e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

# HUMAN IMMUNODEFICIENCY VIRUS AND ITS TREATMENT

**Gayatri Anil Patil[*1], Tejasvinee Sahebrav Chaudhari[*2], Vaibhav Narayan Desale[*3], Saeed Ahemad[*4], Habiburrheman Shaikh[*5], Dr. Swapnil D. Deo[*6]**

[*1,2,3,4,5,6]Dr. Uttmarao Mahajan Collage Of Pharmacy, India.

## ABSTRACT

The Human Immunodeficiency Virus (HIV) is responsible for causing Acquired Immunodeficiency Syndrome (AIDS). HIV/AIDS has always been one of the most completely global of diseases. More than 75 million people worldwide have been infected with HIV and there are now approximately 37 million individuals living with infection. The HIV virus is transmitted to other organism when they come in contact with various fluids of infected person. There are two know type of HIV, which are deeply related, named as HIV1 and HIV 2. Untreated HIV replication causes progressive $CD4^+$ T cell loss and wide range immunological abnormalities leading to an increased risk of infection and oncological complication. HIV infection also contributed to cardiovascular disease, bone disease, renal and hepatic dysfunction and several other common morbidities. Most of this condition are opportunistic infection caused by bacteria, fungi, viruses and parasites that are normally controlled by elements of human system that HIV damage.

**Keywords:** HIV, Immune System, Mode Of Transmission, Symptoms, Treatment.

## I. INTRODUCTION

HIV stands for human immunodeficiency virus. AIDS stands for acquired immunodeficiency syndrome. HIV H-It infects just human beings and also transmitted between humans not from animals. It is not transmitted from bites of mosquitoes, bats or any other species. I-The body has immune system whose function is to protect our body from germs, infections etc. But a person suffering from HIV has inability to oppose against diseases. However, immune system becomes deficient. V-Virus is a small, simplest thing which is in inactive form outside the body and becomes active when it goes inside human body(1,2,3).The human immunodeficiency virus (HIV) is an enveloped retrovirus that contain 2 copies of a single stranded RNA genome. It causes the acquired immunodeficiency syndrome (AIDS) that is the most recent stage of HIV disease. Two to four weeks after HIV enter the body, the patient may complain of primary infection (cur1) HIV is a virus that causes AIDS as normal our body has immune system that attack viruses and bacteria. Immune system has white blood cells which protect us from infections. White blood cells contain CD4+ cells which is also known as helper cells or T cells. A person who is infection will be able to develop. These infections take advantage of body's immune system. These infections cause several health problems and even lead to death of a person (4). HIV infection is through the transfer of viral particles present usually in the blood, semen, vaginal fluid of an infected individual to another uninfected and condom use one of the main prevention means vertical transmission is also a form of contagion, where there is transfer of the mother's virus to her child during pregnancy, childbirth(5). After buy the viral envelope glycoproteins virus reach the defense cells, causing immunological changes, the main lymphopenia caused by direct lysis of CD4 + T lymphocytes (CD - Cluster of Differation, specific group number 4), leading to functional defects in immune system. Treatment is by means of antiretroviral drugs (ARVs) which aims to block HIV replication cycle. HIV primarily targets CD4+ T cells. After transmission event, HIV takes hold in the mucosal tissue, and within days spreads to the lymphoid organ (6). At about day 10, the virus becomes detectable in the blood and then continuous to spread exponentially over the next few weeks, often peaking about day 30, when HIV antibody levels becomes detectable.

## II. STRUCTURE OF HIV VIRUS

- Gp120: Its molecular weight of 120 gives rise to its name. Due to its critical involvement in attachment to certain cell surface receptors, it is necessary for virus entrance into cells.
- GP41: It is a component of the complex of retroviruses' envelope proteins, which also includes the human immunodeficiency virus. It is a class of enveloped viruses that employ reverse transcriptase to replicate within the host cell. It goes after the host cell.
- Viral envelope: The envelope is where the virus attaches itself.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

- P17: Protein is used to make the viral core. It looks like a bullet. The three enzymes reverse transcription, integrase, and protease are necessary for HIV replication.
- P24: A part of the HIV capsid is P24.
- Protease: This retroviral enzyme is necessary for HIV, the retrovirus that caused AIDS, to complete its life cycle. The nature protein components of the infectious HIV virion are created when this enzyme appropriately cleaves newly generated polyproteins.
- Integrase: A retrovirus-produced enzyme that facilitates the integration of the virus' genetic material into the DNA of infected cells.
- RNA: Long strands of DNA are the genetic building blocks of all living things, including the majority of viruses. Since RNA makes up their genes, retroviruses are an exception (5,7,8).

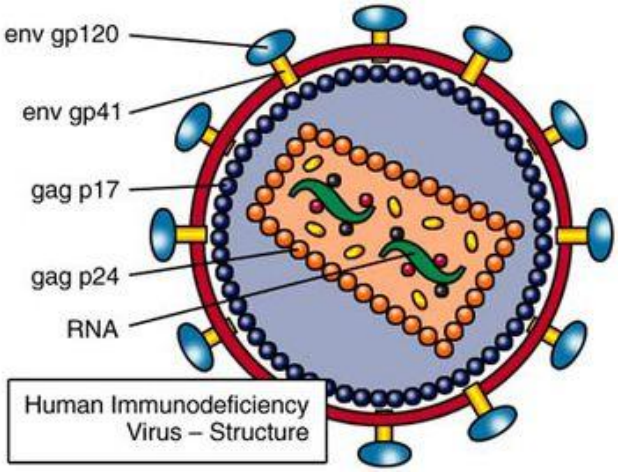


**Fig.1** HIV Virus

## III. CAUSES

Sexual contact between two people spreads the HIV virus. A virus is HIV. When a person contracts HIV, the virus weakens and destroys their immune system, making it incapable of fending off diseases. Sharing drug needles or syringes is one of its causes.

b. Oral, vaginal, or oral contact with an HIV-positive person.

c. It appears that having other STDs such syphilis, herpes, chalmydia, gonorrhea, and pelvic inflammatory disease increases the risk of contracting HIV through unprotected sex with an infected partner.

d. Babies can contract HIV from mothers who are HIV-positive while they are pregnant, giving birth, or nursing.

f. By utilizing the same tattoo supplies (7,8).

**Mode Of Transmission:**

HIV can be spread primarily through three different routes: sexual contact, blood transfusion, infected needles, and transmission from mother to child. In spite of the fact that gay interaction continues to be a significant source of HIV in the United States, "heterosexual transmission is the most important means of HIV spread worldwide today." In developed nations, the risk of HIV transmission via tainted blood products has almost been eradicated through treatment and donor screening, but it is still present among intravenous drug users who share needles. Contaminated blood and needles continue to be significant sources of illness in impoverished nations. It is estimated that 13–35% of HIV-positive expectant mothers will transmit the illness to their unborn children; transmission can happen both before and after birth. The virus has also been detected in large amounts in the breast milk of infected mothers. HIV cannot be spread through the fecal-oral route, aerosols, insects, or casual touch such as hugging or sharing household items. For medical professionals, direct inoculation through needle sticks is the biggest risk. Even while the virus can exist in trace levels in saliva. Blood (including menstrual blood),Semen, Vaginal discharge and other bodily fluids are all routes by which HIV can spread from one infected person to another (8,9).

**Activities That Allow HIV Transmission**

• unauthorized sexual encounters

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

• Direct blood contact, such as through drug injection needles, blood transfusions, mishaps in medical facilities, or specific medical goods.

• The baby's mother, either before or after birth(2,3)

**Membranes:**

The virus cannot enter in the body of healthy skin. HIV can enter the body through the mucous membranes that line the mouth sometimes, the rectum, the urethra, and the vagina. Although it's not a requirement for HIV transmission to happen, mucous membrane damage may enhance the likelihood of transmission.

HIV can be transferred through intravenous, intramuscular, or subcutaneous.

Injections of infected blood that enter the bloodstream directly.

Transfusion of tainted blood and blood products, as well as sharing of unsterilized hypodermic needles and syringes, are two ways that blood-to-blood transmission happens.

**The risk of HIV Transmission is dependent on:**

• The concentration of HIV in the infected fluid.

• The QUANTITY of fluid introduced into the body.

• The ACCESS of the infected fluid to the t4 cells.

**Fluid with high concentration of HIV:**

• Semen,

• Blood and blood components,

• Menstrual flow,

• Vaginal secretions,

• Pre ejaculatory fluid,

• Breast milk.

## IV. SYMPTOMS

- Many HIV-positive individuals may not exhibit any overt symptoms or indicators. According to recent data, between 70% and 90% of individuals who have HIV develop flu-like symptoms a few weeks following infection. The most typical signs include a fever, rash, and a very bad sore throat that all appear at the same time. These symptoms could point to a recent HIV infection in a person who is otherwise healthy.
- Patients who are infected are more prone to develop herpes zoster (shingles). Atypical mycobacterial infections or pneumonia.
- Large lymph nodes or "swollen glands" that may be enlarging for longer than three months, frequent fevers and sweats, skin rashes, or flaky skin that does not go away, short-term memory loss, or sluggish growth or recurrent illness in youngsters are all symptoms to watch out for.
- shortness of breath and a cough; seizures and unsteadiness; discomfort or pain with swallowing; confusion and amnesia; seizures and lack of coordination; nausea, cramps, persistent diarrhea or vomiting, vision loss,
- Unaccounted-for weight reduction.(5,10)

## V. LIFE CYCLE OF HIV

**Entry to human cells:** The only virus that replicates itself inside human cells is HIV. This process starts when the virus enters a cell that has the cd4 protein on its surface. The cd4 receptor and the HIV virus are able to bind together and merge. T-helper cells, which make up the body's immune system, are the immunological cells that HIV mostly infects. HIV spreads to additional cells, weakening the immune system.

**Reverse transcription:** It is the process of changing RNA-based genetic information into DNA. Reverse transcriptase, an enzyme released by the virus, is used to translate its RNA into DNA. This procedure enables the genetic material of the virus to enter the nucleus of your CD4 cells.

**Integration:** After HIV transforms its RNA into DNA, it releases an additional enzyme called integrase inside the CD4 cell's nucleus. These enzymes are used by the virus to join its DNA to the DNA of your CD4 cell.

**Translation and transcription**: Transcription is now happening. Messenger RNA is created when the HIV virus is transformed.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

**Virus Assembly:** New HIV protein and RNA are delivered to the edge of your CD4 cell during the virus assembly stage, where they develop into immature HIV. In its current state, this virus is not contagious.

**Budding:** During the budding stage, your CD4 cell is pushed aside by the developing viruses. The virus is subsequently modified by an enzyme called protease, which results in a more developed and contagious variant (11).

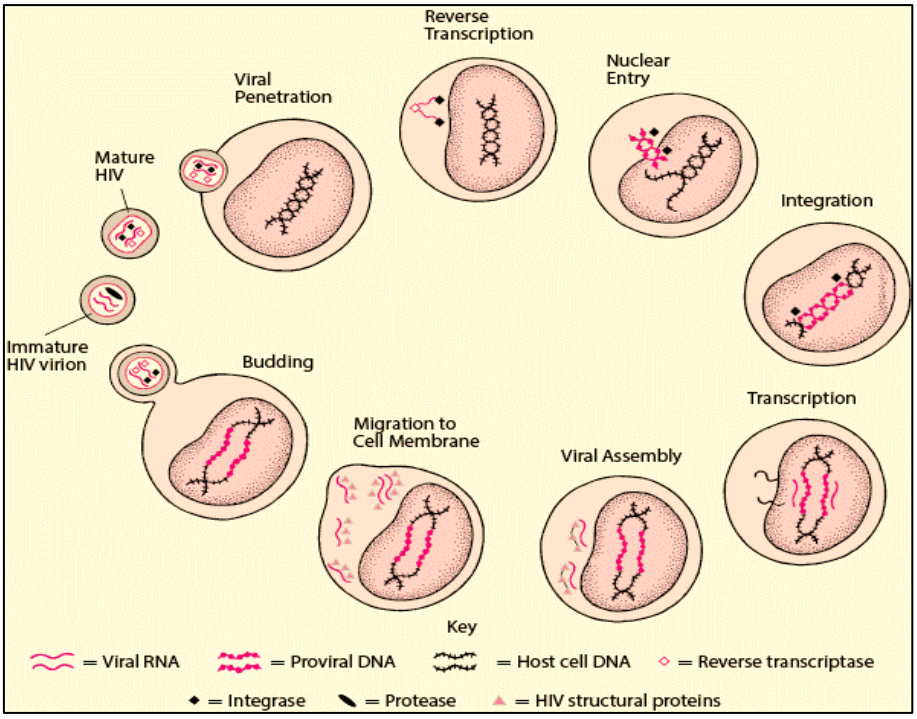


**Fig .2** HIV Life Cycle

## VI. DIAGNOSIS

There are numerous tests available to correctly identify HIV infection. Understanding the natural history of HIV infection will help you choose the best test for a particular clinical presentation. Before the formation of viremia at day 5, during the "eclipse" period, infection cannot be identified. By days 6 to 8, a nucleic acid amplification test (NAAT) can identify the infection. Between days 13 and 20, viral proteins (p24 antigen) can be discovered. By day 20, IgM-type antibodies can be detected, and IgG-type antibodies can be found by day 30. The majority of individuals eventually seek medical attention when tests for nucleic acid and antibodies are both positive. Combination antigen-antibody tests, which use the p24 antigen to detect individuals in the early stages of infection, are becoming the norm in hospital and commercial laboratories due to the high cost of NAAT. Antibodies are recognized by an indication after they bind to antigens. Rapid tests are quick and simple to conduct and can be performed using whole blood (between 10 and 50 mL) obtained either a fingerstick or an oral swab (12,13).

## VII. TREATMENT

Antiretro virals drug are used to treat HIV. These medications are effective against the retrovirus known as the human immunodeficiency virus (HIV). They aid in extending and raising quality of life. Antiretro viral drugs are classified as following:

1) Nucleoside reverse transcriptase inhibitors (NRTIs): Zidovudine (AZT), Didanosine,Lamivudine, Tenofovir.

2) Nonnucleoside reverse transcriptase inhibitors: Nevirapine, Delavirdine, Efavirenz.

3) Protease inhibitors: Indinavir, Nelfinavir, Amprenavir, Lopinavir, Atazanavir.(1,2)

**Mechanism:**

**Nucleoside reverse transcriptase inhibitors (NRTIs)**- It is stop reverse transcriptase, an enzyme that contributes to HIV transmission. HIV converts RNA into DNA through a process known as reverse transcription. When reverse transcriptase and reverse transcription are inhibited, HIV cannot multiply.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
( Peer-Reviewed, Open Access, Fully Refereed International Journal )
Volume:05/Issue:10/October-2023 Impact Factor- 7.868 www.irjmets.com

- **Zidovudine-** Zidovudine is a prodrug that needs to be phosphorylated in order to become its active 5′-triphosphate metabolite, zidovudine triphosphate (ZDV-TP). It is analog of thymine, After the nucleotide analogue is incorporated, it causes DNA chain termination, which reduces the activity of HIV-1 reverse transcriptase (RT).It combines with viral DNA and outcompetes the natural substrate dGTP. Additionally, it is a negligible inhibitor of cellular DNA polymerase enzymes.

**Non-nucleoside reverse transcriptase inhibitors (NNRTIs)-** The HIV reverse transcriptase, an enzyme that is a component of the virus, is attached and inhibited. HIV converts RNA into DNA through a process known as reverse transcription. When reverse transcriptase and reverse transcription are inhibited, HIV cannot multiply.

- **Nevirapine:** It inhibits HIV-1 non-nucleoside reverse transcriptase (NNRTI). By disrupting the enzyme's catalytic site, nevirapine binds directly to reverse transcriptase (RT) and inhibits both the RNA-dependent and DNA-dependent DNA polymerase activities.

## VIII. CONCLUSION

In this review we have concluded that, The HIV epidemic has caused scientists, doctors, health care professionals, and the public to relized that the new environment of the disease may still occur. The country needs to be prepared for a deadly disease whose cause is unknown but whose spread indicates that it is infectious disease.. The social study can contribute to a better understanding of the complexities of the HIV/AIDS and improve prevention and effective and appropriate prevention, care. HIV prevention programs groups at high risk of HIV infection. Although there are millions of people in the United States are at "behavioral risk" for HIV infection, transmission can only occur from an infected person.

## IX. REFERENCES

[1] Abbas AK, Lichtman AH, Pillai S. Imunologia celular molecular. 7. ed. Rio de Janeiro: Elsevier; 2011. Cap 20;458-70.
[2] Murphy K, Travers P, Walport M. Imuno biologia de Janeway. 7. ed. Porto Alegre: Artmed; 2010. Cap 12;525-44.
[3] Balestieri FMP. Imunologia básica. São Paulo: Manole, 2009.
[4] Coffin, J. M. Molecular biology of HIV. In The Evolution of HIV, ed. K. A. Crandall, 1999; 3-40
[5] Friedland, G. and Klein R. Transmission of HIV. Nejm 1987; 317:18: 1125-1135.
[6] Haase, A. T. Perils at mucosal front lines for HIV and SIV and their hosts. Nat. Rev. Immunol. 5, 783–792 (2005).
[7] Downs, A.M. and De I. Vincenzi. Probability of heterosexual transmission of HIV: relationship to the number of unprotected sexual contacts. Europeon study Group in heterosexual transmission of HIV. J. A cquir Immune Defic Syndr Hum Retroviral 1996; 11(4): 388-95.
[8] Amborzia, J. and Levy J. A. Epidemiology, natural history and Pathogenesis of HIV Infection. In Sexually Transmitted Diseases, 3d ed, ed. K.K. Holmes, P.F. Sparling, P.A. Mardh, S.M. Lemon, W.E. Stamm, P. Piot, and J.N. Wasserheit, 1998; 251–58.
[9] Pope, M. and Haase, A. Transmission; acute HIV-1 infection and the quest for strategies to prevent infection. Natural Medicine 2003; 9(7): 847–852.
[10] DiNenno EA, Prejean J, Irwin K, et al. Recommendations for HIV screening of gay, bisexual, and other men who have sex with men — United States, 2017.MMWR Morb Mortal Wkly Rep 2017;66:830-2.
[11] Jill Seladi-Schulman, Ph.D. — By Daniel Yetman on November 16, 2021
[12] Dailey AF, Hoots BE, Hall HI, et al.Human immunodeficiency virus testing and diagnosis delays — United States. MMWR Morb Mortal Wkly Rep 2017;66:1300-6.
[13] Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. MMWR Recomm Rep 2006;55(RR-14):1-17
[14] Coico R, Sunshine G. Imunologia. 6. ed. Rio de Janeiro: Guanabara Koogan S.A; 2010. Cap 17; 268-74.
[15] Benjamini E, Coico R, Sunshine G. Imunologia. 4. ed. Riode Janeiro: Guanabara Koogan S.A; 2002. Cap 1;1-8.
[16] Arruda LB. Caracterização molecular da gp120 do HIV-1e suas implicações sobre o tropismo pelos correceptoresCCR5 e CXCR4 [tese]. São Paulo: UniversidadedeSãoPaulo; 2014 Disponívelem:

http://www.bv.fapesp.br/pt/bolsas/113005/caracterizacao-molecular-da-gp120-do-hiv-1-e-suas-implicacoes-sobre-o-tropismo-pelos-correceptores-c/

[17] Santos MLA, Albuquerque MG, Brito MA. Integrase: Umalvo terapêutico importante no combate à infecção HIV/AIDS. Rev Virtual Quim. 2014; 6(4):937-54.Dis-ponívelem: http://www.uff.br/RVQ/index.php/rvq/article/download/567/444&rc=j&frm=1&q=&esrc=s&sa=U&ei=TpBrVLegDsWogwT9_YII&ved=0CBYQFjAA&usg=AFQjCNHLFkKAviTGkbN4KbgYGDZq_Pcpxg

[18] Vanni AC. Análise das características genéticas da regiãoV3 e do tropismo pelos co-receptores CCR5 e CXCR4 doVírus da Imunodeficiência Humana tipo 1 subtipos B, C erecombinantes BC através de ferramentas genotípicas [Dissertação]. Rio Grande do Sul: Universidade Federaldo Rio Grande do Sul; 2011. Disponívelem: http://www.lume.ufrgs.br/handle/10183/49271

[19] Hermes RB. Investigação dos polimorfismos nos genes FAS e FASL em indivíduos infectados pelo vírus daimunodeficiência humana-1 (HIV – 1). [Dissertação] [Internet]. Belém: Universidade Federal do Pará, Institutode Ciências Biológicas; 2009. Disponívelem: http://www.baip.ufpa.br/arquivos_baip/teses_dissertacoes/Renata_Bezerra_Hermes.pdf

[20] Ministério da Saúde (BR), Secretaria de Vigilância emSaúde - Departamento de DST, Aids e Hepatites Virais. Manual Técnico para o Diagnóstico da Infecção pelo HIV[Internet]. Brasília: Ministério da Saúde, 2014. Disponívelem:http://www.aids.gov.br/noticia/2014/manual-tecnico-para-o-diagnostico-da-infeccao-pelo-hiv-0

[21] Vielmo L, Campos MMA, Beck ST, Andrade CS.Atenção farmacêutica na fase inicial de tratamento daAIDS como fator importante na adesão aos antirretrovi-rais. Rev Bras Farm. 2014; 95(2):617-35. Disponívelem: http://www.rbfarma.org.br/files/646-Atencao-farmaceutica-na-fase-inicial-de-tratamento-da-AIDS-como-fator-importante-na-adesao-aos-antirretrovirais--FINAL.pdf.

[22] Greysen SR, Horwitz LI, Covinsky KE,Gordon K, Ohl ME, Justice AC. Does so-cial isolation predict hospitalization andmortality among HIV+ and uninfectedolder veterans? J Am Geriatr Soc 2013;61:1456-63.50. Lam A, Mayo NE, Scott S, BrouilletteM-J, Fellows LK. HIV-related stigma affects cognition in older men living withHIV. J Acquir Immune Defic Syndr 2019;80:198-204.

[23] Brown SR, Kennelly C. AAFP recom-mends universal screening for HIV infec-tion beginning at age 18 years of age. AmFam Physician 2014;89:614-7.

[24] Qaseem A, Snow V, Shekelle P, Hop-kins R Jr, Owens DK. Screening for HIV in health care settings: a guidance state-ment from the American College of Physicians and HIV Medicine Association. AnnIntern Med 2009;150:125-31.

[25] U.S. Preventive Services Task Force. Human immunodeficiency virus (HIV) in-fection: screening. Final recommendation statement. June 11, 2019 (https://wwwuspreventiveservicestaskforce.org/uspstf/recommendation/human-immunodeficiency-virus-hiv-infection-screening).

[26] Thompson MA, Horberg MA, AgwuAL, et al. Primary care guidance for per-sons with human immunodeficiency virus:2020 update by the HIV Medicine Association of the Infectious Diseases Society of America. Clin Infect Dis 2020 November 6(Epub ahead of print)

[27] Gardner LI, Marks G, Craw JA, et al. Alow-effort, clinic-wide intervention im-proves attendance for HIV primary care. Clin Infect Dis 2012;55:1124-34.

[28] Edelman EJ, Rentsch CT, Justice AC. Polypharmacy in HIV: recent insights and future directions. Curr Opin HIV AIDS2020;15:126-33.

[29] Verheij E, Kirk GD, Wit FW, et al. Frailty is associated with mortality and Incident comorbidity among middle-aged human immune deficiency virus (HIV)-positive and HIV-negative participants. J Infect Dis 2020;222:919-28

[30] Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data — United States and 6 dependent areas, 2018. HIV surveillance supplemental report. Vol. 25. No.2. May 2020. (https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-supplemental-report-vol-25-2.pdf).