# An audit on HIV infection

**ABSTRACT:**
The human immunodeficiency virus (HIV) is a retrovirus which stores its genetic information in single stranded RNA and which causes AIDS and HIV Infection. In Acquired Immunodeficiency syndrome the patient's immune system collapses and the patient may be prone to infecting bacteria, viruses and fungi. HIV may be transmitted through body fluids of infected patient body fluids including blood, seminal fluid, vaginal fluid and breast milk. CD4 Cells, T-cells and macrophages get infected by human immunodeficiency virus HIV. This Infection results in low levels of T cells by a programmed cell death of T cells which is associated with antimicrobial response during inflammation .
The manifestations of Acquired immunodeficiency syndrome are due to the presence of Opportunistic infection which are caused by other microorganisms which are naturally managed by persons immune systems which are damaged by HIV infection. The rate of HIV transmission decreases with use of condoms; it gives a comparable level of assurance. Human Immunodeficiency Virus transmission can be prevented among health care workers by wearing necessary personal protective equipment. The universal body fluid and blood precautions should be followed for all such invasive procedures. Face shields, gloves and gowns are meant to be worn whenever performing invasive procedures. Laboratory workers should use safety cabins for handling specimens or doing lab procedures. Mouth pipetting should be avoided and Automatic pipetting tools should be used. The work surfaces of the Laboratory ought to be cleaned with suitable disinfectant after spilling of sample. If the laboratory machine or devices are infected then they should be sterilized or cleaned with Disinfectant prior to the fixing. After finishing laboratory testing or work the laboratory workers should remove their personal protective equipment and wash their hands and leave their protective equipment in the Laboratory .
Keywords: AIDS, HIV, CD4, NRTI, ART



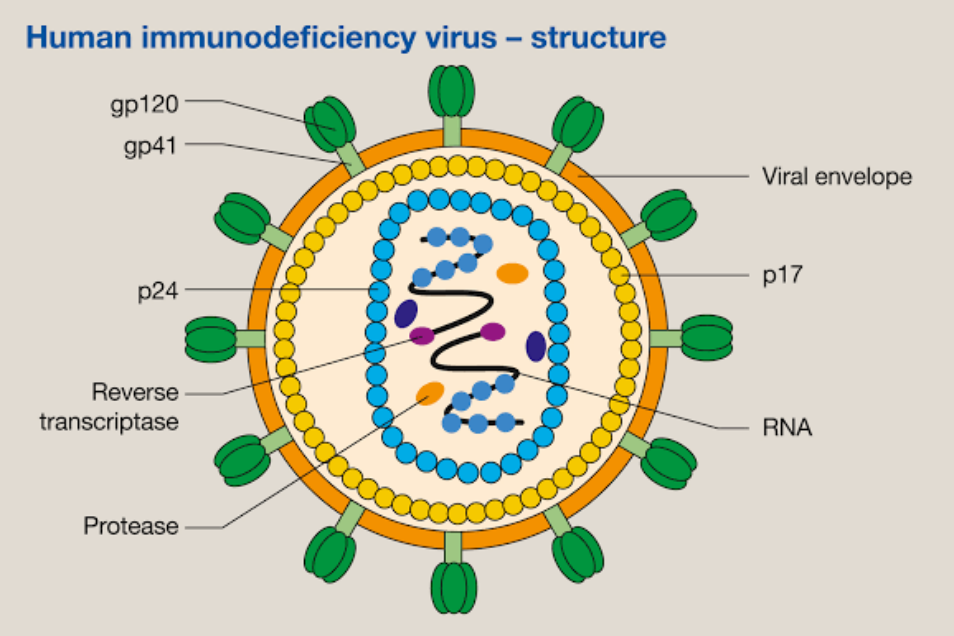
**Introduction:**

Human immunodeficiency virus is a virus which causes infection only in humans and is only transmitted from humans to humans. Zoonotic transmission does not take place. Normally a healthy individual has a defence mechanism which protects an individual from disease causing organisms. But one who has got the HIV infection has an inability to protect itself from disease-causing pathogens due to a damaged immune system.

Acquired immunodeficiency syndrome is caused by human immunodeficiency virus which is transmitted from an infected individual to a healthy individual when it comes in contact with their body fluids etc. It results in deficiency of helper cells of the immune system or cluster of differentiation 4 cells which further leads to a weakened immune system.

The causative agent for Acquired immunodeficiency syndrome is Human Immunodeficiency virus. Our body comprises a defence mechanism or immune system which protects us from harmful pathogens. Immune system comprises of white blood cells which are responsible for protecting us from infections or infection causing pathogens. They contain CD4+ cells also called the T-lymphocyte cells. A person will develop disease after being infected by the virus. The infection takes on a compromised immune system. The infections may decrease the life span of the patient or may lead to death of the patient. In HIV infection patients' ability to fight off the infection is lost and the CD4 cells or T cells decrease in HIV infection. There exists no cure of AIDS in the current situation although medicines are present to slow down the disease progression. No medication exists till date to cure the disease [1].

Structure




GP 120

It's molecular weight is 120 kDa and name was kept as GP 120 or glycoprotein 120. Virus enters into the cells with the help of GP 120.

GP41
It is an envelope glycoprotein of retroviruses including human immunodeficiency virus.

Viral envelope
The envelope protects the virus from the lysosomal enzymes of the host cells as well as it helps to deliver the genetic material inside the cells.

P17
It is involved mostly in the life cycle of retroviruses such as HIV. Enzymes necessary for viral replication are protease, integrase, and reverse transcriptase.

P24
It is a viral capsid protein and it plays an important role in HIV pathogenesis.
It makes most of the viral core.

RNA
It stands for Ribonucleic Acid and most of the viruses store their genetic material on single stranded RNA . Genes of Human Immunodeficiency virus consist of RNA [2].

Causes

It results from unprotected sex between two people and gets transmitted to a healthy person. The human immunodeficiency virus damages the immune system and makes it weak so that it cannot fight infection.

Infection is caused by the following ways:

a. HIV can be transmitted through the prenatal route from mother to the offspring during breastfeeding, birth and pregnancy.
b. Person suffering from syphilis, gonorrhea and herpes increases the risk of HIV transmission.
c. Sexual intercourse (oral and vaginal)
d. Sharing the same needles among the drug addicts and patients.

TRANSMISSION

HIV transmission takes place in 3 ways

- By sexual intercourse
- Transfusion of HIV infected blood and its components.
- contaminated needles
- And from mother to offspring.

Pre transfusional test and screening test has prevented the transmission of HIV or other pathogens from blood and it's components in most developed nations.

Meanwhile, sharing needles among drug addicts is at high risk of getting HIV.

13 to 35 percent of HIV infected pregnant mothers will transfer the infection to their child. Lactating mothers suffering from HIV infection have high levels of HIV in their breast milk.

Transmission of HIV through fecal-oral route, aerial, insect bite or casual contact is not possible. Needle prick injury to health workers is the primary cause of spreading HIV infection. HIV cannot be transmitted from saliva though it contains less amount of virus. It cannot be spread by kissing an infected person.
The HIV can transmitted from one to another through body fluids like:
• Breast milk.

• Semen or seminal fluid,
• Vaginal secretions,
• Blood including menstrual blood.
Activities That Allow HIV Transmission
• Unprotected sexual intercourse allow transmission of HIV
• Direct blood contact through contaminated needles, contaminated machines, transfusion of infected blood and it's blood product.
• Human immunodeficiency virus can be transmitted through the prenatal route from mother to the offspring during breastfeeding, birth and pregnancy.
[2].

The infection can't go through intact skin. The mucous layers of rectum,mouth, vagina and urethra act as entry points for the virus when it comes in contact with the mucous membrane.

Injury to the mucous layer may build the possibility of spread of Human Immunodeficiency Virus yet isn't required for transmission to occur.

Transmission of contaminated Blood:
Blood which is contaminated by HIV is responsible for transmission of HIV when it gets direct into the systemic circulation through following routes

- subcutaneous route
- intramuscular route
- And intravenous route.

Blood transfusion which results in transmission of HIV are given below:

• Transfusion of contaminated blood and it's components.
• unsterilized Needle sharing.

There are high chances of Transmission of HIV infection which depends on the access of the infected body fluids to the t4 cells. The amount of infected body fluids which are transfused into the body and the amount of HIV present in the body fluid.Body Fluids which are high in concentration of Human Immunodeficiency Virus are: Blood and its components, breast milk, vaginal fluids, menstrual flow pre ejaculatory fluid Semen.Nasal mucosa, saliva, pus, urine, tears Feces and vomiting are the bodily fluids which are lower in concentration of human immunodeficiency virus.

INDICATIONS

Individuals who are infected with human immunodeficiency virus are asymptomatic.

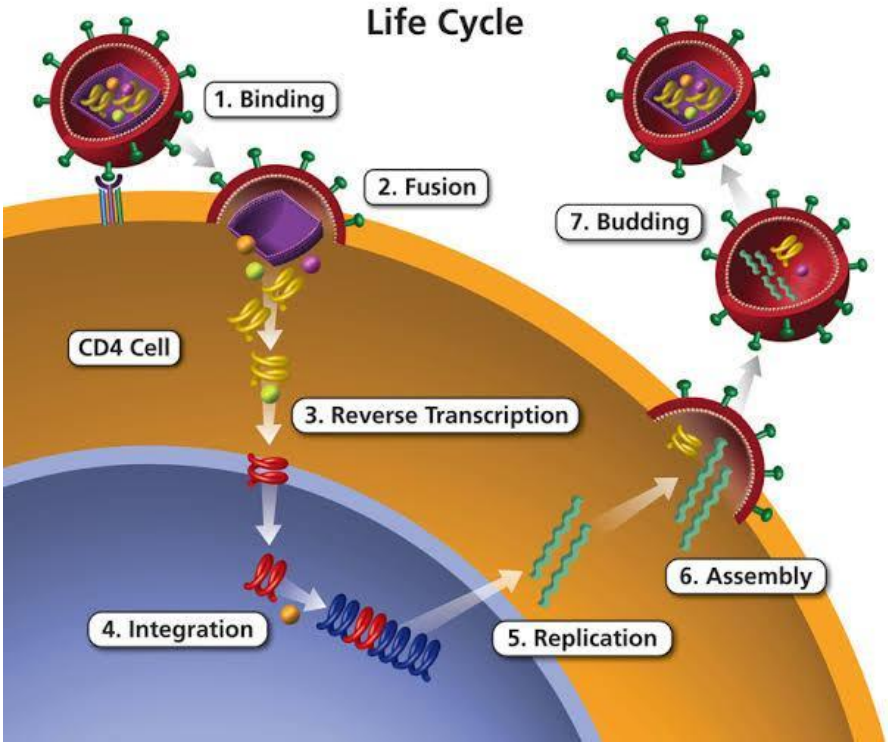
Ongoing proof reveals that about seventy to ninety percent of individuals who are infected with Human immunodeficiency virus show symptoms similar to influenza inside half a month.The most well-known indications are a rash and fever and sore throat all happening simultaneously.

These manifestations in a generally Healthy individual might show later HIV infection. Individuals who are infected with Human immunodeficiency virus may get oral candidiasis and vaginal candidiasis that does not disappear or that happen regularly. Successive and serious herpes infections that cause genital,mouth or butt-centric wounds are additionally normal. Shingles is bound to happen in HIV Infected individuals. Other respiratory infections or so called abnormal mycobacterial diseases can be fatal.
Ladies might get a pelvic infection that doesn't react to therapy. The infection might attack the sensory system (spinal cord,cerebrum and nerves) and give rise to a wide range of symptoms from paresthesia and trouble walking to memory disturbance [3].

Manifestation

- Big or enormous lymph nodes
- Unexplained or unintentionally weight reduction.
- Blindness.
- Reversible memory loss, loose motions,and regurgitating that don't go away.
- Dysphagia
- Seizures and ataxia
- Tussis and dyspnea
- Developmental delay and persistent diseases in teenagers
- Momentary cognitive decline.
- Recurrent fever that does not go away

Life cycle of Human Immunodeficiency virus



Entry into the body's cells

HIV is the only virus which replicates rapidly inside the cells or makes duplicate copies of itself when present in human cells. The cycle initiates when this virus invades into a cell that carries an integral membrane protein that is a cluster of differentiation 4. Human immunodeficiency virus adheres to the cluster of differentiation 4 receptors and furthermore allows them to merge.The virus predominantly targets the Immune system that includes the cells of the defence mechanism of the body which are the building blocks of the immune system in human body structure. HIV infects more and more immune system cells which results in making the defence mechanism weaker and weaker and making the body vulnerable to other infections which include bacterial,fungal,viral and parasite infections.

Reverse transcription

Reverse transcriptase is the enzyme which helps in the process of reverse transcription. Conversion of Ribonucleic Acid to deoxyRibonucleic Acid takes place with the help of this enzyme. After which DNA is introduced into cell by an enzyme which is known as integrase or enzyme integrase

Transcription and translation

The virus gets converted into messenger RNA by the process of transcription and translation.

Assembly, budding and maturation

Newly made Copies or duplicates assemble with recently made Human Immunodeficiency virus nucleic acid and conjugated proteins to form new daughter cells, which are later split from the Cluster of differentiation 4 cells where it was attached. The proteolytic enzyme breaks down HIV into smaller sections. The virus which was formed recently will target the cells with CD4 receptors [4].

Investigation

The serum and saliva is tested for antibodies against HIV. But it requires more time to produce antibodies and may take up to twelve weeks to develop the antibodies.

A recently developed test that screens for HIV foreign substance, a substance which is created by the HIV followed by an infection, can rapidly affirm the results after the infection Or contamination [5].

Tests given below are for detection of Human Immunodeficiency virus:

RAPID HIV SELF TEST

A FDA-approved home test. A swab is taken from the lower and upper gums. If you are tested positive you will have to consult the doctor and confirm the test.
If you are tested negative you will have to repeat the test after 90 days.

Tests To Tailor Treatment

If you are tested positive you should do the following test given below:

Total CD4 count

This test determines the total number of CD4 cells present in the body and gives overall status of the immune system. It determines if the drugs given are working properly or not.

Viral load

It is a measure of total virus present in the body.It has been reported that a person with a high level of viral loads suggests that the virus is present and is multiplying rapidly and if the person is receiving ART and if the viral load is high it means that treatment you are getting is insufficient.

Drug resistance

Some strains are resistant to the certain antiretroviral drugs of HIV. This test will be able to analyse the strain of virus which is resistant to some of the antiretroviral drugs[6].

Treatment

Antiretroviral therapy is used to treat HIV infection which includes use of various anti retroviral drugs. This therapy specifically targets HIV and helps to reduce the viral loads of an individual. It has been seen that people who are having low viral loads have no risk of transmitting the HIV to another.

Given below are the anti-retroviral drugs:

1. NRTIs:Tenofovir,Didanosine,stavudine,Lamivudine,Emtricitabine.
2. Non Nucleoside reverse transcriptase inhibitors:Nevirapine, Delavirdine, Efavirenz.
3. Protease inhibitors: darunavir,tipranavir,fosamprenavir,ritonavir.

NRTIs:

NRTIs are the drugs which are one of few classes of anti HIV drugs .

When HIV enters into a cell it introduces it's nucleic acid into cell's DNA and alters normal biochemical mechanism of cells and diverts it to produce the virus macromolecules for replication this process requires enzyme reverse transcriptase the NRTIs hinders in the process of replication and stops the enzyme reverse transcriptase from copying the DNA and prevent it from making copies.

NNRTIs

They were introduced in 1996. They bind to the enzyme known as reverse transcriptase decreasing its function and changing its structure in transcription of Ribonucleic Acid. In contrast to NRTIs, non nucleosides bind directly to the enzyme reverse transcriptase and decrease its ability [7].

HAART

HAART is antiretroviral therapy and is named as highly active antiretroviral therapy . HIV type 1 is treated by this therapy which includes use of multiple antiretroviral drugs.

Prevention

One can lower the chance of Human Immunodeficiency virus infection by restricting exposure to risk factors key approaches for HIV prevention are often utilizes in combination includes

- Elimination of prenatal transmission of Human immunodeficiency virus
- Use of ART for prevention
- Voluntary medical male circumcision
- Testing and counselling for linkage to Tuberculosis
- Testing and counselling for Sexually transmitted infection and HIV
- Use of male & female condoms[8].

Universal precaution among medical workers:

All medical workers ought to regularly utilize suitable barrier precautionary measures to prevent mucous membrane and skin exposure when contact with body fluids or blood of any person is assumed. Gloves ought to be worn for handling body fluids and blood or surfaces contaminated with body fluids or blood and for performing procedures like venipuncture aprons or gowns ought to be worn during procedure that are probably going to result in splashes of body fluids or blood.skin surfaces and hands ought to be washed promptly and completely whenever defiled with body fluids and blood . Hands ought to be washed following gloves are taken out.All medical workers should avoid potential risk to forestall wounds brought about by sharp instruments or gadgets during technique.In spite of the fact that salivation has not been involved in HIV transmission to limit the requirement for crisis mouth to mouth revival ,mouth pieces revival bags or other ventilation gadgets ought to be accessible for use in regions in which need for revival is predictable. Carrying out universal body fluid and blood precautions for all inpatients eliminates the need for use of the isolation category of "Blood and Body Fluid Precautions" recently suggested by Centre of Disease Control[9]for patients known to be

infected with blood-borne microbes. Isolation precautions ought to be utilized as vital whenever related conditions, like irresistible loose bowels and tuberculosis.

Safety measures for Invasive Procedures

An obtrusive method is characterized as careful passage into Pits ,tissues, organs, fix of major horrendous wounds in a delivery or an operating room, outpatient setting, emergency department, dentists and physicians offices, cardiac catheterization and angiographic procedures ,vaginal delivery or a cesarean or other procedure or the removal or cutting of any perioral tissues or oral, and other structure, during which bleeding occurs or the potential for bleeding exists. The universal body fluids and blood precautions listed above, combined with the preventive measures which are listed below, should be the minimum preventive measures taken for all procedures.

All medical workers who partake in invasive procedures should regularly utilise proper barrier precautions to forestall mucous-membrane and skin contact with all body fluids and blood of all patients. Surgical masks and Gloves ought to be worn for all medical procedures. Face shields ought to be worn for procedures that commonly result in production of bone chips, splashing of blood and droplets, pinafore (gowns) made of materials that give a compelling hindrance ought to be worn during procedures that that are probably going to bring about the sprinkling of blood or other body liquids. People who carry out vaginal and cesarean deliveries should wear gowns and gloves when handling the placenta or the infant until blood and amniotic fluid have been removed from the infant's skin and should wear gloves during post-delivery care of the umbilical cord.

On the off chance that a glove is ruptured and injury happens, the glove ought to be taken out and another glove utilized as quickly as quiet security allows; the needle or instrument associated with the occurrence ought to likewise be eliminated from the sterile field.

**Safety measures while performing Autopsies**

Notwithstanding the general blood and body-liquid safety measures recorded over, the accompanying safeguards ought to be utilized by people performing post mortem procedures:

All individuals who are assisting in or performing the postmortem procedures should wear waterproof aprons, gowns, face shield ,masks and gloves.

Surfaces and Instruments which are contaminated during the procedure of postmortem should be sterilized and cleaned with an appropriate Disinfectant.

**Safety measures for Laboratories ****

Body fluids and Blood from inpatient or outpatient ought to be considered infective. To enhance the widespread blood & bodily fluids precautionary measures recorded over, the

accompanying safeguards are suggested for medical workers in clinical research facilities. All samples of body fluids and blood ought to be placed in a container with a protective lid to stop spilling of samples while transferring it from one place to another. Individuals processing body fluids and blood samples ought to wear gloves. Face shield and Mask ought to be worn if mucous-membrane contact with body fluids or blood is expected. For microbiological culturing, routine techniques, like pathologic investigation and histologic , a biological safety cabinet is not necessary. Anyhow safety cabinets are to be utilised for procedures that have a high chance for producing droplets.

Mouth pipetting should be avoided and pipetting devices should be made mandatory in the laboratory. Utilization of syringes and needles ought to be restricted to circumstances in which there is no other option and the recommendations for preventing injuries with needles outlined under universal precautions should be followed. The working area of the Laboratory ought to be cleaned with suitable cleansing agent after a spill of body fluids or blood. And after completion of the work. Infected stuff which are utilised in laboratory testing ought to be decontaminated Prior to reutilize or discarded as per institution strategies for Removal of contaminated waste [10]. Equipment which has been infected with body fluids or blood ought to be cleaned with disinfectant prior to being fixed in the laboratory or moved to the manufacturer. Individuals who are working in a laboratory should wash and clean their hands after performing lab activities and should take off the PPE Prior to exiting the laboratory. A number of studies on different aspects of HIV and AIDS were reviewed[11-15].

**Conclusion:**

By and large, HIV anticipation programs have zeroed in essentially on creating hazard decrease intercessions for individuals who are at high danger for getting tainted with HIV. Antiretroviral therapy exists for patients who are suffering from HIV infection as far as vaccine is concerned the cure is far away the treatment focuses on decreasing the viral load upto an extent that the patient cannot spread disease to another. By using preventive methods health care workers can prevent the transmission of HIV infection among them, as well as by spreading awareness among people about the disease can stop the spread of HIV.

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