

# An audit on HIV infection

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## 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

Comment [J1]: What does this mean?

Comment [J2]: Biosafety

Comment [J3]: cabinets

## Introduction:

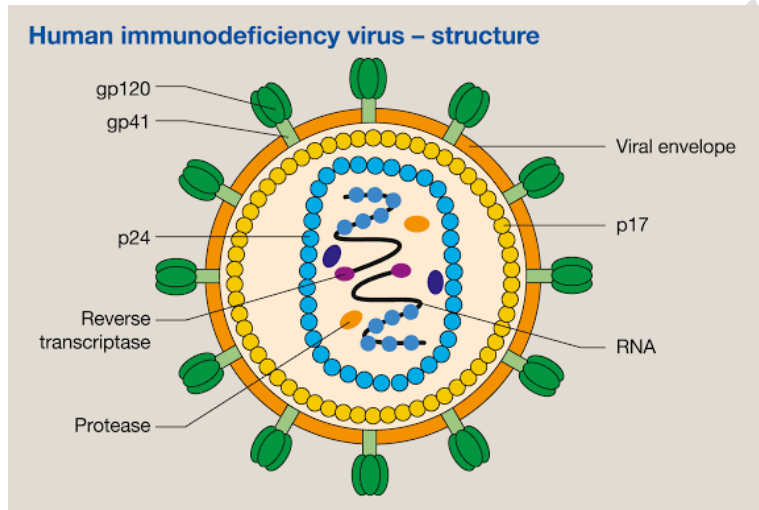
Human immunodeficiency virus is a virus which causes infection only in humans and is only transmitted from humans to humans. Zoonotic transmission does not take place. Normally a healthy individual has a defence mechanism which protects an individual from disease causing organisms. But one who has got 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.

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

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#### Structure



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#### GP 120

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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.

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#### GP41

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

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#### 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.

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#### 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.

75  
76 P24  
77 It is a viral capsid protein and it plays an important role in HIV pathogenesis.  
78 It makes most of the viral core.  
79  
80 RNA  
81 It stands for Ribonucleic Acid and most of the viruses store their genetic material on single  
82 stranded RNA . Genes of Human Immunodeficiency virus consist of RNA [2].  
83  
84 Causes  
85  
86 It results from unprotected sex between two people and gets transmitted to a healthy person. The  
87 human immunodeficiency virus damages the immune system and makes it weak so that it cannot  
88 fight infection.  
89  
90 Infection is caused by the following ways:  
91  
92 a. HIV can be transmitted through the prenatal route from mother to the offspring during  
93 breastfeeding, birth and pregnancy.  
94 b. Person suffering from syphilis, gonorrhea and herpes increases the risk of HIV  
95 transmission.  
96 c. Sexual intercourse (oral and vaginal)  
97 d. Sharing the same needles among the drug addicts and patients.  
98  
99 TRANSMISSION  
100  
101 HIV transmission takes place in 3 ways  
102 ● By sexual intercourse  
103 ● Transfusion of HIV infected blood and its components.  
104 ● contaminated needles  
105 ● And from mother to offspring.  
106  
107 Pre transfusional test and screening test has prevented the transmission of HIV or other  
108 pathogens from blood and it's components in most developed nations.  
109  
110 Meanwhile, sharing needles among drug addicts is at high risk of getting HIV.  
111  
112 13 to 35 percent of HIV infected pregnant mothers will transfer the infection to their child.  
113 Lactating mothers suffering from HIV infection have high levels of HIV in their breast milk.  
114  
115 Transmission of HIV through fecal-oral route, aerial, insect bite or casual contact is not possible.  
116 Needle prick injury to health workers is the primary cause of spreading HIV infection. HIV  
117 cannot be transmitted from saliva though it contains less amount of virus. It cannot be spread by  
118 kissing an infected person.  
119 The HIV can transmitted from one to another through body fluids like:  
120 ● Breast milk.

- 121 • Semen or seminal fluid,  
122 • Vaginal secretions,  
123 • Blood including menstrual blood.  
124 Activities That Allow HIV Transmission  
125 • Unprotected sexual intercourse allow transmission of HIV  
126 • Direct blood contact through contaminated needles, contaminated machines, transfusion of  
127 infected blood and it's blood product.  
128 • Human immunodeficiency virus can be transmitted through the prenatal route from mother to  
129 the offspring during breastfeeding, birth and pregnancy.  
130 [2].  
131  
132

133 | The infection can't go through intact skin. The mucous layers of rectum, mouth, vagina and  
134 urethra act as entry points for the virus when it comes in contact with the mucous membrane.  
135

136 Injury to the mucous layer may build the possibility of spread of Human Immunodeficiency  
137 Virus yet isn't required for transmission to occur.  
138

139 Transmission of contaminated Blood:

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

- 142 • subcutaneous route  
143 • intramuscular route  
144 • And intravenous route.  
145

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

- 147  
148 • Transfusion of contaminated blood and it's components.  
149 • unsterilized Needle sharing.  
150

151 There are high chances of Transmission of HIV infection which depends on the access of the  
152 infected body fluids to the t4 cells. The amount of infected body fluids which are transfused into  
153 the body and the amount of HIV present in the body fluid. Body Fluids which are high in  
154 concentration of Human Immunodeficiency Virus are: Blood and its components, breast milk,  
155 vaginal fluids, menstrual flow pre ejaculatory fluid Semen. Nasal mucosa, saliva, pus, urine, tears  
156 Feces and vomiting are the bodily fluids which are lower in concentration of human  
157 immunodeficiency virus.  
158

## 159 INDICATIONS

160 Individuals who are infected with human immunodeficiency virus are asymptomatic.  
161  
162

163 Ongoing proof reveals that about seventy to ninety percent of individuals who are infected with  
164 Human immunodeficiency virus show symptoms similar to influenza inside half a month. The  
165 most well-known indications are a rash and fever and sore throat all happening simultaneously.  
166

167 These manifestations in a generally Healthy individual might show later HIV infection.  
168 Individuals who are infected with Human immunodeficiency virus may get oral candidiasis and  
169 vaginal candidiasis that does not disappear or that happen regularly. Successive and serious  
170 herpes infections that cause genital,mouth or butt-centric wounds are additionally normal.  
171 Shingles is bound to happen in HIV Infected individuals. Other respiratory infections or so called  
172 abnormal mycobacterial diseases can be fatal.

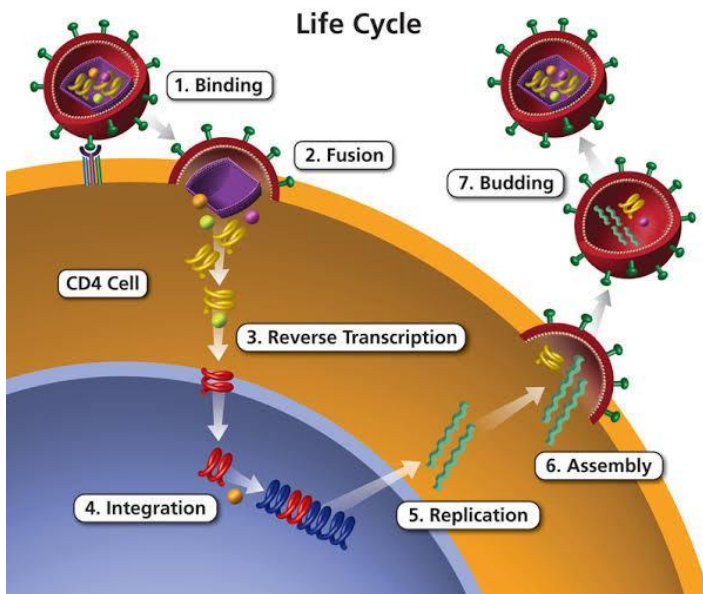
173 Ladies might get a pelvic infection that doesn't react to therapy. The infection might attack the  
174 sensory system (spinal cord,cerebrum and nerves) and give rise to a wide range of symptoms  
175 from paresthesia and trouble walking to memory disturbance [3].

176  
177 **Manifestation**

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

188  
189 **Life cycle of Human Immunodeficiency virus**

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194  
195 Entry into the body's cells  
196  
197 HIV is the only virus which replicates rapidly inside the cells or makes duplicate copies of itself  
198 when present in human cells. The cycle initiates when this virus invades into a cell that carries  
199 an integral membrane protein that is a cluster of differentiation 4. Human immunodeficiency  
200 virus adheres to the cluster of differentiation 4 receptors and furthermore allows them to  
201 merge. The virus predominantly targets the Immune system that includes the cells of the  
202 defence mechanism of the body which are the building blocks of the immune system in human  
203 body structure. HIV infects more and more immune system cells which results in making the  
204 defence mechanism weaker and weaker and making the body vulnerable to other infections  
205 which include bacterial, fungal, viral and parasite infections.  
206  
207 Reverse transcription  
208  
209 Reverse transcriptase is the enzyme which helps in the process of reverse transcription.  
210 Conversion of Ribonucleic Acid to deoxyRibonucleic Acid takes place with the help of this  
211 enzyme. After which DNA is introduced into cell by an enzyme which is known as integrase or  
212 enzyme integrase  
213  
214  
215  
216 Transcription and translation  
217  
218 The virus gets converted into messenger RNA by the process of transcription and translation.  
219  
220  
221 Assembly, budding and maturation  
222  
223 Newly made Copies or duplicates assemble with recently made Human Immunodeficiency virus  
224 nucleic acid and conjugated proteins to form new daughter cells, which are later split from the  
225 Cluster of differentiation 4 cells where it was attached. The proteolytic enzyme breaks down  
226 HIV into smaller sections. The virus which was formed recently will target the cells with CD4  
227 receptors [4].  
228  
229  
230 Investigation  
231  
232 The serum and saliva is tested for antibodies against HIV. But it requires more time to produce  
233 antibodies and may take up to twelve weeks to develop the antibodies.  
234  
235 A recently developed test that screens for HIV foreign substance, a substance which is created by  
236 the HIV followed by an infection, can rapidly affirm the results after the infection Or  
237 contamination [5].  
238  
239 Tests given below are for detection of Human Immunodeficiency virus:

240  
241 **RAPID HIV SELF TEST**  
242  
243 A FDA-approved home test. A swab is taken from the lower and upper gums. If you are tested  
244 positive you will have to consult the doctor and confirm the test.  
245 If you are tested negative you will have to repeat the test after 90 days.  
246  
247 **Tests To Tailor Treatment**  
248  
249 If you are tested positive you should do the following test given below:  
250  
251 **Total CD4 count**  
252  
253 This test determines the total number of CD4 cells present in the body and gives overall status of  
254 the immune system. It determines if the drugs given are working properly or not.  
255  
256 **Viral load**  
257  
258 It is a measure of total virus present in the body. It has been reported that a person with a high  
259 level of viral loads suggests that the virus is present and is multiplying rapidly and if the person  
260 is receiving ART and if the viral load is high it means that treatment you are getting is  
261 insufficient.  
262  
263 **Drug resistance**  
264  
265 Some strains are resistant to the certain antiretroviral drugs of HIV. This test will be able to  
266 analyse the strain of virus which is resistant to some of the antiretroviral drugs[6].  
267  
268 **Treatment**  
269  
270 Antiretroviral therapy is used to treat HIV infection which includes use of various anti retroviral  
271 drugs. This therapy specifically targets HIV and helps to reduce the viral loads of an individual.  
272 It has been seen that people who are having low viral loads have no risk of transmitting the HIV  
273 to another.  
274  
275 Given below are the anti-retroviral drugs:  
276  
277 1. NRTIs: Tenofovir, Didanosine, stavudine, Lamivudine, Emtricitabine.  
278 2. Non Nucleoside reverse transcriptase inhibitors: Nevirapine, Delavirdine, Efavirenz.  
279 3. Protease inhibitors: darunavir, tipranavir, fosamprenavir, ritonavir.  
280  
281 **NRTIs:**  
282  
283 NRTIs are the drugs which are one of few classes of anti HIV drugs .  
284

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

290

291 NNRTIs

292

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

297

298 HAART

299

300 HAART is antiretroviral therapy and is named as highly active antiretroviral therapy . HIV type  
301 1 is treated by this therapy which includes use of multiple antiretroviral drugs.

302

303 Prevention

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

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315 Universal precaution among medical workers:

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

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

333

334 **Safety measures for Invasive Procedures**

335

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

344

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

355

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

359

360

361

362 **Safety measures while performing Autopsies**

363

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

366

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

369

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

372

373 **Safety measures for Laboratories \*\***

374

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

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

385 Mouth pipetting should be avoided and pipetting devices should be made mandatory in the  
386 laboratory. Utilization of syringes and needles ought to be restricted to circumstances in which  
387 there is no other option and the recommendations for preventing injuries with needles outlined  
388 under universal precautions should be followed. The working area of the Laboratory ought to be  
389 cleaned with suitable cleansing agent after a spill of body fluids or blood. And after completion  
390 of the work. Infected stuff which are utilised in laboratory testing ought to be decontaminated  
391 Prior to reutilize or discarded as per institution strategies for Removal of contaminated waste  
392 [10]. Equipment which has been infected with body fluids or blood ought to be cleaned with  
393 disinfectant prior to being fixed in the laboratory or moved to the manufacturer. Individuals who  
394 are working in a laboratory should wash and clean their hands after performing lab activities and  
395 should take off the PPE Prior to exiting the laboratory. A number of studies on different aspects  
396 of HIV and AIDS were reviewed[11-15].

397

#### 398 **Conclusion:**

399

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

407

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