

# Acquired Immuno Deficiency Syndrome (A I D S)

## The Recent Concepts

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### Introduction

AIDS is a fatal disease caused by a virus belonging to the family of retrovirus. It infects the helper T lymphocytes which are very important in immune system. After infection with this virus the infected person usually suffers from generalized Lymphadenopathy, opportunistic infection and Kaposi's Sarcoma. AIDS is in fact the terminal stage of the disease process.

First case of AIDS appeared in 1981 in U. S. in one of the hospital in California where the doctors found large number of cases of Pneucystis carinii Pneumonia and Kaposi's Sarcoma amongst the gay people. Within the short span of 7 to 8 years the disease has spread throughout the world. The total number of cases around the world is 1,36,000 by the end of Jan. 1989. In United States only, there are 94,000 cases of AIDS and in Europe 20,000 in Africa 21,000 and in Asia 285 cases. AIDS cases have also been reported from Japan, Singapore, Hongkong, Thailand, India and China. So it is right time to be alert for the prevention of AIDS in Nepal.

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## Clinical aspects of AIDS:

Three categories of HIV infection have been recognised.

### 1. ASYMPTOMATIC CARRIER STAGE :

50% to 70% of infected cases have no problems at all. They look and feel healthy. But they can transfer the virus to others. Their blood is positive for HIV antibody and they can infect other people.

### 3. AIDS RELATED COMPLEX (ARC) :

20 to 50% of HIV infected people develop opportunistic infections- fungal, protozoal, bacterial & viral otherwise not common among the non infected people. They may present with unexplained diarrhoea, cough, fever of long duration and the symptoms are related to opportunistic infections.

### 4. AIDS (AS SUCH)

10 to 30% of HIV infected people have AIDS. After the development of AIDS, death is certain. They may present with the following symptoms:-

- Extreme weakness, fatigue and emaciation.
- Cough, fever and diarrhoea for more than one month.
- Purplish rashes over the body.

Their blood is positive for HIV antibody in ELISA test and distinct bands in the Western Blot test.

### 5. AIDS RELATED DEMENTIA

10% of HIV infected people develop dementia. Patients suffer from dementia and other neurological problems.

### 6. PERSISTENT GENERALISED LYMPHADENOPATHY:

Patients may have persistent enlargement of the lymph nodes of axillae, groin, cervical region.

## KAPOSI'S SARCOMA :

It is the malignant tumour arising from the skin which may present as a purplish spot in the skin underlying tumour. Associated with this, patients may have tumour of internal organs like lymphoma.

Patients are positive for HIV antibody.

## VIROLOGICAL ASPECT :

### Structure of HIV Virus :

The virus measures about 100 nm. It has glycoprotein receptors on its surface (gp 142). The outer coat is lipid coat having double layer. The inner coat is also double layered protein i. e. P 18 and P 24 enclosing the RNA genome and enzyme reverse trans-

criptase. The presence of this enzyme is the conspicuous feature of the virus and enables it to form DNA intermediates during replication and eventually the DNA intermediate is incorporated with the cellular genome. Thus the viral gene is incorporated with the cellular genome. Therefore the HIV infection is life long. Like other Retroviruses this virus can remain dormant in T cells in an unexpressed state.

#### IMMUNOLOGICAL ASPECT:

It has got specific tropism for the T subsets of helper lymphocytes because of the presence of glycoprotein receptor on its surface. The virus multiplies inside the T-Cells and finally damages it. Thus there is selective depletion of T helper lymphocytic population. For the intact and normal functioning of the immune system the presence of T-cell is vital.

Virus is also found to be present in macrophages, nerve cells and tissue histiocytes. The virus is maximally concentrated in semen and blood. The virus is found in low concentration in breast milk, saliva and sweat. The transmission from these sources is therefore unlikely.

The antibodies (IgM & IgG) are detectable only after 2-6 weeks of infection. IgM lasts only for a short period of time about 10 weeks and then disappears. Then IgG antibody level starts rising up and is detectable by most of the ELISA kits. IgG antibodies directed towards core and glycoprotein of the virus (anti-core antibody- P24) and develop antibodies which are detectable in Western blot assay. IgG once positive persists for life.

#### Epidemiology of AIDS

Since the first AIDS case detected in U. S. in 1981 reports of cases have come from different parts of the world and are coming still. In Africa and Haiti cases were detected at the same time. In Africa the people affected were mainly the heterosexuals. Males and females were equally affected. Whereas in U. S. males predominated the picture, showing the homosexual transmission pattern. The disease has spread now around the world crossing the man made boundary. It does not discriminate between the colour, region and political status. The disease affects mainly the sexually active group (20-40 years of life). Therefore the impact in the society is tremendous because of the great loss of young people.

In Africa children born of HIV positive parents were also found to be suffering from AIDS. In these cases the transmission is through the placenta. Chances of perinatal transmission of virus is 25 to 50%. In Asia, AIDS appears amongst the people who have sex contact with the foreigners and prostitutes.

#### AIDS Problems

Problem can be described as the three types of epidemics.

The first one is the Epidemics of HIV infection which went silently for several

years affecting many people without being aware of the disease.

The second is the epidemic of AIDS disease itself during which period number of AIDS cases went up. Third is the epidemics of social reactions and response. AIDS being a fatal disease occurring at such an alarming rate people started reacting to it.

After the recognition of AIDS in 1981, now by 1988 June the WHO estimates world wide AIDS cases to be above 1,00,00. It is estimated to reach one million by 1991.

In 1987, only 121 countries reported to WHO about the AIDS cases and now 137 countries have already reported till 1988 June.

## AIDS Pattern in the World

### *I. Pattern I- Western Pattern :-*

In North America, Western Europe, Australia & Newzealand

#### GROUPS OF PEOPLE

- Homosexual, Bisexual
- IV drugs users
- Recipients of blood and blood products

### *II. Pattern II African pattern:-*

In Sub-Saraha Africa, Oceanic, Caribbean Islands

- Heterosexual
- Unscreened blood transfusion
- Infected syringe
- Transplacental

### *III Pattern III- Asian pattern:-*

In Eastern Europe, North Africa, Middle East, Asia.

#### RISK GROUPS

- Contact with the foreingers
- Imported blood and blood products
- I. V. drug users
- Prostitutes.

## Modes of Transmission

1. Sexual- Homosexual, Heterosexual, Bisexual, Sex with multiple partners. ( 73% Risk)
2. Blood and blood products- (10% risk)
3. I. V. Drug Users or Drug abuses- (17% risk)

4. Transplacental transmission.
5. Organ and semen transplantation.

#### 1. SEXUAL TRANSMISSION

Incidence of AIDS is higher in homosexual, heterosexual and bisexual individuals. The mode of transmission is most important and difficult to tackle for the prevention. Presence of trauma or preexisting viral diseases of the genitalia predisposes to the HIV infection. Chances of getting HIV infection is higher in those who have multiple sex partners.

#### 2. BLOOD AND BLOOD PRODUCTS

Chances of getting AIDS is higher if an infected blood is used for transfusion. Therefore the patients with Haemophilia, Thalassaemia and Leukaemia are particularly at high risk because they need repeated transfusion of blood and blood products during their treatment. Transfusion of factor VIII carries a special risk because this is made from pooled plasma which are likely to be contaminated with HIV infected plasma but albumin and gamma globulin do not carry any risk of getting HIV infection probably because the preparation of these blood and blood products need treating them in cold Ethanol which kills the virus.

#### 3. REUSE OF NEEDLES & SYRINGES :

This practice is particularly common amongst the drug abusers, who usually share the needles and syringes during the I. V. drug infusion. The volume of the blood at the tip of the needle used (5 ul) is enough to transmit the virus. The chances of infection by this route is also high. Similarly reuse of skin piercing instrument during the trivial ceremonies like circumcision, ear pricking or tattooing and even Acupuncture carry the risk of transmitting the infection.

#### 4. TRANSPLACENTAL TRANSMISSION

Infected mother may give birth to an infected baby. Chances is 25 to 50%.

#### 5. ORGAN TRANSPLANT

Transplantation of the kidney, heart and skin etc. carry the similar risk. Therefore the person who donate the organ should be screened for HIV infection beforehand.

#### 6. SEMEN TRANSFUSION

Transfusion of semen is common practice for the sterile couples. If unscreened semen is used chances are high so artificial insemination carries the similar risk.

## Risk Groups

1. Homosexuals, Heterosexuals and Bisexuals.
2. I. V. Drug abusers.
3. Haemophiliacs.
4. Children of infected mothers.
5. Prostitutes.
6. People travelling abroad for Business or others.
7. Truck drivers.

## Ways in Which AIDS is not Transmitted

1. Huggings,
2. Sneezing
3. Hand shaking
4. Using toilets
5. Beverages & food
6. Swimming pools and
7. Insects

## How to avoid AIDS: What can you do ?

1. Learn about AIDS, way of transmission and tell others;
2. Use condoms- Always insist condoms unless you are sure that he/she is not a HIV carrier.
3. Don't have many sexual partners, which increases the risk.
4. Don't have sex with male or female prostitute or IV drug users.
5. Never share unsterilized needles or syringe. Even for vaccination buy separate syringe.
6. Avoid pregnancy if you are HIV positive.
7. Medical or paramedical staff should take care while handling the blood (Use gloves).
8. Even knife, scissors or razors and cutting instruments soiled with blood must be sterilized.

Note : Special care to be taken by the birth attendants (ANM, Nurse or Midwives)

## Incidence of AIDS in the Adolescents

- Homosexual or bisexual	72%
- Intravenous drug users	17%
- Haemophiliacs	5%
- Heterosexual contact with AIDS patient	5%
- Transfusion of blood and blood products	1%

## Incidence of AIDS in Paediatrics

- infants born of mothers with AIDS	71%
- Haemophilias or coagulation disorders	5%

- Transfusion of blood and blood products 16%
- Other categories 8%

In African countries, prostitutes have been found to be the major source of transmission of AIDS.

## Diagnosis

1. ELISA- (Enzyme linked immuno sorbent assay)
2. Western blot (or Immuno Blot)
3. Immunofluorescence Microscopy
4. Radio-immuno precipitation
5. Competitive Inhibition Assay

### 1. ELISA

This enables to test a large number of serum samples at a time. ELISA has been developed since 1984 particularly for the screening of blood donors. This test is very sensitive and easy to perform and applicable in the field condition also. It is performed for the screening of the blood from the risk groups.

#### Principle

Crude Antigen which is the protein material derived from the HIV virions after detergent solubilization of the virus particle, is disintegrated to finer molecules. This antigen is then attached to the solid phase usually plastic wells or beads. The human serum (test sample) is then incubated with the solid phase HIV antigen. The antibody if present in the serum remain attached to the solid phase even after vigorous washing. Then anti human antibody to which an enzyme (HRPO) has been conjugated, is used to detect the antigen antibody binding. Substrate (OPD) is added to detect the positive reaction which gives the light brown colour obviously seen by naked eye or a spectrophotometer. The intensity in the colour in relation to the critical level (cut-off) determines if the specimen is positive. It is important to use the known positive and known negative controls and compared.

ELISA sometimes may give rise to false positive and false negative results. But 98% of positive result are positive by WB which is confirmative test. ELISA negative (false negative) may occur in the early incubation period i.e. less than 2 weeks. During this time antibodies have not been developed in the blood of the infected persons. In some persons ELISA is positive but WB is negative. In such cases periodic screening after 6 weeks, 9 weeks, 12 weeks and then 6 months is advised. During these times there is rise of antibody levels which is confirmed by Western Blot.

## 2. WESTERN BLOT (IMMUNO BLOT)

This is the confirmative test for the diagnosis of AIDS. This is a very good and specific test.

### Configuration of the Test

This is virtually the ELISA test over the Nitrocellulose strips in which the HIV antigen has been already fed after electrophoretical separation in S. D. S. polyacrylamide gel transferred to a Nitrocellulose strip maintaining the relative positions of the antigens.

The colour developed at the end of the test is pinkish band which are insoluble and remain as such over the strips for a long time.

The position of the bands are interpreted in reference to the known positive test strip.

W. B. kits are available from Abbot, Bio-Rads and Du Point labs.

### W. B. Strips

The W. B. Strips are 3 mm wide Nitrocellulose strips which have been cut off after the antigen transfer. Each strip is suitable for a single serum sample for testing. Strips are supplied in tubes or in the plastic troughs packed properly. Strips are already treated with Triton X to inactivate the virus, if any.

Note : Handle the strips with care.

### Precautions for the Lab. Personnels

HIV virus is very delicate and is easily inactivated by heat. Heating at 56 degree centigrade for half an hour inactivates the virus. This method of inactivation is recommended for the serum samples before testing by ELISA and W. B. But chances of infection from HBsAg is even higher (23%) whereas chances of HIV infection is 2%. Even though same procedures as applicable for decontamination against HBsAg and Tubercle bacilli holds true for HIV infection, following activities are recommended for the prevention of laboratory exposed HIV infection.

1. Treat all the samples of blood as potentially infectious.
2. Avoid aerosol productions in the lab e. g. during pippeting, centrifugation, mixing, etc.
3. Wear protective clothings (gowns, gloves and masks).
4. Wash hands immediately after handling the blood samples with soap and water.
5. Ensure safe transportation of specimens.
6. Decontaminate work surfaces at the end of the work daily. For specific containers and instrument use sodium hypochlorite 0.5% for 10-30 minutes.
7. Institute safe disposal of wastes, use buckets with lids.

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8. Institute safe use and disposal of sharp cutting instruments and needle etc.
9. Avoid mouth pipetting
10. Refrain from work if injuries, ulcers and weeping lesions over the hands and fingers are present.
11. Avoid eating, drinking and smoking in the lab.

### Decontamination and Sterilization Methods

1. CHLORINE- Sod. hypochlorite 0.5% solution of 5 gms/litre e. g. Chlorox 10%- 15% is used.  
Contact time - 10 to 30 minutes is recommended.  
DISADVANTAGES- Hypochlorite gradually loses the strength so solution must be prepared fresh everyday.
2. HEATING- This method is used to inactivate the virus in serum samples before doing AIDS test.  
Other articles can be boiled for 10 minutes.
3. ETHANOL- 50 to 70%.  
Contact time 10 - 30 minutes at room temp.
4. ISOPROPANOL 35%.  
Contact time 10 - 30 minutes at room temperature.
5. GLUTARALDEHYDE- 1 to 2% is used for heat labile instruments only. Contact time as above.
6. FORMALIN- 0.1% to 5% - Contact time for one hour.

### Treatment of AIDS

So far there is no drugs nor vaccine has been developed for the treatment of AIDS inspite of vigorous research about AIDS.

Drug recommended are :

1. AZOTHYIMIDINE (AZOVUDINE) AZT :

This is the only drug so far found to be effective for treatment of AIDS. But this drug only limits the disease process but does not cure the disease. Besides this drug is very toxic and has many side effects and expensive too, it is estimated that for the t/t of AIDS with AZT cost is 50-150 thousand U. S. dollar approximately.

2. RIBAVIRINE

3. T/T OF OPPORTUNISTIC INFECTIONS

- a) Co-trimoxazole, Pentamidine - given in high doses for the treatment of Toxoplasmosis.

- b) Amphotericin B- used for candidiasis.
- c) Clofazimine- for the Mycobacterium avium infections.
- d) Acyclovir- for the t/t of Herpes virus.
- e) Spiramycin- for the cryptosporidium.

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