HIV Infection/AIDS

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Author(s)

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Course Objectives

Upon completion of this course, participants will be able:

1. To know the characteristics of HIV
2. To understand the natural course of AIDS
3. To know the importance of HIV as a public health hazard
4. To learn the incidence and prevalence of AIDS worldwide
5. To identify the various modes of transmission of HIV
6. To understand the pathogenesis of AIDS
7. To know the clinical features of AIDS
8. To know the importance of proper diagnosis of AIDS
9. To apprehend about the available tests for the diagnosis of HIV infection
10. To know how to diagnose HIV infection
11. To know how to counsel a patient of AIDS in terms if its diagnosis, treatment and possible outcome
12. To know about the possible available treatment options
13. To know the prognosis of AIDS
14. To know the methods of prevention of HIV infection
15. To learn how to reduce cultural, legal, economical and religious barriers in the way of HIV infection prevention

Disclosures

None.

Audience

All Health Care Workers

Accreditation

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Course Description

AIDS/HIV infection was first diagnosed in the United States in 1981, when the US Centers for disease and control came to know the unexplained occurrence of pneumonia in previously five healthy homosexual men in Los Angeles, and Kaposi’s sarcoma in 26 previously healthy homosexual men in New York and Los Angeles. AIDS is a worldwide pandemic, having cases reported from almost every country. At the end of 2009, almost 33.3 million individuals were living with HIV infection according to Joint United Nations Programme on HIV/AIDS with one million of those living in the United States. However, the number of people having HIV is decreasing due to early diagnosis, awareness about the infection and advanced treatment options. Early diagnosis with proper tests and proper treatment can make a patient of AIDS symptom free for a long a time period. Although good diagnostic techniques and advanced treatment options have decreased the incidence of AIDS, it is still necessary to apply comprehensive preventive techniques and widespread awareness modalities for further decrease of diseases incidence. The management plan of a patient having AIDS is not an easy task and it must be evaluated organized on the individual basis. This course will provide the primary care provide a comprehensive review of AIDS, its spread, management and prevention [1,2].
Introduction

Human Immunodeficiency Virus (HIV) is the causative agent of AIDS. AIDS is characterized by the defective immune system of the body that is unable to fight against the microorganisms/offenders. It is an acquired immunodeficiency disorder. Since the initial recognition of AIDS in United States in 1981, tremendous advances have been taken place in the understanding of this disease in the last decade regarding its incidence, etiology, immunology, pathogenesis, clinical features and morphological changes. But efforts at searching its definite treatment and vaccine have not yielded success so far. Thus, the prognosis remains grim. At present, the health care providers are focusing on preventive measures. Although, at present, good diagnostic techniques and proper treatment options are available for AIDS, but these techniques carry their own limitations and hazards. Thus, public education and prevention of HIV infection is of prime importance [3].

(Source: www.topnews.in)
Overview

AIDS is a disease of immune system caused by HIV characterized by presence of:

- Systemic symptoms like sweats, diarrhea, weight loss and muscle-wasting
- Opportunistic infections due to decreased cellular immunity
- Malignant cancers such as Kaposi’s sarcoma and lymphoma
- Neurological symptoms like dementia, aseptic meningitis and neuropathy
- Decreased lymphocyte count
- Transmission is via sexual contact and per-ental route
- Treatment is by anti-retroviral drugs
- Can be prevented by safe sex and careful handling of blood contaminated materials

(Source: www.aids.gov)
Characteristics of HIV

HIV belongs to the human retrovirus family. There are two types of this virus i.e. HIV-1 and HIV-2. The most common cause of HIV disease throughout the world is HIV-1. HIV-2 was first identified in 1986 in West African patients and it causes similar disease in West Africa and parts of India. HIV-1 is spherical in shape with a size of 100-140 nm. It has a core, containing core proteins (p24 and p18), two stranded genomic RNA and the enzyme called reverse transcriptase. The core is covered by double layered membrane derived from the outer membrane of the infected host cell during budding process of the virus. This membrane has two glycoproteins (gp120 and gp41) embedded in it. There are many genes in HIV-1, but three important genes which code for respective components of virus are:

- **Gag** - for core proteins
- **pol** - for reverse transcriptase
- **env** - for envelop proteins

These genes act as markers for laboratory diagnosis of HIV infection. There is another gene namely tat-gene which is responsible for viral functions like amplification of viral genes, viral budding and replication [3, 6].

(Source: www.healthcentral.com; www.organopharma.net)
Epidemiology of AIDS

According to the Joint United Nations Programme on HIV/AIDS, an estimated 33.3 million people were living with HIV infection till the end of 2009. The statistics shows that estimated:

- 1,106,400 Americans are infected with HIV
- 51,000 new infections each year in US
- 468,578 persons in the US living with AIDS

Of the above statistics, 76% are men and 23% are women. Children account for less than 1% of living cases. Estimated number of people living with HIV infection worldwide (total=31.3-35.3 million) are given below:

- North America- 1.2-2.0 million
- Caribbean- 220,000-270,000
- Central and South America- 1.2-1.6 million
- Western and Central Europe- 720,000-910,000
- Middle East and North America- 400,000-530,000
- Sub-Saharan Africa- 20.9-24.2 million
- Eastern Europe and Central Asia- 1.3-1.6 million
- East Asia-560,000- 1.0 million
- South and South East Asia- 3.7-4.6 million
- Oceania-57,000(1-3)

Source: www.avert.org
Adults and children estimated to be living with HIV in 2009

North America
1.5 million
(1.2 million – 2.0 million)

Caribbean
240 000
(220 000 – 270 000)

Central & South America
1.4 million
(1.2 million – 1.6 million)

Western & Central Europe
820 000
(720 000 – 920 000)

Eastern Europe
1.4 million
(1.3 million – 1.6 million)

Middle East & North Africa
460 000
(400 000 – 530 000)

Sub-Saharan Africa
22.5 million
(20.8 million – 24.2 million)

East Asia
770 000
(580 000 – 1.0 million)

South & South-East Asia
4.1 million
(3.7 million – 4.5 million)

Oceania
57 000
(50 000 – 64 000)

Total: 33.3 million [31.4 million – 35.3 million]

Estimated number of people living with HIV infection
(Source: www.cdc.gov)
Estimated Rate of New HIV Infections, 2009, by Gender and Race/Ethnicity

Source: CDC

Estimated rate of new HIV infection, 2009, by gender & race
(Source: www.Cdc.gov)
Mode of Transmission of HIV

HIV infection can be transmitted from one individual to another via following modes:

- Sexual contact
- Per-enteral route
- Peri-natal route

Source: www.hivandhepatitis.com

Sexual contact

It is the major mode of spread of HIV infection and comprises 75% of the spread of all the cases of HIV transmission. Most cases of AIDS in US occur in homosexual and bisexual males while heterosexual promiscuity seems to be dominant mode of HIV transmission in Africa and Asia. Sexual transmission of HIV occurs when infected materials like semen, blood, or vaginal secretions enter the blood circulation of the partner. HIV can be transmitted by oral or vaginal penetration but the unsafe anal
route by a male or female seems to be the most dangerous way of spread. The factors which determine the HIV transmission via sexual route include:

- Total number of sexual partners
- Presence of HIV infection in the partner
- Probability of virus transmission during sexual contact [2,3].

Other sexually transmitted diseases may act as a co-factor for the spread of HIV infection. There are many misconceptions in the mind of common person regarding transmission of HIV. Keep in mind the following points to educate such persons:

- HIV does not spread by tears, sweat, coughing or sneezing
- HIV is not transmitted via an infected person’s cloth, phone, drinking glasses, eating utensils and other things that HIV infected persons have used, essentially not contaminated with their blood.
- Transmission from male to male or male to female is more potent than that from female to male [3].

Sexual Transmission

(Sources: www.shakehandwithlife.blogspot.com)
Per-ental transmission

This route of transmission is the next largest group (25%). This route is an important way of HIV transmission in following 3 groups of high risk populations:

- Intravenous drug abusers- by sharing needles, syringes etc comprise a large group in the US
- Hemophiliacs- who have received large amounts of factor 8 concentrates from the pooled blood components from multiple donors
- Recipients- of blood and blood products(3)
Perinatal transmission

HIV infection can be transmitted from the infected mother to new born during pregnancy through transplacentally, or in immediate after delivery through contamination with maternal blood, infected amniotic fluid and breast milk [3, 5].

Other ways of transmission

In 6% of cases of AIDS the risk factor cannot be found. HIV has also been isolated from a number of body fluids and tissues like semen, vaginal secretions, cervical secretions, and breast milk, CSF, synovial, pleural, peritoneal, pericardial and amniotic fluid [3, 6].

(Source: www.blistersofoblivion.wordpress.com)
HIV cannot be transmitted by:

- Coughing and sneezing
- Touching and kissing and hugging
- Water and food
- Public baths and hand shake
- Work or school contacts
- Using telephones
- Sharing cup, glasses, plates and other utensils
- Insect bites
You Can’t Get HIV through “Casual Contact”

Although HIV and AIDS have been around for more than 25 years, there are still many myths about how HIV is spread.
Did you know that HIV cannot be spread by:

- sharing a drinking fountain
- mosquito bites
- shaking hands
- donating blood
- kissing
- swimming in a pool
- hugging
- using a public restroom

World AIDS Day is Dec. 1st
AIDS Awareness Week is Nov. 24th to Dec. 1st
For more information call the Health Unit at 613 966-5513 ext. 263

Summary of facts that cannot transmit HIB

(Source: www.hpedsb.on.ca)
Pathogenesis of HIV infection

HIV causes reduction or depletion of helper T-cells (CD4+ cells) resulting in profound immune-suppression. Steps of pathogenesis of HIV infection in descending sequence include:

- Interaction of gp120 of HIV to CD4+ molecule of T-cell
- Entry of virus into the host cell
- Un-coating of the virus
- Production of pro-viral DNA via reverse transcriptase
- In the inactive T-helper cell, the viral DNA remains in latent phase for a long period
- In the active T-helper cell, there occurs viral DNA budding
- Cytopathic phase- characterized by quantitative depletion of T-helper cells and failure of T-helper cells to respond to antigens
- Decreased T-helper cells leading to immune deficiency and AIDS manifestations
HIV Life Cycle

(Source: www.en.wikipedia.org)
Phases of HIV Infection and its Features

HIV infection has three phases:

**Acute HIV syndrome (3-12 weeks):** It is characterized by:

- It occurs 3-6 weeks after infection
- There is high level of plasma viremia (virus entered in the blood) due to viral replication
- There occurs sudden reduction of T-helper cells count
- Appearance of flu-like viral illness
- Clinical manifestations include fever, sore throat, myalgia, skin rash and sometimes aseptic meningitis
- Symptoms resolve spontaneously in 2-3 weeks [3,5,6].

**Middle chronic phase (10-12 years):** It is characterized by:

- Chronic stage may continue as long as 10 years
- Progressive and gradually increase in viral replication
- Moderate decrease in T-cell count
- It is stage of latency, patient may be asymptomatic or may develop mild symptoms and persistent generalized lymphadenopathy [3, 6]

**Final crisis phase:** It is characterized by:

- Marked increase in viremia
- Markedly reduce T-cell count
- Clinical features of this final phase can be divided into five groups, given below in the tables [3]:


Clinical features of final crisis phases of AIDS

A. CONSTITUTIONAL DISEASE
- Fever > 1 month
- Weight loss > 10% of body weight
- Chronic diarrhoea > 1 month

B. NEUROLOGIC DISEASE
- Meningoencephalitis
- Aseptic meningitis
- Peripheral neuropathy
- AIDS-dementia complex

C. SECONDARY OPPORTUNISTIC INFECTIONS
- Fungal e.g. candidiasis, cryptococcosis, coccidioidomycosis, histoplasmosis.
- Viral e.g. cytomegalovirus (CMV), herpes simplex, and herpes zoster.
- Bacterial e.g. mycobacteriosis, M. tuberculosis, M. avium-intracellulare, nocardiosis, salmonellosis.
- Protozoal and helminthic e.g. Pneumocystis carinii pneumonia, toxoplasmosis, cryptosporidiosis, strongyloidosis.

D. SECONDARY NEOPLASMS
- Kaposi’s sarcoma (multicentric)
- Primary CNS lymphoma
- NHL and Hodgkin’s lymphoma
- HPV-associated carcinomas (ca. cervix, vagina, anus)

E. OTHER CONDITIONS
- CD4+T cells > 200/μl
- Pulmonary tuberculosis
- Recurrent pneumonia
According to WHO, AIDS can be defined as the presence of at least two major signs associated with at least one minor sign, in the absence of known secondary causes of immunosuppression.

**Major signs are:**

- Decreased weight of more than 10% of the body weight
- Chronic diarrhea of more than one month duration
- Prolonged fever (intermittent or continuous) of more than one month duration [1-3].

**Minor signs are:**

- Recurrent oropharyngeal candidacies
- Persistent generalized lymphadenopathy
- Persistent cough for more than one month
- Generalized pruritic dermatitis
- Recurrent herpes zoster
- Progressive disseminated herpes simplex infection [1-4, 6].

Following table is showing images of AIDS complication:
Oral AIDS

Cancrum Oris

Oral Thrush

Eczema

Kaposi’s Sarcoma

Herpes
Leukoplakia

Herpes Zoster Eye

(Source: www.hardinmd.lib.uiowa.edu)
Diagnosis of HIV infection

For diagnosis of AIDS following tests are carried out:

- **HIV enzyme linked immunosorbent assay (ELISA)-** It is a screening test for HIV. It is positive in 95% of cases within 6 weeks after HIV transmission. Its sensitivity is more than 99.9%.
- **Western blot-** it is confirmatory test for HIV infection. Its sensitivity along with ELISA is more than 99.99%.
- **HIV rapid antibody test-** it is also a screening test for HIV infection and it can be performed by a personnel with limited training. Results must be confirmed by ELISA and western blot.
- **Complete blood count-** it shows neutropenia (decreased neutrophils in the blood), anemia and thrombocytopenia in advanced disease.
- **Absolute CD-lymphocyte count-** it is most widely used predictor of HIV progression. Risk of progression of AIDS to opportunistic infection or malignancy is high with CD4-count of less than 200cells/mcl in the absence of treatment.
- **CD4-lymphocyte percentage-** it is more reliable than CD-count. Risk of progression of AIDS to opportunistic infection or malignancy is high with percentage of less than 14% in the absence of treatment.
- **HIV viral load tests-** these are used to measure the amount of actively replicating HIV virus [1-2,6].
Treatment of HIV infection/AIDS and counseling of patient regarding treatment

It is necessary to counsel the patient of AIDS regarding treatment before its initiation. Consider the following points while counseling the HIV patients:

- Tell the patient about the disease and its possible outcomes. Be gentle and do not use medical terms. Obtain the patients’ perception about the disease and its treatment. Maintain the privacy and talk to the patient in his/her language.
- Tell the patient that there is no cure for AIDS, but a combination of many drugs can be used to control the viral load.
- Explain the patient about duration of the treatment and possible side effects of the drugs to be used, and advise him/her to take medication with good compliance.
- Let the patient to decide about receiving of treatment and do not impose your will [1,2].

Possible drug groups for treatment of AIDS include:

- Non-nucleoside reverse transcriptase inhibitors (NNRTIs) - Examples include efavirenz, etravirine and nevirapine.
- Nucleoside reverse transcriptase inhibitors (NRTIs) - Examples include Abacavir and the combination drugs emtricitabine and tenofovir, and lamivudine and zidovudine.
- Protease inhibitors (PIs) - Examples include atazanavir, darunavir, fosamprenavir and ritonavir.
- Fusion inhibitors - Examples include enfuvirtide and maraviroc.
- Integrase inhibitors - Example is raltegravir [2].
Indications for initiating treatment are:

- Severe symptoms
- CD4 count is under 500
- Pregnancy
- HIV-related kidney disease
- Being treated for hepatitis B [1,2].

General side effects of drugs are:

- Nausea, vomiting or loose motion
- Cardiac arrhythmias
- Difficulty in breathing
- Skin rash or allergy
- Fracture of bones
- Bone death, particularly in the hip joints [2].

Before starting treatment for AIDS it is necessary to confirm that patient is not receiving:

- Contraceptives and hormones
- Treatment of tuberculosis
- Drugs to treat hepatitis C

Treatment Regimes

It is necessary to use combination of HIV drugs from at least two of the main classes to overcome the new resistant strains of the virus that emerge during viral replication. This combination is termed as highly active antiretroviral therapy (HAART). Current guidelines recommend the use of two NRTIs combined with either a NNRTI or PI. It is
necessary to understand that these are suggested first line drug combinations and that other drugs within each group can be substituted depending upon the patient’s tolerance, drug interactions and resistance to particular drug. The goals of this drug therapy include:

- Increase in the CD4-count
- Decrease in viral load to undetectable amounts
- A drop in viral load of at least 50% in the first month of therapy [1,2]

Pregnant woman with serious disease (AIDS) must be treated fully for HIV infection. Such patient must receive triple drug regime as compared to a non pregnant patient.

(Source: www.dispatch.ug)
Prevention of HIV infection/AIDS

**Primary prevention of AIDS:** It means preventing the uninfected persons from getting HIV infection. It includes following steps to prevent a new HIV infection:

- Delay sexual debut
- Avoid or reduce multiple sexual partners
- Consistent condom use if one has multiple concurrent sexual partners
- Use sterile syringes
- Safe and appropriate use of injections
- Reduce unnecessary transfusions
- Screening before transfusion
- Routine HIV antibody screening during pregnancy
- Short course monotherapy to mother and baby, elective cesarean delivery and breast milk replacement [1-2,5]

**Secondary prophylaxis of AIDS:** it is aimed at enabling the people with HIV to stay well. It includes:

- Early diagnosis by proper tests
- Getting best possible treatment option
- Prevention of opportunistic infections of AIDS
- Monitoring of viral load and cell count
- Life style modifications
- Post exposure prophylaxis by use of drugs

**Tertiary prevention of HIV:** it aims at:

- Preventing the damage and pain from HIV infection
- Slowing down the progression of AIDS
- Preventing the disease from causing complications
- Giving better care to people with the disease
- Making people with AIDS healthy again and able to do what they used to do [1,2].
Summary

HIV infection is non-curable disease of immune system that if properly diagnosed and treated at an early stage, can prolong the life span of the patient. Best tests are available for early detection of AIDS, but treatment options are not very much satisfactory. So, the main aim is to prevent the HIV-infection by acknowledging the steps of primary prevention of AIDS.

References


