



In Depth and Extensive Review of HIV Infection

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Received: July 14, 2023

Published: August 14, 2023

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Abstract

Since the discovery of HIV (Human Immunodeficiency Virus) infection in the late 1950s, the burden of the disease is still remarkable in many parts of the world and it is the most alarming infectious diseases HIV still remains a big challenge and a twisted knot for scientists to untangle, in this review we will explain not only the epidemiology, pathogenesis presenting features, diagnosis, treatment options and complications of AIDS but also will discuss points of awareness for very physician, health-care provider and practicing clinician of HIV-infected patients so as to enable him early and appropriate intervention thus creating a high index of suspicion in encouraging HIV testing to patients presenting to hospital.

Keywords: AIDS (Acquired Immunodeficiency Syndrome); HIV (Human Immunodeficiency Virus)

Introduction

HIV is lentivirus (sub group of retrovirus) that causes HIV infection and acquires immunodeficiency syndrome [1]. The HIV infecting humans is of two types HIV 1 and HIV 2. The HIV 1 is the most common and very pathogenic whereas HIV type 2 is less common and less pathogenic. On entering the body the virus attacks T Lymphocytes and other cells which have CD4 surface marker. This leads to low levels of CD4 T Lymphocyte cells. This happens through a number of mechanisms, including pyroptosis of abortively infected T cells [2].

When the CD4 cell count falls below 500 cells/mm³, (normally 600-1500 cells/mm³), the immune system starts breaking down with the appearance of opportunistic infections and unusual malignancies, when HIV infects all vital cells in the human immune system such as helper T cells (specifically CD4+ T cells), macrophages, and dendritic cells then it is called as AIDS [3] it is a fatal, predominantly sexually transmitted disease which

is preventable, about 80% of HIV-infected patients eventually develop complications. AIDS is a condition in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive without treatment average survival is estimated to be 9 to 11 years depending on the HIV subtype [4]. Infection with HIV occurs by the transfer of, blood, semen, vaginal fluid, or breast milk. It is a global pandemic [5].

Enhanced research and development work and the implementation of preventive measures, including education, behavior modification and worldwide strategies to strengthen national health care and social infrastructure are essential to eliminate this devastating human killer. To achieve this goal we should be able to expand the understanding about HIV disease and to strength blood safety policies, information, education and communication programmes. HIV prevention programmes should emphasizes identifying cases of HIV promptly, initiating appropriate therapy and ensuring completion of treatment.

Global situation

Since the first descriptions of acquired immunodeficiency syndrome (AIDS), the human immunodeficiency virus (HIV) infections has emerged as a major public health problem. AIDS has been one of the most devastating disease humankind has ever faced. Since the epidemic began, millions of people have been effected with the virus. HIV/AIDS is the leading cause of death in sub Saharan Africa and is the biggest killer worldwide. In many parts of the developing world, majority of the infections occur in young adults, with young women being especially vulnerable. The agony is that many of them even are not aware that they are carriers. Even today HIV/AIDS is a great challenge and remains a nightmare of the 21st century. The overall rate of new HIV infection continues to be a concern in several countries. According to the World Health Organization almost 35 million have died from AIDS since the start of the pandemic [6]. Though there is no cure for HIV or AIDS, however earlier treated person can live almost a normal life with HIV infection. A study in 2019 in the medical journal Lancet, showed that an anti-viral treatment effectively halt the spread of HIV [7].

Modes of transmission

By far and large HIV infection the recognized mode of transmission is either by Sexual contact or by use of unsterile needles or infected syringes or by blood products or infected mother to children during pregnancy, during birth and through breast milk.

- Parenteral contact
- Mucocutaneous inoculation of infected HIV human blood or body fluids
- Transfusion of infected HIV blood or blood products.
- Needle sharing of IV drug abuse
- Organ transplantation from HIV infected donor Maternal-infant contact intrauterine transplacental inoculation per partum inoculation Breast feeding (from milk).

High risk groups

Multiple sexual partners, homosexuals, prostitutes and truck drivers, receivers of blood products and drug abusers, children of HIV infected mothers. Maximum risk to health workers is from blood and body fluids like amniotic, pleural, peritoneal or pericardial fluid.

Structure of HIV virus

This virus (HIV) belongs to the family of Retroviridae, it has two major components one is core of ribonucleic acid (RNA), called the genome, and the other one is a protein component that encircles the genome called the capsid.

The genome takes the genetic information of the virus, whereas the capsid is responsible for its shape and it safeguards the genome. The capsid is further divided of subunits known as capsomeres.

Cascade of intracellular events

All living cells have on their surface membrane highly complex protein structures known as receptors. The receptor can be compared to a lock into which a specific key or ligand can fit. On T-lymphocytes there are two receptors to which the human immunodeficiency virus (HIV) can stick. The primary receptor is "CD4", and the secondary receptor that loops through the cell membrane.

To be infected with HIV the virus needs attachment to both these ligand-receptor of the cell membrane of the T-lymphocyte , if HIV "key" does not matches the lymphocyte "lock" attachment is incomplete only when the viral particle is attached completely to the receptors on the lymphocyte cell membrane then it enables to diffuse with the cell membrane. This complete diffusion allows viral contents to be emptied into the cell's cytoplasm including viral RNA. Like other viral infections HIV then commands the host's human cells to make multiple copies. An enzyme (protein) that's part of the (HIV) reads the sequence of viral RNA nucleic acids that have entered the host cell and transcribes the sequence into a complementary DNA sequence. The enzyme is known as reverse transcriptase which is responsible to incorporate into the host cell to reproduce.

A total of 9 genes are present in the RNA of HIV virus, they contain the code to make structural proteins including viral envelope and enzymes which are reverse transcriptase, integrase, and a very important enzyme protease. Which facilitate the production of new viruses.

Course of disease

Just after exposure, there is chain of intracellular events after initial contact with the virus which gets attached to a cell of the

immune system like lymphocytes or monocytes, resulting in production of massive numbers of new viral particles, death of the infected cells, and ultimate devastation of the immune system. The disease has the following stages

- **Initial period:** Viraemia is the primary infection with HIV, which produces mild clinical disease like fever, headache, body ache and pain, macular skin rashes and lymph node enlargement. The initial period of viraemia last for a few weeks.
- **Latent period:** This is asymptomatic phase and may last for variable period, on an average for 10 years, during this period no virus is detectable in plasma though it is replicating in the lymphoid tissue and the T-helper cell number and function is deteriorating.
- **Advanced disease:** It starts after several years. When the CD4 T Cell count falls below 200 cells/mm³ then the patient becomes more prone to opportunistic infections. These opportunistic infections can occur in oral, nasal, laryngeal mucosa leading to complications and manifestations of AIDS. Which appears when CD4 count decreases <200cells/mm³. The two important tests are reverse transcriptase PCR and branched DNA assay. It determines number of copies of RNA per millimeters of plasma. It indicates viral load.

HIV infection and health workers

Doctors and laboratory staff handling the blood and blood stained body Fluids and other secretions may contract the disease as occupational hazard. The risk is due to needle injury, cuts with contaminated knife or other sharp instruments Exposure of open wound to infected blood or body fluid of the patient Exposure of skin to infected blood and body fluids. All these can be prevented by following strictly the universal precautions which are as follows.

Wash hands before and after patient or specimen contact. Handle the blood of all patients as potentially infectious. Wear gloves for potential contact with blood and body fluids. All sharps like blades, needles, etc. To be put in impermeable container and destroyed. During operations knife to be passed to surgeon in a tray. Place used syringes immediately in a nearby impermeable container. Use double gloves where there are likely to be pierced as in surgery. Wear protective eyewear and mask if splatter with

blood is anticipated. Wear gowns when splash with blood or body fluid is anticipated. Handle all linen soiled with blood or body secretions as potentially infectious.

Bibliography

1. Weiss RA. "How Does HIV Cause AIDS?" *Science* 260 (1993): 1273-1279.
2. <http://dx.doi.org/10.1126/science.8493571>
3. Douek DC., *et al.* "Emerging Concepts in the Immunopathogenesis of AIDS". *Annual Review of Medicine* 60 (2009): 471-484.
4. Doitsh G., *et al.* "Cell Death by Pyroptosis Drives CD4 T-Cell Depletion in HIV-1 Infection". *Nature* 505 (2014): 509-5145.
5. Cohen MS., *et al.* "The Spread, Treatment, and Prevention of HIV-1: Evolution of a Global Pandemic". *The Journal of Clinical Investigation* 118 (2008): 1244-1254.
6. HISTORY.COM EDITORSUPDATED: FEB 21, 2021 ORIGINAL (2017).
7. Cohen MS., *et al.* "Prevention of HIV-1 infection with early antiretroviral therapy". *The New England Journal of Medicine* 365 (2011): 493-505.