pulmonary disease vaccination reduces exacerbations, it is not clear if it reduces asthma exacerbations. Evidence supports a lower rate of influenza-like illness in many groups who are immunocompromised such as those with: HIV/AIDS, cancer, and post organ transplant.

Diagnosis:-

There are a number of rapid tests for the flu. One is called a Rapid Molecular Assay, when an upper respiratory tract specimen (mucus) is taken using a nasal swab or a nasopharyngeal swab. It should be done within 3–4 days of symptom onset, as upper respiratory viral shedding takes a downward spiral after that.

Influenza treatment:-

People with the flu are advised to get plenty of rest, drink plenty of liquids, avoid using alcohol and tobacco and, if necessary, take medications such as acetaminophen (paracetamol) to relieve the fever and muscle aches associated with the flu. In contrast, there is not enough evidence to support corticosteroids as additional therapy for influenza. It is advised to avoid close contact with others to prevent spread of infection. Children and teenagers with flu symptoms (particularly fever) should avoid taking aspirin during an influenza infection (especially influenza type B), because doing so can lead to Reye's syndrome, a rare but potentially fatal disease of the liver. Since influenza is caused by a virus, antibiotics have no effect on the infection; unless prescribed for secondary infections such as bacterial pneumonia. Antiviral medication may be effective, if given early (within 48 hours to first symptoms), but some strains of influenza can show resistance to the standard antiviral medications and there is concern about the quality of the research.

Neuraminidase inhibitors

Overall the benefits of neuraminidase inhibitors in those who are otherwise healthy do not appear to be greater than the risks. There does not appear to be any benefit in those with other health problems. In those believed to have the flu, they decreased the length of time symptoms were present by slightly less than a day but did not appear to affect the risk of complications such as needing hospitalization or pneumonia.

Measles:- It is a highly contagious infectious disease caused by measles virus. Symptoms usually develop 10–12 days after exposure to an infected person and last 7–10 days. Initial symptoms typically include fever, often greater than 40 °C (104 °F), cough, runny nose,

and inflamed eyes. Small white spots known as Koplik's spots may form inside the mouth two or three days after the start of symptoms.

A red, flat rash which usually starts on the face and then spreads to the rest of the body typically begins three to five days after the start of symptoms. Common complications include diarrhea (in 8% of cases), middle ear infection (7%), and pneumonia (6%). These occur in part due to measles-induced immunosuppression. Less commonly seizures, blindness, or inflammation of the brain may occur. Other names include *morbilli*, *rubeola*, *red measles*, and *English measles*. Both rubella, also known as *German measles*, and roseola are different diseases caused by unrelated viruses.

Measles is an airborne disease which spreads easily from one person to the next through the coughs and sneezes of infected people. It may also be spread through direct contact with mouth or nasal secretions. It is extremely contagious–nine out of ten people who are not immune and share living space with an infected person will be infected. People are infectious to others from four days before to four days after the start of the rash. While often regarded as a childhood illness, it can affect people of any age. Most people do not get the disease more than once. Testing for the measles virus in suspected cases is important for public health efforts. Measles is not known to occur in other animals.

Once a person has become infected, no specific treatment is available, although supportive care may improve outcomes. Such care may include oral rehydration solution (slightly sweet and salty fluids), healthy food, and medications to control the fever. Antibiotics should be prescribed if secondary bacterial infections such as ear infections or pneumonia occur. Vitamin A supplementation is also recommended for children.

The measles vaccine is effective at preventing the disease, is exceptionally safe, and is often delivered in combination with other vaccines.

Diagnosis:-

Clinical diagnosis of measles requires a history of fever of at least three days, with at least one of the following symptoms: cough, coryza, or conjunctivitis. Observation of Koplik's spots is also diagnostic. Other possible condition that can result in these symptoms include parvovirus, dengue fever, Kawasaki disease, and scarlet fever. Laboratory confirmation is however strongly recommended.

Laboratory diagnosis of measles can be done with confirmation of positive measles IgM antibodies or detection of measles virus RNA from throat, nasal or urine specimen by using the reverse transcription polymerase chain reaction assay.

saliva can be collected for salivary measles-specific IgA testing. Salivary tests used to diagnose measles involve collecting a saliva sample and testing for the presence of measles antibodies. This method is not ideal, as saliva contains many other fluids and proteins which may make it difficult to collect samples and detect measles antibodies. Saliva also contains 800 times fewer antibodies than blood samples do, which makes salivary testing additionally difficult. Positive contact with other people known to have measles adds evidence to the diagnosis.

Prevention:-

In developed countries, it is recommended that children be immunized against measles at 12 months, generally as part of a three-part MMR vaccine (measles, mumps, and rubella). The vaccine is generally not

given before this age because such infants respond inadequately to the vaccine due to an immature immune system. A second dose of the vaccine is usually given to children between the ages of four and five, to increase rates of immunity.

Measles vaccination programs are often used to deliver other child health interventions as well, such as bed nets to protect against malaria, antiparasite medicine and vitamin A supplements, and so contribute to the reduction of child deaths from other causes.

Treatment:-

There is no specific antiviral treatment if measles develops. Instead the medications are generally aimed at treating superinfections, maintaining good hydration with adequate fluids, and pain relief. Some groups, like young children and the severely malnourished, are also given vitamin A, which act as an immunomodulator that boosts the antibody responses to measles and decreases the risk of serious complications.

Rubella, also known as **German measles** or **three-day measles**, is an infection caused by the rubella virus. This disease is often mild with half of people not realizing that they are infected. A rash may start around two weeks after exposure and last for three days. It usually starts on the face and spreads to the rest of the body. The rash is sometimes itchy and is not as bright as that of measles. Swollen lymph nodes are common and may last a few weeks. A fever, sore throat, and fatigue may also occur. In adults joint pain is common.

Complications may include bleeding problems, testicular swelling, encephalitis, and inflammation of nerves. Infection during early pregnancy may result in a miscarriage or a child born

with congenital rubella syndrome (CRS). Symptoms of CRS manifest as problems with the eyes such as cataracts, deafness, as well as affecting the heart and brain. Problems are rare after the 20th week of pregnancy.

Rubella is usually spread from one person to the next through the air via coughs of people who are infected. People are infectious during the week before and after the appearance of the rash. Babies with CRS may spread the virus for more than a year. Only humans are infected. Insects do not spread the disease. Once recovered, people are immune to future infections. Testing is available that can verify immunity. Diagnosis is confirmed by finding the virus in the blood, throat, or urine. Testing the blood for antibodies may also be useful.

Many mothers who contract rubella within the critical first trimester have either a miscarriage or a stillborn baby. If the fetus survives the infection, it can be born with severe heart disorders (patent ductus arteriosus being the most common), blindness, deafness, or other life-threatening organ disorders.

Diagnosis:- Rubella virus specific IgM antibodies are present in people recently infected by rubella virus, but these antibodies can persist for over a year, and a positive test result needs to be interpreted with caution. The presence of these antibodies along with, or a short time after, the characteristic rash confirms the diagnosis.

Prevention:- Rubella infections are prevented by active immunisation programs using live attenuated virus vaccines. Two live attenuated virus vaccines were effective in the prevention of adult disease.

The vaccine is now usually given as part of the MMR vaccine. The WHO recommends the first dose be given at 12 to 18 months of age

with a second dose at 36 months. Pregnant women are usually tested for immunity to rubella early on. Women found to be susceptible are not vaccinated until after the baby is born because the vaccine contains live virus.

Treatment:- There is no specific treatment for rubella; however, management is a matter of responding to symptoms to diminish discomfort. Treatment of newborn babies is focused on management of the complications. Congenital heart defects and cataracts can be corrected by direct surgery.

Management for ocular congenital rubella syndrome (CRS) is similar to that for age-related macular degeneration, including counseling, regular monitoring, and the provision of low vision devices, if required

mumps virus, an RNA virus in the family *Paramyxoviridae*. The virus is primarily transmitted by respiratory secretions such as droplets and saliva, as well as via direct contact with an infected person. Mumps is highly contagious and spreads easily in densely populated settings. Transmission can occur from one week before the onset of symptoms to eight days after. During infection, the virus first infects the upper respiratory tract. From there, it spreads to the salivary glands and lymph nodes. Infection of the lymph nodes leads to presence of the virus in blood, which spreads the virus throughout the body. Mumps infection is usually self-limiting, coming to an end as the immune system clears the infection.

In places where mumps is common, it can be diagnosed based on clinical presentation. In places where mumps is less common, however, laboratory diagnosis using antibody testing, viral cultures, or real-

time reverse transcription polymerase chain reaction may be needed. There is no specific treatment for mumps, so treatment is supportive in nature and includes bed rest and pain relief. Prognosis is usually excellent with a full recovery as death and long-term complications are rare. Infection can be prevented with vaccination, either via an individual mumps vaccine or through combination vaccines such as the MMR vaccine, which also protects against measles and rubella. The spread of the disease can also be preventing by isolating infected individuals.

Mumps historically has been a highly prevalent disease, commonly occurring in outbreaks in densely crowded spaces. In the absence of vaccination, infection normally occurs in childhood, most frequently at the ages of 5–9. Symptoms and complications are more common in males and more severe in adolescents and adults. Infection is most common in winter and spring in temperate climates, whereas no seasonality is observed in tropical regions.

The mumps virus is mainly transmitted by inhalation or oral contact with respiratory droplets or secretions. In experiments, mumps could develop after inoculation either via the mouth or the nose. Respiratory transmission is also supported by the presence of MuV in cases of respiratory illness without parotitis, detection in nasal samples, and transmission between people in close contact. MuV is excreted in saliva from approximately one week before to eight days after the onset of symptoms, peaking at the onset of parotitis, though it has also been identified in the saliva of asymptomatic individuals.

Mother-to-child transmission has been observed in various forms. In non-human primates, placental transmission has been observed, which is supported by isolation of MuV from spontaneous and planned aborted fetuses during maternal mumps. MuV has also been isolated from

newborns whose mother was infected. While MuV has been detected in breast milk, it is unclear if the virus can be transmitted through it. Other manners of transmission include direct contact with infected droplets or saliva, fomites contaminated by saliva, and possibly urine. Most transmissions likely occur before the development of symptoms and up to five days after such time.

Diagnosis:-

MuV can be isolated from saliva, blood, the nasopharynx, salivary ducts, and seminal fluid within one week of the onset of symptoms, as well as from cell cultures. In meningitis cases, MuV can be isolated from CSF. In CNS cases, a lumbar puncture may be used to rule out other potential causes, which shows normal opening pressure, more than 10 leukocytes per cubic millimeter, elevated lymphocyte count in CSF,

Mumps-specific IgM antibodies in serum or oral fluid specimens can be used to identify mumps. IgM quantities peak up to 8 days after the onset of symptoms,[9] and IgM can be measured by enzyme-linked immunosorbent assays (ELISA) 7–10 days after the onset of symptoms.

Real-time reverse transcription polymerase chain reaction (rRT-PCR) can be used to detect MuV RNA from the first day that symptoms appear, declining over the next 8–10 days. rRT-PCR of saliva is typically positive from 2–3 days before parotitis develops to 4–5 days after and has a sensitivity of about 70%. Since MuV replicates in kidneys, viral culture and RNA detection in urine can be used for diagnosis up to two weeks after symptoms begin.

Treatment:-

Mumps is usually self-limiting, and no specific antiviral treatments exist for it, so treatment is aimed at alleviating symptoms and preventing complications. Non-medicinal ways to manage the disease include bed rest, using ice or heat packs on the neck and scrotum, consuming more fluids, eating soft food, and gargling with warm salt water. Anti-fever medications may be used during the febrile period, excluding aspirin when given to children, which may cause Reye syndrome. Analgesics may also be provided to control pain from mumps inflammatory conditions. For seizures, anticonvulsants may be used. In severe neurological cases, ventilators may be used to support breathing.

Intramuscular mumps immunoglobulin may be of benefit when administered early in some cases, but it has not shown benefit in outbreaks. Although not recommended, intravenous immunoglobulin therapy may reduce the rates of some complications. Antibiotics may be used as a precaution in cases in which bacterial infection cannot be ruled out as well as to prevent secondary bacterial infection.

Vaccination:. Mumps vaccines use live attenuated viruses. Most countries include mumps vaccination in their immunization programs, and the MMR vaccine, which also protects against measles and rubella, is the most commonly used mumps vaccine. Mumps vaccination can also be done on its own and as a part of the MMRV vaccine, which also provides protection against measles, rubella, chickenpox, and shingles.

Human parainfluenza viruses (**HPIVs**) are the viruses that cause **human parainfluenza**. HPIVs are a paraphyletic group of four distinct single-stranded RNA viruses belonging to the *Paramyxoviridae* family. These viruses are closely associated with both human and veterinary disease.

The viruses can be detected via cell culture, immunofluorescent microscopy, and PCR. HPIVs remain the second main cause of hospitalisation in children under 5 years of age suffering from a respiratory illness (only *Human orthopneumovirus* causes more respiratory hospitalisations for this age group).

HPIV-1, HPIV-2 and HPIV-3 have been linked with up to a third of these infections. Upper respiratory infections (URI) are also important in the context of HPIV, however, they are caused to a lesser extent by the virus. The highest rates of serious HPIV illnesses occur among young children, and surveys have shown that about 75% of children aged 5 or older have antibodies to HPIV-1.

Repeated infection throughout the life of the host is not uncommon and symptoms of later breakouts include upper respiratory tract illness, such as cold and a sore throat. The incubation period for all four serotypes is 1 to 7 days. In immunosuppressed people, parainfluenza virus infections can cause severe pneumonia, which can be fatal.

HPIV-1 and HPIV-2 have been demonstrated to be the principal causative agent behind croup (laryngotracheobronchitis), which is a viral disease of the upper airway and is mainly problematic in children aged 6–48 months of age. Biennial epidemics starting in Autumn are associated with both HPIV-1 and 2; however, HPIV-2 can also have yearly outbreaks. Additionally, HPIV-1 tends to cause biennial outbreaks of croup in the Fall. In the United States, large peaks have presently been occurring during odd-numbered years.

HPIV-3 has been closely associated with bronchiolitis and pneumonia and principally targets those aged <1 year.

HPIV-4 remains infrequently detected. However, it is now believed to be more common than previously thought, but is less likely to cause severe disease. By the age of 10, the majority of children are sero-positive for HPIV-4 infection which may be indicative of a large proportion of asymptomatic or mild infections.

Important epidemiological factors that are associated with a higher risk of infection and mortality are those who are immuno-compromised and may be taken ill with more extreme forms of LRI. Associations between HPIVs and neurologic disease are known; for example, hospitalisation with certain HPIVs has a strong association with febrile seizures. HPIV-4B has the strongest association (up to 62%) followed by hPIV-3 and -1.

HPIVs have also been linked with rare cases of virally caused meningitis and Guillain–Barré syndrome.

HPIVs are spread from person to person ('horizontal transmission') by contact with infected secretions through respiratory droplets or contaminated surfaces or objects. Infection can occur when infectious material contacts mucous membranes of the eyes, mouth, or nose, and possibly through the inhalation of droplets generated by a sneeze or cough. HPIVs can remain infectious in airborne droplets for over an hour.

Overall, HPIVs remain best known for its effects on the respiratory system and this appears to be where the majority of the focus has been upon

Diagnosis can be made in several ways, encompassing a range of multi-faceted techniques:

- Isolation and detection of the virus in cell culture.

- Detection of viral antigens directly within bodily respiratory tract secretions using immunofluorescence, enzyme immunoassays or fluoroimmunoassays.
- Polymerase chain reaction (PCR).
- Analysis of specific IgG antibodies showing a subsequent rise in titre following infection (using paired serum specimens).

Because of the similarity in terms of the antigenic profile between the viruses, hemagglutination assay (HA) or hemadsorption inhibition (HAdI) processes are often used. Both complement fixation, neutralisation and enzyme linked immunosorbent assays – ELISA, can also be used to aid in the process of distinguishing between viral serotypes.

Prevention:-

Recombinant technology has however been used to target the formation of vaccines for HPIV-1, -2 and -3 and has taken the form of several live-attenuated intranasal vaccines. Two vaccines in particular were found to be immunogenic and well tolerated against HPIV-3 in phase I trials. HPIV-1 and -2 vaccine candidates remain less advanced.

Vaccine techniques which have been used against HPIVs are not limited to intranasal forms, but also viruses attenuated by cold passage, host range attenuation, chimeric construct vaccines and also introducing mutations with the help of reverse genetics to achieve attenuation.

Maternal antibodies may offer some degree of protection against HPIVs during the early stages of life via the colostrum in breast milk.

Corona viruses are a group of related RNA viruses that cause diseases in mammals and birds. In humans and birds, they cause respiratory tract

infections that can range from mild to lethal. Mild illnesses in humans include some cases of the common cold (which is also caused by other viruses, predominantly rhinoviruses), while more lethal varieties can cause SARS, MERS, and COVID-19. In cows and pigs they cause diarrhea, while in mice they cause hepatitis and encephalomyelitis. There are as yet no vaccines or antiviral drugs to prevent or treat human coronavirus infections.

Coronaviruses constitute the subfamily ***Orthocoronavirinae***, in the family *Coronaviridae*, order *Nidovirales*, and realm *Riboviria*. They are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. The genome size of coronaviruses ranges from approximately 26 to 32 kilobases, one of the largest among RNA viruses. They have characteristic club-shaped spikes that project from their surface, which in electron micrographs create an image reminiscent of the solar corona, from which their name derives.

Transmission

Infected carriers are able to shed viruses into the environment. The interaction of the coronavirus spike protein with its complementary cell receptor is central in determining the tissue tropism, infectivity, and species range of the released virus. Coronaviruses mainly target epithelial cells. They are transmitted from one host to another host, depending on the coronavirus species, by either an aerosol, fomite, or fecal-oral route.

Human coronaviruses infect the epithelial cells of the respiratory tract, while animal coronaviruses generally infect the epithelial cells of the digestive tract. SARS coronavirus, for example, infects via an aerosol route, the human epithelial cells of the lungs by binding to

the angiotensin-converting enzyme 2 (ACE2) receptor. Transmissible gastroenteritis coronavirus (TGEV) infects, via a fecal-oral route, the pig epithelial cells of the digestive tract by binding to the alanine aminopeptidase (APN) receptor. COVID-19 spreads from person to person mainly through the respiratory route after an infected person coughs, sneezes, sings, talks or breathes. A new infection occurs when virus-containing particles exhaled by an infected person, either respiratory droplets or aerosols, get into the mouth, nose, or eyes of other people who are in close contact with the infected person. Respiratory droplets may evaporate into droplet nuclei, which remain suspended in the air for prolonged periods of time. Possibility of short range airborne transmission has been demonstrated in healthcare settings, with certain aerosol-generating medical procedures performed on COVID-19 patients, but is also reported to happen in crowded and inadequately ventilated indoor spaces

A person can get COVID-19 through indirect contact by touching a contaminated surface or object before touching their own mouth, nose, or eyes, though this is not thought to be the main way the virus spreads. There is currently no significant evidence of COVID-19 virus transmission through feces, urine, breast milk, food, wastewater, drinking water, animal disease vectors, or from mother to baby during pregnancy, although research is ongoing and caution is advised.

It can be transmitted as early as two days before developing symptoms, and even if symptoms never appear. People remain infectious in moderate cases for 7–12 days, and up to two weeks in severe cases. In October 2020, medical scientists reported evidence of reinfection in one patient.

Viral testing

The standard test for presence of SARS-CoV-2 uses RNA testing of respiratory secretions collected using a nasopharyngeal swab, though it is possible to test other samples. This test uses real-time rRT-PCR which detects the presence of viral RNA fragments. As this test detects RNA but not infectious virus, its "ability to determine duration of infectivity of patients is limited." Positive tests have been shown not to correlate with future excess deaths.

A number of laboratories and companies have developed serological tests, which detect antibodies produced by the body in response to infection.

research showed that breath analysis could make the "rapid identification" in seconds for coronavirus possible.

Characteristic imaging features on chest radiographs and computed tomography (CT) of people who are symptomatic include asymmetric peripheral ground-glass opacities without pleural effusions. imaging without confirmation by rRT-PCR is of limited specificity in identifying COVID-19. A large study in China compared chest CT results to PCR and demonstrated that though imaging is less specific for the infection, it is faster and more sensitive.

Treatment and Prevention :-

A number of antiviral targets have been identified such as viral proteases, polymerases, and entry proteins. Drugs are in development which target these proteins and the different steps of viral replication. A number of

vaccines using different methods are also under development for different human coronaviruses.