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Study on " HIV & AIDS ": Review Article

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ABSTRACT

The HIV-1 pandemic is a complex mix of diverse epidemics within and between countries and regions of the world, and is undoubtedly the defining public-health crisis of our time. Research has deepened our understanding of how the virus replicates, manipulates, and hides in an infected person.

Although our understanding of pathogenesis and transmission dynamics has become more nuanced and prevention options have expanded, a cure or protective vaccine remains elusive. Antiretroviral treatment has transformed AIDS from an inevitably fatal condition to a chronic, manageable disease in some settings. This transformation has yet to be realised in those parts of the world that continue to bear a disproportionate burden of new HIV-1 infections and are most a% ected by increasing morbidity and mortality.

This Seminar provides an update on epidemiology, pathogenesis, treatment, and prevention interventions pertinent to HIV-1. HIV/AIDS has always been one of the most thoroughly global of diseases. The human immunodeficiency virus (HIV) is a lent virus that causes HIV infection and AIDS.

AIDS is a condition in humans in which progressive failure of the immune system allows life-threatening infections and cancers to thrive. Infection with HIV occurs by the transfer of blood, semen, vaginal fluid, breast milk. Within these bodily fluids, HIV is present as both free virus particles and virus within infected immune cells. HIV infects vital cells in the human immune system such as helper CD4 T cells, macrophages. HIV infection leads to low levels of T cells through a number of mechanisms, including pyroptosis of infected T cells.

Introduction

HIV stands for human immunodeficiency virus. AIDS stands for acquired immuno deficiency syndrome. HIV H-It infects only 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 fight 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.

AIDS

A-It is not inherited means it cannot be transmit from one generation to another. It is transmitted to healthy person by infected person.

I-It weakens the immune system.

D-Creates a deficiency of CD4+ cells in the immune system.

S-It is a collection of diseases.

HIV is a virus that causes AIDS. Normally, 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 infected 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. HIV has inability to protect against diseases and count of CD4 cells also decreases in HIV. There is no cure of AIDS but there are certain medicines which are use to slow down the diseases so you stay healthier for long time. There is no medicine to get rid of diseases [1]

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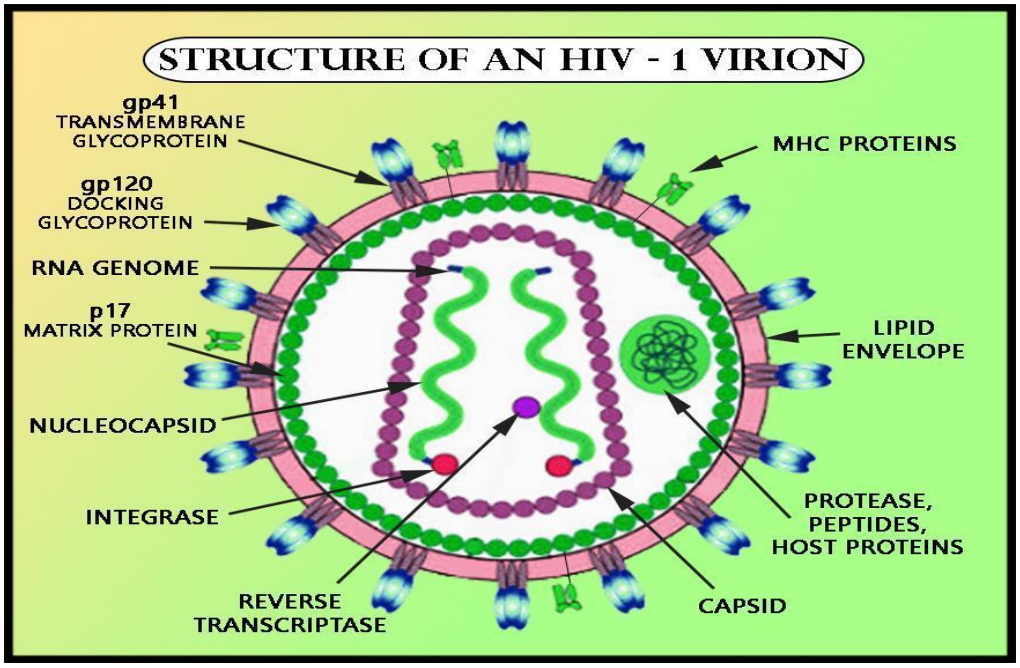
Structure of HIV Virus

- ***Gp120***

The 120 in its name comes from its molecular weight. It is essential for virus entry into the cells as it plays vital role in attachment to specific cell surface receptors.



- ***GP41***

It is a subunit of the envelope protein complex of retroviruses including human immuno deficiencies virus. It is family of enveloped viruses that replicate in host cell through process of reverse transcriptase. It targets a host cell.

- ***Viral envelope***

It is envelope through which virus binds.

- ***P17***

Viral core is made from protein. It is bullet shaped. Three enzymes required for HIV replication are reverse transcription, integrase and protease.

- ***P24***

P24 is component of HIV capsid.

- ***Protease***

It is a retroviral aspartyl protease that is essential for life cycle of HIV, the retrovirus that caused AIDS. This enzyme cleaves newly synthesized polyproteins at appropriate place to create nature protein components of infectious HIV virion.

- ***Integrase***

Enzyme produce by retrovirus that enables its genetic material to be integrated into the DNA of infected cell. RNA All organisms including most viruses store their genetic material on long strands of DNA. Retrovirus is exception because their genes are composed of RNA [2]. Causes It is caused by sexual contact from one person to another person. HIV is a virus. When someone becomes infected with HIV the virus weakens and damages their body's defence system (the immune system) so that it cannot fight off infections. It is cause by:

a) Sharing drug needles or syringes.

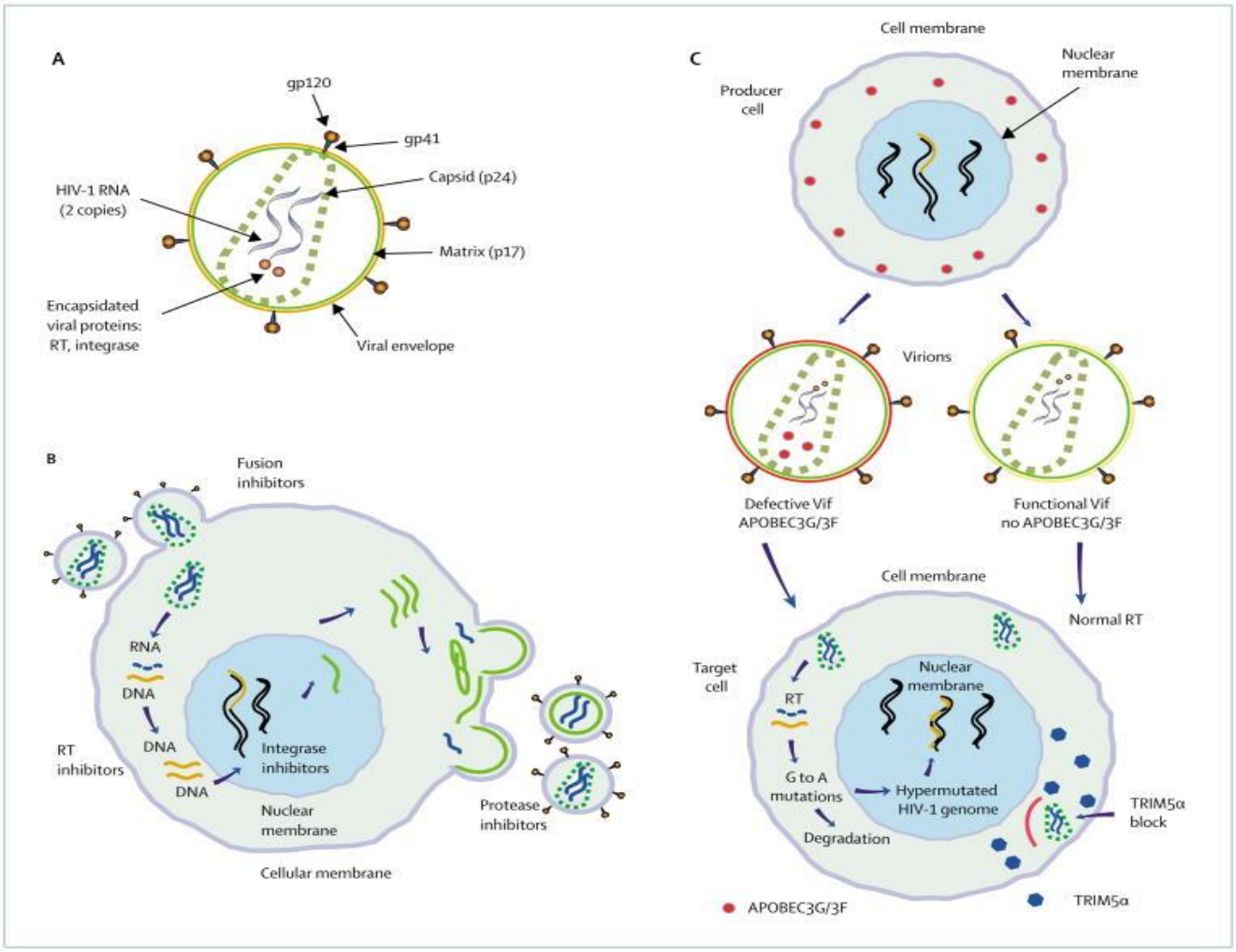
b) Sexual contact including oral, vaginal or oral who is HIV positive.
c) Having other sexually transmitted diseases such as syphilis, herpes, and gonorrhea seems to increase the risk of being infected by HIV during unprotected sexual contact with infected partner.
d) Babies can be infected by an HIV-positive mother during pregnancy, birth and breast feeding.

Pathogenesis of HIV-1

The worldwide spread of HIV-1 indicates that the virus effectively counteracts innate, adapted, and intrinsic immunity.41,42 Despite its modest genome size (less than 10 kb) and its few genes (figure 3), HIV-1 excels in taking advantage of cellular pathways while neutralising and hiding from the different components of the immune system.43–45 Notably, our understanding of pathogenesis is often derived from studies of subtype B viruses and non-human primate studies.

The HIV-1 life cycle is complex and its duration and outcome is dependent on target cell type and cell activation.46 In the early steps, HIV-1 gains access to cells without causing immediate lethal damages but the entry process can stimulate intracellular signal cascades, which in turn might facilitate viral replication.47,48

The two molecules on the HIV-1 envelope, the external glycoprotein (gp120) and the transmembrane protein (gp41), form the spikes on the virion's surface.49 During the entry process, gp120 attaches to the cell membrane by first binding to the CD4+ receptor. Subsequent interactions between virus and chemokine co-receptors (eg, CCR5, CXCR4) trigger irreversible conformational change.



The actual fusion event takes place within minutes by pore formation,50,51 and releases the viral core into the cell cytoplasm. After the core disassembles, the viral genome is reverse transcribed into DNA by the virus' own reverse transcriptase enzyme.46 Related yet distinct viral variants can be generated during this process since reverse transcriptase is error prone and has no proofreading activity.46 At the midpoint of infection, the viral protein integrase in conjunction with host DNA repair enzymes inserts the viral genome into gene-rich, transcriptionally active domains of the host's chromosomal DNA.52–54 An integrase binding host factor, LEDGF/p75 (lens epithelium-derived growth factor), facilitates integration,55,56 which marks the turning point by irreversibly transforming the cell into a potential virus producer.

In the late steps, production of viral particles needs host driven as well as virus driven transcription.46 Viral proteins are transported to and assemble in proximity to the cell membrane. Virus egress from the cell is not lytic and takes advantage of the vesicular sorting pathway (ESCRT-I, II, III), which

normally mediates the budding of endosomes into multivesicular bodies.57,58 HIV-1 accesses this protein-sorting pathway by binding TSG101 via its late domain, a short sequence motif in p6 of Gag.59,60 Cleavage of the Gag-Pol poly-protein by the viral protease produces mature infectious virions.
HIV is transmitted principally in three ways: By sexual contact, by blood through transfusion, blood products or contaminated needles or by passage from mother to child. Although homosexual contact remains a major source of HIV within the United States, "hetero sexual transmission is the most important means of HIV spread worldwide today." Treatment of blood products and donor screening has essentially eliminated the risk of HIV from contaminated blood products in developed countries, but its spread continues among intravenous drug users who share needles. In developing countries, contaminated blood and contaminated needles remain important means of infection. Thirteen to thirty-five percent of pregnant women infected with HIV will pass the infection on to their babies; transmission occurs before as well as during birth. Breast milk from infected mothers has been shown to contain high levels of the virus also. HIV is not spread by the fecal-oral route; aerosols; insects; or casual contact, such as sharing household items or hugging.
The risk to health care workers is primarily from direct inoculation by needle sticks. Although saliva contain small quantities of the virus, the virus cannot be spread by kissing. HIV can be transmitted from an infected person to another through:

- Blood (including menstrual blood),
- Semen,
- Vaginal secretions,
- Breast milk. Activities That Allow HIV Transmission
- Unprotected sexual contact
- Direct blood contact, including injection drug needles, blood transfusions, accidents in health care settings or certain health care products.
- Mother to baby (before or during birth) [2].

HIV is known to be transmitted only through:

- Contact of infected blood, semen, or vaginal and cervical secretions with mucous membranes.
- Injection of infected blood or blood products.
- Vertical transmission (that is, from infected mother to fetus) and from mother to infant via breast milk.

Contact of Sexual Fluids or Blood with Mucous Membranes:
The virus cannot pass through undamaged skin. HIV can enter the body through the mucous membranes that line the vagina, rectum, urethra, and possibly, on rare occasions, the mouth. Damage to a mucous membrane may increase the risk of transmission of HIV but is not necessary for transmission to occur. Injection of Infected Blood: HIV can be transmitted by infected blood getting directly into the bloodstream through intravenous, intramuscular, or subcutaneous injection. Blood-to-blood transmission occurs in the following ways:- • Transfusion of contaminated blood and blood products and other blood recipients. • Sharing of unsterilized hypodermic needles and syringes.

- Pus,
- Saliva,
- Tears,
- Urine, • Feces,
- Vomiting,
- Nasal mucosa.

Symptoms Many people who are living with HIV have no obvious signs and symptoms at all. Recent evidence shows that between 70% to 90% of people who become infected with HIV experience flu-like symptoms within a few weeks after infection. The most common symptoms are a fever, a rash and a severe sore throat all occurring at the same time. These symptoms in an otherwise healthy person may indicate recent HIV infection. HIV infected patients may get yeast infections (oral or vaginal) that do not go away or that occur often. Frequent and severe herpes infections that cause mouth, genital, or anal sores are also common. Herpes zoster (shingles) is more likely to occur in infected patients. Other pulmonary infections (pneumonia) or socalled atypical mycobacterial infections can be serious for your loved one. Women may get pelvic inflammatory disease that does not respond to treatment. The virus may attack the nervous system (nerves, spinal cord or brain) and produce a variety of symptoms ranging from tingling in the feet and trouble walking to memory disturbances [3].

Symptoms

- large lymph nodes or "swollen glands" that may be enlarged,
- for more than three months,
- frequent fevers and sweats skin rashes or flaky skin that does not go away,
- short-term memory loss,
- slow growth or frequent illness in children,
- cough and shortness of breath,
- seizures and lack of coordination,
- difficult or painful swallowing,
- confusion and forgetfulness nausea, cramps diarrhea or vomiting that do not go away,
- vision loss,
- Unexplained weight loss

Life Cycle of HIV AIDS

HIV attacks and destroys the CD4 cells (CD4 T lymphocyte) of the immune system. CD4 cells are a type of white blood cell that play a major role in protecting the body from infection. HIV uses the machinery of the CD4 cells to multiply and spread throughout the body. This process, which is carried out in seven steps or stages, is called the HIV life cycle.

The seven stages of the HIV life cycle:-

The seven stages of the HIV life cycle are

1) attachment,
2) fusion,
3) reverse transcription,
4) integration,
5) replication,
6) assembly, and
7) budding.

To understand each stage of the HIV life cycle, it is helpful to first visualize what HIV looks like.

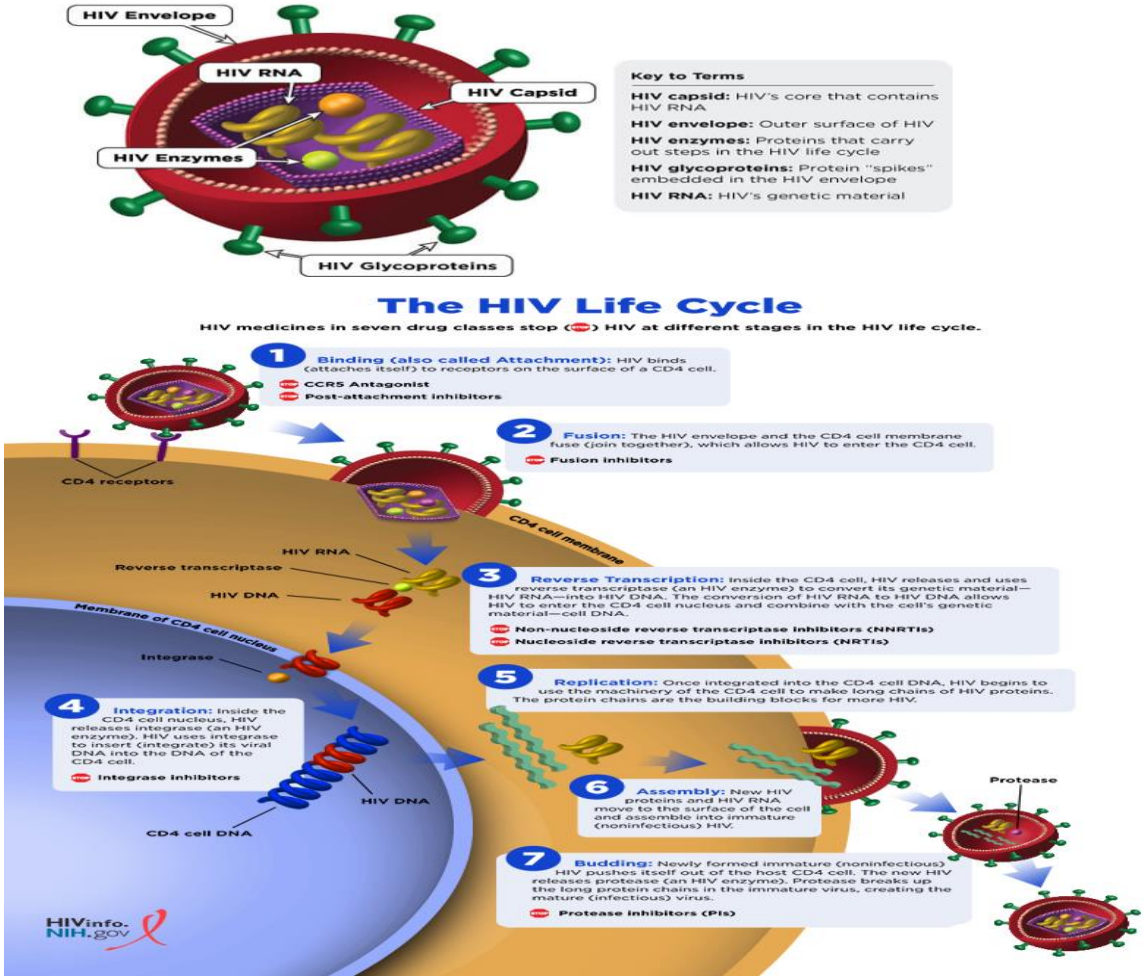
Diagnosis

HIV is most commonly diagnosed by testing your blood or saliva for antibodies to the virus. Unfortunately it takes time for your body to develop these antibodies-usually up to 12 week.

A newer type of test that checks for HIV antigen, aprotein produced by the virus immediately after infection, can quickly confirm a diagnosis soon after infection [5]. Following are the tests for detection of HIV AIDS:

Home Test

A Food and Drug Administration-approved home test. To do the test, you swab fluid from your upper and lower gums. If the test is positive, you need to see your doctor to confirm the diagnosis. If the test is negative, it needs to be repeated in three months to confirm the results.



Tests To Tailor Treatment

If you receive a diagnosis of HIV/AIDS, several types of tests can be done. These tests include:

- **CD4 count**

CD4 cells are a type of white blood cell that's specifically targeted and destroyed by HIV.

- **Viral load**

This test measures the amount of virus in your blood. Studies have shown that people with higher viral loads generally fare more poorly than do those with a lower viral load.

- **Drug resistance**

This blood test determines whether the strain of HIV you have will be resistant to certain anti-HIV medications [6]. Treatment Antiretroviral drugs are used to treat HIV. These are the drugs active against human immunodeficiency virus (HIV) which is a retrovirus. They are useful in prolonging and improving a quality of life.

Antiretroviral Drugs are Classified as Following:

Nucleoside Reverse Transcriptase Inhibitors

(NRTIs): Zidovudine (AZT), Didanosine,Lamivudine, Tenofovir.

Nonnucleoside Reverse Transcriptase Inhibitors:

Nevirapine, Delavirdine, Efavirenz. Protease inhibitors: Indinavir, Nelfinavir, Amprenavir, Lopinavir, Atazanavir.

Nucleoside Analogue Reverse Transcriptase Inhibitors

(NRTIs) were the first type of drug available to treat HIV infection in 1987. When HIV infects a cell, it copies its own genetic code into the cell's DNA, and the cell is then programmed to create new copies of HIV. To reproduce, HIV must first convert its RNA into DNA using the enzyme reverse transcriptase. These inhibitors act like false building blocks and compete with the cell's nucleosides, thereby preventing DNA synthesis.
Non nucleoside reverse transcriptase inhibitors (NNRTIs) started to be approved in 1997. These also interfere with HIV's ability to infect cells by targeting reverse transcriptase. In contrast to nucleoside analogue reverse transcriptase inhibitors, non nucleosides bind directly to the enzyme [7].

Haart

It is highly active antiretroviral therapy. HIV can also be treated by HAART. It is a combination of three drugs. Conclusion Historically, HIV prevention programs have focused primarily on developing risk reduction interventions for those at high risk for becoming infected with HIV. In 1999, a review of 55 state and city applications to the CDC for funds for HIV prevention programs demonstrated that only 18 (32.7%) listed HIV-infected individuals as a priority population for HIV prevention programs. Although there are millions of people in the United States at "behavioral risk" for HIV infection, transmission can occur only from people who are infected with the virus. As the number of individuals with HIV continues to increase because of ART, so does the urgency for lifelong prevention strategies customized for them.

References

1. Coffin, J. M. Molecular biology of HIV. In The Evolution of HIV, ed. K. A. Crandall, 1999; 3-40.
2. Friedland, G. and Klein R. Transmission of HIV. Nejm 1987; 317:18: 1125-1135.
3. 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.
4. 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.
5. https://www.medicalnewstoday.com/articles/17131#takeaway
6. Pettifor AE, Rees HV, Kleinschmidt I, et al. Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. AIDS. 2005;19:1525–34. [PubMed] [Google Scholar]
7. Shisana O, Davids A. Correcting gender inequalities is central to controlling HIV/AIDS. Bull World Health Organ. 2004;82:812. [PMC free article] [PubMed] [Google Scholar]
8. Siegfried N, Muller M, Volmink J, et al. Male circumcision for prevention of heterosexual acquisition of HIV in men. Cochrane Database Syst Rev. 2003;3:CD003362. [PubMed] [Google Scholar]
9. Aral SO, Padian NS, Holmes KK. Advances in multilevel approaches to understanding the epidemiology and prevention of sexually transmitted infections and HIV: an overview. J Infect Dis. 2005;191 (suppl 1):S1–6. [PubMed] [Google Scholar]
10. Rottingen JA, Cameron DW, Garnett GP. A systematic review of the epidemiologic interactions between classic sexually transmitted diseases and HIV: how much really is known? Sex Transm Dis. 2001;28:579–97. [PubMed] [Google Scholar]

11. Korenromp EL, White RG, Orroth KK, et al. Determinants of the impact of sexually transmitted infection treatment on prevention of HIV infection: a synthesis of evidence from the Mwanza, Rakai, and Masaka intervention trials. J Infect Dis. 2005;191 (suppl 1):S168–78. [PubMed] [Google Scholar]
12. Bloom SS, Urassa M, Isingo R, Ng'weshemi J, Boerma JT. Community effects on the risk of HIV infection in rural Tanzania. Sex Transm Infect. 2002;78:261–66. [PMC free article] [PubMed] [Google Scholar]
13. Nunn AJ, Wagner HU, Kamali A, Kengeya-Kayondo JF, Mulder DW. Migration and HIV-1 seroprevalence in a rural Ugandan population. AIDS. 1995;9:503–06. [PubMed] [Google Scholar]
14. Lurie MN, Williams BG, Zuma K, et al. The impact of migration on HIV-1 transmission in South Africa: a study of migrant and nonmigrant men and their partners. Sex Transm Dis. 2003;30:149–56. [PubMed] [Google Scholar]
15. Abdool Karim Q, Abdool Karim SS, Singh B, Short R, Ngxongo S. Seroprevalence of HIV infection in rural South Africa. AIDS. 1992;6:1535–39. [PubMed] [Google Scholar]
16. Buchbinder SP, Vittinghoff E, Heagerty PJ, et al. Sexual risk, nitrite inhalant use, and lack of circumcision associated with HIV seroconversion in men who have sex with men in the United States. J Acquir Immune Defic Syndr. 2005;39:82–89. [PubMed] [Google Scholar]
17. Halperin DT, Epstein H. Concurrent sexual partnerships help to explain Africa's high HIV prevalence: implications for prevention. Lancet. 2004;364:4–6. [PubMed] [Google Scholar]
18. Cates W., Jr Review of non-hormonal contraception (condoms, intrauterine devices, nonoxynol-9 and combos) on HIV acquisition. J Acquir Immune Defic Syndr. 2005;38 (suppl 1):S8–10. [PubMed] [Google Scholar]
19. Gray RH, Wawer MJ, Serwadda D, et al. Population-based study of fertility in women with HIV-1 infection in Uganda. Lancet. 1998;351:98–103. [PubMed] [Google Scholar]
20. Gregson S, Garnett GP, Nyamukapa CA, et al. HIV decline associated with behavior change in eastern Zimbabwe. Science. 2006;311:664–66. [PubMed] [Google Scholar]
21. Quinn TC, Wawer MJ, Sewankambo N, et al. Viral load and heterosexual transmission of human immunodeficiency virus type 1. Rakai Project Study Group. N Engl J Med. 2000;342:921–29. [PubMed] [Google Scholar]
22. Wawer MJ, Gray RH, Sewankambo NK, et al. Rates of HIV-1 transmission per coital act, by stage of HIV-1 infection, in Rakai, Uganda. J Infect Dis. 2005;191:1403–09. [PubMed] [Google Scholar]
23. https://hivinfo.nih.gov/understanding-hiv/fact-sheets/hiv-life-cycle#:~:text=The%20seven%20stages%20of%20the%20HIV%20life%20cycle%20are%3A%201,imagine%20what%20HIV%20looks%20like.
24. https://www.researchgate.net/figure/Structure-of-human-immunodeficiency-virus-HIV-virus-10-Image-was-originally_fig1_341001134/download