ISSN: 2347-6567

International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

IJAMSCR |Vol.13 | Issue 2| Apr - Jun -2025

www.ijamscr.com

DOI : https://doi.org/10.61096/ijamscr.v13.iss2.2025.133-136

Review

Understanding the Virus, Its Impact, and Prevention

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Check for updates

Published on: 09 April 2025

Published by:
DrSriram Publications

Abstract

Human immunodeficiency virus (HIV) is a major global health problem that affects millions of people. It targets CD4 T cells, a part of the immune system, making people more susceptible to infections. Untreated, HIV progresses t0 AIDS, a severe condition that leads t0 life-threatening issues. Due to a lack of awareness, stigma, and restricted access to healthcare, HIV continues to spread. Treatment and prevention have made significant progress since its discovery in the early 1980s. HIV is now a manageable illness thanks to antiretroviral therapy (ART), which has made it possible for people to live healthy lives. However, it is still difficult to fight the epidemic because of obstacles like high medication costs, social stigma, and false information. In order to stop HIV from spreading, it is important to know how it is transmitted and how to prevent it. The majority of HIV transmission occurs through mother-to-child transmission, sharing contaminated needles, and unprotected sexual contact. Many may not exhibit symptoms for years, highlighting the need for regular testing and early diagnosis. Effective diagnostic tools are available for early detection, allowing timely treatment before serious damage occurs.

Safe sex practices, PrEP for high-risk individuals, and PEP for HIV-exposed individuals have all contributed to a decrease in new cases. HIV education and stigma reduction in communities have been aided by public awareness campaigns. HIV-positive individuals continue to face discrimination and mental health issues despite advancements. Innovations like gene editing and stem cell therapy offer hope for a vaccine and a potential treatment. Raising awareness and promoting healthcare access are key to eliminating HIV and enhancing the lives 0f those affected.

Keywords: Human Immunodeficiency Virus (HIV), Acquired Immunodeficiency Syndrome (AIDS), CD4 T cells, Antiretroviral Therapy (ART)

INTRODUCTION

Human Immunodeficiency Virus (HIV) is a viral infection that has affected global health for over forty years. It primarily targets CD4 T cells, which are essential for disease defense, in its attack on the immune system. HIV weakens the immune system as it progresses, making the body more vulnerable to infections and certain cancers. HIV can lead to Acquired Immunodeficiency Syndrome (AIDS), a serious condition in which the immune system is severely compromised, if it is not treated. Since the 1980s, HIV has been extensively studied, leading to a better understanding of the virus, its transmission, and treatments. HIV is no longer considered to be a life-threatening virus thanks to advancements in ART. ART helps to manage the virus, reduce the viral load, prevent progression to AIDS, and allow individuals with HIV to have long, healthy lives. Despite this, challenges like stigma, misinformation, and barriers to healthcare, particularly in low-resource areas, continue to make it difficult to control the virus.

HIV is mostly passed from person to person through bodily fluids like blood, sperm, vaginal fluids, and breast milk. Key risk factors include unprotected sex, sharing needles, and mother-to-child transmission during childbirth or breastfeeding. Regular testing and public education campaigns are crucial in preventing the virus from spreading. Early diagnosis and treatment are essential. HIV can be treated, but there is no cure at this time. Research is being conducted for vaccines and other treatments, with gene editing and stem cell therapies showing promise. Preventive measures such as condoms, PEP (Post-Exposure Prophylaxis), and Prep (Pre-Exposure Prophylaxis) are successful in reducing transmission. People with HIV 0ften face social and psychological issues due to stigma, highlighting the need for education and support. The purpose of this article is to provide a comprehensive understanding of HIV, including its transmission, treatment, prevention, and global social effects. The virus is thought to have originated in Central Africa in the early 20th century and spread to humans via zoonotic transmission from chimpanzees to humans from the simian immunodeficiency virus (SIV).

UNDERSTANDING HIV AND ITS ORIGINS

It is believed that HIV was passed on several times over many decades, resulting in the virus's emergence. Although it is believed that the first human cases occurred in the 1950s, the virus probably existed for many years before it was identified. Initially, it went undetected as it was often confused with other diseases or remained unnoticed because people showed n0 symptoms. The virus spread quietly in communities, with many individuals unaware they were infected. In the early 1980s, an increase in unexplained illnesses led researchers t0 investigate these cases, which resulted in identifying HIV as the cause of AIDS, a severe condition from advanced HIV infection that damages the immune system.

In the early years, HIV was linked to specific high-risk groups like gay men, drug users, and those receiving contaminated blood. This association caused fear, misinformation, and stigma around HIV and AIDS, complicating control efforts. However, research demonstrated that people of any background can be affected by HIV. The genetic material of the virus, RNA, is a member of the retrovirus family. It targets CD4 T cells critical for immune defence, binding t0 them t0 replicate and ultimately destroying the cells. This depletion weakens the immune system, increasing the risk 0f opportunistic infections that characterize AIDS.

Infected bodily fluids like blood and sexual contact, sharing needles, and mother-to-child transmission during childbirth or breastfeeding are the primary routes by which HIV is transmitted. Preventative measures have relied heavily on an understanding of these routes. There are two main strains of HIV: HIV-1, which is more prevalent and widespread, and HIV-2, which is primarily found in West Africa. Advances in research have led to better understanding and treatment with antiretroviral therapies (ART), improving health and longevity for those with HIV. Millions of people worldwide continue to be infected with HIV despite advancements. The complexity of the HIV virus and the social and scientific difficulties that have arisen as a result of its spread are brought to light by its origins. The virus's history demonstrates the ongoing need for research, education, and advocacy to lessen its effects and improve the lives of those who are affected. Although significant efforts are still required, there is hope for an HIV-free future through advancements in treatment, prevention, and potential vaccines and cures.

How the immune system is affected by HIV?

The immune system is attacked by HIV (Human Immunodeficiency Virus), specifically CD4 T cells, which are essential for the body's defense against infections. When HIV enters the body, it binds to the CD4 receptor on these cells, infiltrates them, and begins to multiply. CD4 cells are destroyed by this replication, which eventually weakens the immune system. A decrease in CD4 cells impairs the body’s ability to combat infections, and untreated HIV can eventually progress to Acquired Immunodeficiency Syndrome (AIDS), where the immune system is severely compromised, making the body susceptible to opportunistic infections.

There are three main stages of HIV infection

1. **Acute HIV Infection:** This initial stage occurs between two and four weeks after exposure and is characterized by symptoms such as fever and sore throat due to the rapid viral replication.
2. **Chronic HIV infection:** In this case, the virus is still present but at a lower level, causing immune system damage even though there are no obvious symptoms.
3. **AIDS:** The final stage involves a significant drop in CD4 count, leading to life-threatening opportunistic infections and cancers. For early virus detection, treatment, and management, understanding these stages is essential. This phase may not show any symptoms, but the virus remains active and continues to weaken the immune system. The body becomes more susceptible to infections as the number of CD4 T cells gradually decreases without treatment. However, with proper antiretroviral therapy (ART), individuals can keep the virus suppressed and prevent progression t0 the next stage.

The most severe stage of HIV infection is AIDS, or acquired immunodeficiency syndrome, which occurs when the immune system is significantly compromised. This stage is diagnosed when the CD4 T cell count falls below 200 cells per microliter 0f blood, 0r when the individual develops opportunistic infections and illnesses like tuberculosis, pneumonia, or certain cancers. At this stage, the body's ability t0 fight infections is severely compromised, leading t0 life-threatening health complications. Modern HIV treatments make it possible for many to avoid developing AIDS and live long, healthy lives, despite the fact that survival rates are drastically reduced in the absence of treatment**.**

MODES OF TRANSMISSION

- HIV is spread through contact with blood, sperm, vaginal and rectal fluids, breast milk, and other bodily fluids.
- Primary modes 0f transmission include:-
- Sharing needles.
- Mother-to-child transmission.
- Blood transfusions or organ transplants are all examples of unprotected sexual contact. From flu-like symptoms early on to severe weight loss and frequent infections during the AIDS stage, common HIV symptoms vary by infection stage. Utilizing antibody tests to detect HIV antibodies in blood or saliva is essential for managing HIV.

HIV DIAGNOSTIC ANTIBODY TEST

For the purpose of early detection, antigen tests identify HIV proteins (the p24 antigen) in the blood. The genetic material of the virus can be detected using nucleic acid tests (PCR), which are used for early or confirmatory diagnosis. There is n0 cure for HIV, but Antiretroviral Therapy (ART) helps control the virus. HIV treatment lowers the risk of transmission, boosts immune function by conserving CD4 T cells, and suppresses HIV replication, allowing HIV-positive individuals to live healthy lives. Safe sex practices, Pre-Exposure Prophylaxis (Prep) for high-risk individuals, Post-Exposure Prophylaxis (PEP) for emergency situations, and public awareness campaigns are examples of HIV prevention measures.

SOCIAL AND SCPSYCHOLOGICAL IMPACT OF HIV

HIV patients frequently experience discrimination and stigma, which can lead to mental health issues. Community support and counselling are essential f0r their well-being. Future research focuses 0n gene editing, stem cell therapy, and developing effective vaccines.

CONCLUSION

HIV remains a major global health challenge, affecting millions. Although HIV has progressed from a fatal illness to a chronic condition that can be managed, it still causes serious health and social issues. The virus weakens the immune system, leading t0 higher risks of infections and illnesses without treatment. However, with early diagnosis and regular use 0f Antiretroviral Therapy (ART), individuals with HIV can live long and healthy lives and reduce transmission risk.

Prevention is key to controlling HIV's spread

Safe sexual practices, Pre-Exposure Prophylaxis (Prep), Post-Exposure Prophylaxis (PEP), and awareness campaigns have proven effective in lowering new infections. There is also reason for optimism in gene therapy, vaccine development, and potential treatments. Despite these advancements, stigma and discrimination hinder many from seeking testing and treatment. Tackling these social issues through education, advocacy, and supportive policies is crucial f0r ensuring proper care access. To combat HIV, global efforts must continue to focus on treatment accessibility, prevention strategies, and scientific research. A world without HIV can be achieved through collective action, increased awareness, and ongoing medical advancements.

Author Contribution

Malik Javaid Shakeel, Shubham Singh & kulbir Singh have written the draft and revised review, editing, & rewriting & Finalized the manuscript, Tanya sharma was responsible for editing. supervision of the manuscript. All authors approved the manuscript.

Competing interests

The authors declare no conflicts of interest.

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