

THE PHARMA INNOVATION

Aids Epidemic In India-Prevention, Risk Factor and Treatment

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AIDS stands for Acquired Immunodeficiency Syndrome. Acquired means you can get infected with it, Immune Deficiency means a weakness in the body's system that fights diseases, Syndrome means a group of health problems that make up a disease. AIDS is caused by a virus called HIV, the Human Immunodeficiency Virus. This condition reduces the effectiveness of the immune system and leaves individuals susceptible to infections and tumors. India spends about 5 percent of its \$5.4 billion healthcare budget on treating AIDS patients. India is the second most populous country in the world, with more than 880 million people in 1993. With less than 1% of the global land mass, India has more than 16% of the world's population, more than that of South America, Africa, and Australia combined. The population will exceed one billion by 2000, surpassing even China. By then, India will have more new cases of HIV infection per year than any single country, and probably the largest number of HIV-infected people as well. Whatever happens in India will therefore have a major impact upon the global pandemic of HIV and AIDS. The paper considers the history of the HIV epidemic in India, the probable routes of entry of HIV into India, trends in prevalence in population samples, the geographic distribution of HIV in India, AIDS in India, clinical problems in India, projections of HIV/AIDS cases, and how to control HIV/AIDS. The HIV epidemic has grown silently in India over the past decade, with the virus spread mainly through heterosexual intercourse. All known routes of transmission are, however, known in India, and increasing seroprevalence has been noted among prostitutes, STD clinic patients, blood donors, and IV drug users. The population has been largely ignorant of the advance of HIV, with public officials and the media at a loss to adequately inform the public about what is taking place. Greater energy and resources are now being devoted to the problem, but it may be too late to stop a major epidemic.

Keyword: Acquired Immunodeficiency Syndrome, immune system, epidemic, awareness

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INTRODUCTION: HIV/AIDS is a disease and an epidemic. It infects and affects men, women, and children of every nationality, ethnicity, sexuality, social class, and economic status. Every year, millions of people are infected with

the HIV virus and millions of people die from AIDS. In 2004 alone, 4.9 million people became infected and 3.1 million died worldwide. There is no cure, but there is hope. It is crucial to educate people about HIV/AIDS prevention, as the disease has no cure. However, awareness and education efforts can be achieved through an understanding of the virus itself. Only through this awareness and understanding can the world begin to confront the growing HIV/AIDS epidemic. An epidemic is an outbreak of a disease that spreads rapidly and widely. HIV was first discovered in March 1981, when eight men in New York were diagnosed with a rare form of Kaposi's sarcoma (a relatively benign cancer that usually occurs in older people) and numerous cases of a rare lung infection called pneumocystis carinii pneumonia (PCP) started popping up in New York and California among homosexual men. By 1983, it became clear that the disease could be passed heterosexually as well, as women were also being infected. That same year, accounts of a similar virus were reported across Europe and Africa, making it clear that HIV/AIDS was a worldwide phenomenon. Human immunodeficiency virus (HIV) is a virus. A virus is an agent that infects cells in biological organisms such as humans. Once the virus has infected a cell, it grows by invading and controlling other cells around it. Most viruses attack specific parts of the body, such as they do with ear infections, chicken pox, or the common cold. HIV is a virus that infects cells of the body's immune system though. The immune system defends, protects, and heals the body from viruses, diseases, infections, and cancers. By attacking cells in the body's immune system, HIV destroys the body's ability to fight infection. HIV and Acquired Immune Deficiency Syndromes (AIDS) is not the same thing. When the immune system is weak because of HIV, a person becomes susceptible to a number of severe illnesses, also known as opportunistic infections. When this happens, along with at least one of 26 other defining conditions, a person is considered to have progressed to AIDS. It is from these opportunistic infections, not the AIDS diagnosis that people die. It is important to note, however,

that although there is no cure for HIV, many opportunistic infections are treatable and a person who has progressed to an AIDS diagnosis can return to HIV status with successful treatment of the opportunistic infection and rebuilding the immune system. It is also important to note that not all people with HIV will develop AIDS. In the United States, HIV/AIDS has become a chronic disease. This means that although there is no cure, a person can live a full, healthy life with HIV by controlling and suppressing the virus through highly active antiretroviral (HAART) medications and by monitoring a person's white blood cell (CD4) count and viral load (the amount of virus in the body). In other parts of the world, where these medications are not widely available and treatment options are limited, HIV/AIDS remains a life-threatening disease. HIV is transmitted through penetrative (anal or vaginal) and oral sex, blood transfusion, the sharing of contaminated needles in health care settings and through drug injection, and between mother and infant during pregnancy, childbirth, and breastfeeding. HIV lives in blood, semen, vaginal fluids, and breast milk. The virus cannot be passed through casual contact. Despite common misperceptions, it is not passed through urine or saliva, and one cannot become infected through casual contact such as hugging, kissing, sneezing, coughing, sharing a toilet seat, or simply by living in close contact with an infected person. Knowing the ways in which the virus can be transmitted means it is possible to protect oneself against it. It is important to understand that anyone can become infected regardless of race, sexual orientation, age, etc. Therefore, just because people look healthy, does not mean they are not infected. The only way to know of one's status for sure is to take a blood test, which is completely confidential. The safest way to protect against the infection is through abstinence (abstaining from sexual contact). However, if you are having sex, try to do so in a monogamous relationship and always use condoms correctly (latex condoms can prevent against HIV and other sexually transmitted diseases extremely effectively). In addition, never share needles or syringes. If you have had unprotected sex, or

have come into contact with someone else's blood through methods such as sharing needles, it is important to get tested. If infected, there are steps that can be taken in order to stay healthy and make sure the virus is not transmitted to anyone else. Now that we know what HIV is and how it is not transmitted, we can learn how to prevent HIV transmission. Practicing safe sex with condoms and dental dams, using new syringes after every injection or triple cleaning syringes with water and bleach after every use, not sharing needles/syringes with others, and seeking proper medical treatment during pregnancy can all reduce the risk of infection. India with 2.5 million patients is among the top three countries with the highest number of HIV cases, alongside South Africa and Nigeria. But with HIV cases showing signs of rising in the capital New Delhi, in the financial hub of Mumbai, in the north and the northeast, the cost of treatment in India could rise to \$1.8 billion by 2020, about 7 percent of the total health expenditure, the World Bank says. This would pose an enormous burden on the health care services and the budget in a country where malaria still kills hundreds of people every year and other health-sector challenges like non-communicable diseases are as sharp as AIDS, experts say. More than 15 percent of the 200,000 plus injectable drug users (IDUs) are HIV positive in the country against a global average of 10 percent, AIDS experts say. In some areas, HIV positive cases among IDUs have been found to be as high as 50 percent, health ministry officials quoting an ongoing survey said. This rise could fuel the spread of AIDS unless checked, aid agencies say in their reports. "What we are worried about, are the concentrated epidemics in the country, among vulnerable groups in districts," said Mariam Claeson, World Bank Program Coordinator (HIV/AIDS). "Those concentrated epidemics can act as wildfires, and therefore need to be targeted with effective prevention efforts," Claeson, an expert on AIDS in South Asia, told Reuters. Injecting drug users are infected by the virus by sharing needles with an HIV-infected person, and passing it on by having unprotected sex. The World Bank says the

poor risk getting poorer in India as AIDS patients get marginalized and face income loss due to their HIV status. The World Bank quoting a recent study says in its report that about 36 percent of people living with HIV/AIDS in India reported an income loss and increased expenditure on treatment. "HIV is not a major threat to the current economic growth of India, but the welfare impact is significant and HIV disproportionately affects the poor.

MODE OF TRANSMISSION

The virus of HIV primarily is transmitted by sex (anal, vaginal or oral sex with an infected partner), by injections (sharing contaminated needles for drug use or accidental piercing with a contaminated needle), or from infected mother to child through pregnancy or breast-feeding.

Infected semen and vaginal fluids, blood and blood product lead to the transmission of HIV. Drug abuse with unsterilized needles is another high-risk activity. Unprotected sex with multiple partners is the major cause of infection.

SYMPTOMS

HIV disease becomes AIDS when the immune system is seriously damaged. In such cases, the cell count decreases by fourteen percent. The infected person becomes prone to various opportunistic infections such as

- PCP (Pneumocystis pneumonia), a lung infection.
 - KS (Kaposi's sarcoma), a skin cancer.
 - CMV (Cytomegalovirus), an infection that usually affects the eyes.
 - Candida, a fungal infection that can cause thrush (a white film in your mouth) or infections in your throat or vagina.
- The AIDS related diseases also include serious weight loss, brain tumors and other health problems.

RISK

People with job that involves routine exposure to blood, and other body fluids are highly prone to HIV infection. Healthcare professional can be

exposed to HIV from needle-sticks and cuts and nicks caused by sharp objects. The infection can also be transmitted if the workers have contact with blood or infectious body fluids through broken, cut or torn skin.

There is also high risk of infection if the contaminated blood or body fluid comes in contact with wet skin in the eyes, nose, or mouth. Corrections staff, law enforcement, and public safety workers such as emergency medical personnel are always at risk due to exposure to infected blood or body fluids.

TESTS AND DIAGNOSIS

HIV is most commonly diagnosed by testing your blood or saliva for the presence of antibodies to the virus. Unfortunately, these types of HIV tests aren't accurate immediately after infection because it takes time for your body to develop these antibodies — usually up to 12 weeks. In rare cases, it can take up to six months for an HIV antibody test to become positive.

A newer type of test checks for HIV antigen, a protein produced by the virus immediately after infection. This test can confirm a diagnosis within days of infection. An earlier diagnosis may prompt people to take extra precautions to prevent transmission of the virus to others.

Tests to tailor treatment

If you receive a diagnosis of HIV/AIDS, several types of tests can help your doctor determine what stage of the disease you have. These tests include:

- **CD4 count.** CD4 cells are a type of white blood cell that's specifically targeted and destroyed by HIV. A healthy person's CD4 count can vary from 500 to more than 1,000. Even if a person has no symptoms, HIV infection progresses to AIDS when his or her CD4 count becomes less than 200.

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 type of test determines if your strain of HIV is resistant to any anti-HIV medications.

Tests for complications

Your doctor might also order lab tests to check for other infections or complications, including:

1. Tuberculosis
2. Hepatitis
3. Toxoplasmosis
4. Sexually transmitted diseases
5. Liver or kidney damage
6. Urinary tract infections
7. Lifestyle and home remedies

Although it's important to receive medical treatment for HIV/AIDS, it's also essential to take an active role in your own care. The following suggestions may help you stay healthy longer:

▪ **Eat healthy foods.** Emphasize fresh fruits and vegetables, whole grains and lean protein. Healthy foods help keep you strong, give you more energy and support your immune system.

Avoid certain foods. Food-borne illnesses can be especially severe in people who are infected with HIV. Avoid unpasteurized dairy products, raw eggs and raw seafood such as oysters, sushi or sashimi. Cook meat until it's well-done or until there's no trace of pink color.

Get immunizations. These may prevent infections such as pneumonia and the flu. Make sure the vaccines don't contain live viruses, which

can be dangerous for people with weakened immune systems.

- **Take care with companion animals.** Some animals may carry parasites that can cause infections in people who are HIV-positive. Cat feces can cause toxoplasmosis, while pet reptiles can carry salmonella.

Alternative medicine

People who are infected with HIV sometimes try dietary supplements that claim to boost the immune system or counteract side effects of anti-HIV drugs.

SUPPLEMENTS

- **Fish oil.** Some anti-HIV drugs can cause increases in cholesterol levels. Studies indicate that fish oil supplements can help bring those numbers down.
- **Whey protein.** Preliminary evidence indicates that whey protein, a cheese by-product, can help some people with HIV gain weight. Whey protein also appears to reduce diarrhea and increase CD4 counts.
- **Coenzyme Q10.** This supplement appears to increase levels of CD4 cells, which could make your immune system stronger. More research is needed, however.

Supplements that may be dangerous

- **St. John's wort.** Commonly used to combat depression, St. John's wort can reduce the effectiveness of several types of anti-HIV drugs by more than 50 percent.
- **Garlic supplements.** Although garlic may help strengthen the immune system, it also interacts with several anti-HIV drugs — reducing their effectiveness by 50 percent. **Occasionally eating garlic in food appears to be safe.**
 - Promiscuous sexual behavior can leave a person highly susceptible to the HIV infection. Always use latex condoms. The female condom can also help protect both partners. Use only water-based lubricants. Oil lubricants (such as Vaseline) might even tear latex condoms.
 - Always avoid alcohol or drugs during sex, you might lose control of your senses and engage in unsafe sex.

Causes

Scientists believe a virus similar to HIV first occurred in some populations of chimps and monkeys in Africa, where they're hunted for food. Contact with an infected monkey's blood during butchering or cooking may have allowed the virus to cross into humans and HIV destroys CD4 cells — a specific type of white blood cell that plays a large role in helping your body fight disease. Your immune system weakens as more CD4 cells are killed. You can have an HIV infection for years before it progresses to AIDS.

To be diagnosed with AIDS, you must have a CD4 count under 200 or experience an AIDS-defining complication, such as:

1. Pneumocystis jiroveci pneumonia
2. Cytomegalovirus
3. Tuberculosis
4. Toxoplasmosis
5. Cryptosporidiosis

PREVENTIONS

Although AIDS is a high risk disease, it can be prevented if proper precautions are taken. Greater awareness should be meted out to those who are ignorant of the virus and its repercussions on the human body. We have listed a few measures that can be adopted by everyone in order to stave off the HIV infection.

- Promiscuous sexual behavior can leave a person highly susceptible to the HIV infection. Always use latex condoms. The female condom can also help protect both partners. Use only water-based lubricants. Oil lubricants (such as Vaseline) might even tear latex condoms.
- Always avoid alcohol or drugs during sex, you might lose control of your senses and engage in unsafe sex.

- Use only disposable syringe and needles for transfusion. Always get the blood that is screened and certified as HIV free.
- It is recommended that an HIV-positive woman should not breast-feed her baby. The infant should be given AZT for the first several weeks in order to reduce the risk of infection.

TRANSMISSION OF HIV IN INDIA

As was stated earlier, HIV has progressed from a disease found in only the highest-risk population to one found in all segments of the Indian population, be it men, women, rich, poor, urban or rural. Populations thought at one time to be low risk are now being infected, as are high-risk groups. Some groups are being infected at a higher rate than others, however. For instance, women are being infected by way of heterosexual transmission at an alarming rate. Women now make up about 39 percent of those people living with HIV. Most are being infected by husbands or boyfriends who have multiple sexual partners, many of whom are HIV infected and do not know it. Here are some facts about those populations considered to have the highest risk of acquiring HIV.

- Sex Workers – Because of widespread poverty throughout India, women often resort to prostitution as a means of making money for their families. Others are forced into sex work due to an underground of violence and disrespect toward women. Finally, women involved in marital break-ups will often begin prostituting themselves as a means of surviving financially after being left with children to feed and a household to support. In some areas of India, it's estimated that one in every two sex workers are HIV infected, many not knowing it.
- IV Drug Use (IVDU) – The recreational use of drugs often overlaps with the sex trade. While IVDU seems to be worse in the northeastern parts of India, it is common throughout the country. Many attribute the widespread problem of IVDU and HIV to government policies that do not support HIV prevention and risk reduction among IV drug users.

Because IVDU is a crime and is consistently enforced and prosecuted, getting prevention messages to users is very difficult. There have been instances of prevention workers themselves being arrested while trying to help and educate IV drug users. Official estimates actually report the HIV prevalence among IV drug users to have gone down from 13 percent in 2003 to 10 percent in 2005.

- Truck Drivers – India's economy depends a great deal on its very large trucking network across the country. While truckers help move goods and services throughout India, they also contribute a great deal to the huge HIV population and the spread of HIV from one area of India to another. Truckers will pick-up sex workers along their route, engage in unprotected sex activity and then drop off the sex worker at the trucker's next stop along the route. This has contributed to the spread of HIV from urban areas into the rural towns and villages. The most damaging fact about truckers and their use of sex workers is that neither party knows they are infected.
- Men Having Sex with Men – There is a high degree of stigma associated with homosexuality in India. In fact, homosexuality has been criminalized, making HIV education and surveillance very difficult. Outreach workers are often harassed and even arrested for "promoting homosexuality." It's estimated that 42 percent of all men who have sex with men are also married, fueling the increasing HIV infection rate among women of India.
- Migrant Workers – As is the case in the United States, migrant workers in India are very transient and mobile, moving from town to town wherever the work takes them. Unfortunately, they take their risky behavior along with them, fueling the spread of HIV throughout India. While there are attempts at HIV education, the variety of languages, dialects, and cultures makes HIV education very difficult.

TRANSMISSION OF HIV

To become infected with HIV, infected blood, semen or vaginal secretions must enter your body. You can't become infected through ordinary contact — hugging, kissing, dancing or shaking hands — with someone who has HIV or AIDS. HIV can't be transmitted through the air, water or via insect bites.

You can become infected with HIV in several ways, including:

- **During sex.** You may become infected if you have vaginal, anal or oral sex with an infected partner whose blood, semen or vaginal secretions enter your body. The virus can enter your body through mouth sores or small tears that sometimes develop in the rectum or vagina during sexual activity.
- **Blood transfusions.** In some cases, the virus may be transmitted through blood transfusions. American hospitals and blood banks now screen the blood supply for HIV antibodies, so this risk is very small.
- **Sharing needles.** HIV can be transmitted through needles and syringes contaminated with infected blood. Sharing intravenous drug paraphernalia puts you at high risk of HIV and other infectious diseases such as hepatitis.
- **From mother to child.** Infected mothers can infect their babies during pregnancy or delivery, or through breast-feeding. But if women receive treatment for HIV infection during pregnancy, the risk to their babies is significantly reduced.

NATIONAL AIDS CONTROL PROGRAM

HIV/AIDS Situation in India

- As per revised estimates carried out during 2006 using multiple data sources, including National Family Health Survey, the number of persons living with HIV in the country is 2 to 3.1 million with an estimated adult HIV prevalence of 0.36%.

- The adult prevalence rate of HIV infection in the country has stabilised over the last three years. (0.41% in 2004, 0.39% in 2005 and 0.36% in 2006).
- Andhra Pradesh, Karnataka, Maharashtra & Tamil Nadu contribute 63% of the HIV infected persons in the country.
- 39.3% of the infections are in women and 3.8% in children.
- 84.6% of the infections were transmitted through the sexual route and peri-natal transmission accounted for 4.34% of infections. 1.8% and 1.9% of infections were acquired through injection drug use and contaminated blood and blood products respectively.
- The HIV prevalence among high risk groups continues to be nearly 6 to 8 times greater than that among the general population. Based on the sentinel surveillance data for 2004-2006, the districts have been classified into 4 categories. There are 156 districts in category A, 39 districts in category B, 296 in C category and 118 in D category.

National Response Under Various Interventions

Targeted Interventions for Population at High Risk

The Targeted Intervention (TI) projects aim to interrupt HIV transmission among highly vulnerable populations. Such population groups include commercial sex workers, injecting drug users, men who have sex with men, truckers and migrant workers. As on date, 871 Targeted Interventions are operational in various states and UTs in the country. Saturation of all high risk groups through 2100 TIs and development of 50% of TIs into CBOs is the target under NACP-III. Recently, Oral Substitution Therapy (OST) has been introduced in the National Programme as a part of the Harm Reduction Strategy to bring

down HIV infection among injectable drug users. The total to be covered under OST is 40,000 persons for **Rs.136 crore**.

Blood Safety

About 1.1% of the transmission is through contaminated blood. The goal is to reduce the transmission through blood to less than 1%. Over 1088 blood banks have been modernized, over 59% of the total blood units collected through Voluntary Blood Donation and a system of mandatory screening of blood for HIV, Hepatitis B&C, malaria and syphilis is enforced. This has enabled reducing transmission of HIV infection through contaminated blood from about 6.07% (1999), 4.61% (2003), 2.07% (2005), 1.96% (2006) to 1.1% (2007).

The blood safety activities constitute an important component of National AIDS Control Programme, as the gap in supply and demand needs to be met to ensure availability of quality blood and blood products. The vision of blood safety activities is to ensure provision of adequate, safe and quality blood to every patient in need of transfusion in the country through a well-coordinated National Blood Transfusion Services. The specific objective is to ensure reduction in sero-reactivity among Blood donors to less than 1%. Under the existing regulatory framework, all the blood units are mandatorily tested against five Transfusion Transmissible Infections (TTIs) i.e. HIV, Hepatitis-B, Hepatitis-C, Syphilis and Malaria. Only the blood units free from these TTIs are used for transfusion purposes.

4 new initiatives have recently been taken

- Constitution of 4 state of the Antiretroviral Treatment (ART) Blood Banks in the metros each with a capacity of daily collection of 1 lakh units for an outlay of **Rs.400 crore**. It is under submission to the Cabinet Committee on Economic Affairs (CCEA) for approval.

- A Fractionation Plant for **Rs.250 crore** under submission to the CCEA for approval.
- A draft Law to regulate standards in Blood Safety under submission to Ministry of Law.
- Establishment of a National Blood Transfusion Authority.

Integrated Counseling and Testing Centres (ICTC)

About 70% of HIV infected are not aware about their status and there is need to extend access to the counseling and testing facilities and increase demand generation. The ICTCs have been established at medical colleges, district hospitals, sub-district level hospitals and few community health centres and it is proposed to further extend the services to all the CHCs and 24 hours PHCs in the country.

Prevention of Parent to Child Transmission

All the ICTCs centres are now providing counseling and testing services to pregnant women. Hospitals with large number of ANCs & institutional deliveries provide an ICTC in the Obstetrics & Gynaecology department. The programme aims at increasing the proportion of women counselled and tested, especially in category A&B districts and the coverage of HIV positive women with Nevirapine to 70% in the next year. The high dropout rates need to be addressed and awareness levels and demand for services improved.

Sexually Transmitted Infections (STI)

The number of STI clinics being supported by NACO has increased from 815 in 2005 to 895 in 2007. The reported number of patients treated for STI in 2005 was over 16.7 lakh, in 2006, 20.2 lakh and in 2007, it has increased to 25.9 lakh. The baseline survey carried out in 2001 indicated that at any given time 6% of the adult population had symptoms of STI. There is, thus, very large

gap between the estimated number of STI patients and those reported to have sought treatment in government health facilities. During 2006, NACO and RCH division jointly released a manual on management of STIs, so as to strengthen the services in the government health facilities and also to involve the physicians working in the private sector. Joint training material has also been developed. A package for involvement of private physicians in the Category A&B districts has been developed. Medicines are under procurement in coloured cartons for each STI syndrome to facilitate the management of STI in the peripheral health facilities.

Care and Support

Government of India announced a policy cum programme commitment for providing free ART with effect from 1st April, 2004. Antiretroviral treatment (ART) is a combination of at least 3 ARV drugs that is given to HIV infected individuals once they reach a stage of advanced immuno-suppression. At present there are 174 ART centres in the country. More than 1.46 lakh patients are receiving free ART at these centres (May, 2008). In addition nearly 35,000 patients are receiving ART in private and NGO sector. Second line ARV drugs are being provided free of cost at Mumbai and Chennai from 2008. A total of 159 community care centres have also been established in high prevalence states to enable People Living with HIV/AIDS (PLHA) to get used to ART, to provide Counseling & follow-up advice on drug adherence, management of opportunistic infections and Nutrition Counseling, to provide pre-ART care for those PLHA who are not yet on ART through outreach and home-based services. To reduce inconvenience and indirect expenditures of patients, 46 drug dispensing centres have been established linked to the ART centre. These link centres will require the patients to go to the ART centres only 2 times instead of 12 as at present. Second line treatment has been introduced on a pilot basis in 2 centres and 42 persons are being treated.

National Paediatric AIDS Initiative

In order to provide comprehensive Care & Support (including ART) to children infected and affected by HIV, NACO has launched National Paediatric AIDS Initiative on 30th November, 2006. For this initiative NACO, along with the Indian Academy of Paediatrics (IAP), UNICEF, WHO and Clinton Foundation, has developed guidelines for paediatric ART. ARV drugs in paediatric formulations are available at all ART centres. Number of children receiving ART increased from 1800 before October 2006 to 9925 in May 2008. 32,500 are reported and being monitored. Other activities under this initiative include establishment of seven Regional Paediatric Centres, free CD4 monitoring, free DNA PCR test for children up to 18 months, liquid formulations for babies weighing less than 5 kg, diagnosis and treatment of opportunistic infections and micro nutrient supplementation. The initiative also includes training of paediatricians and counsellors, establishing laboratories for diagnosis, introduction of Dried Blood Support system to transport dried blood samples. Care and Support for CLHA (Children Living with HIV/AIDS) orphans and vulnerable children forms an integral part of NACP III.

Condom Promotion

Condom programme is central to HIV/AIDS prevention at the intervention level. The use of condoms is promoted as a protection against STIs and HIV/AIDS in addition, to Family Planning. Condom use is promoted and condoms provided at all ICTCS and ART centres and also the STI clinics. In 2006, 1250 million condoms were supplied free, 604 million were distributed through social marketing while 389 million through commercial marketing. 11025 Condom Vending Machines have been installed and another 11000 are in the process of being installed. 3.5 billion condoms are targeted to be distributed through 3 million outlets during NACP-III.

Information, Education and Communication activities (IEC)

NACO is working on a communication strategy which is a shift from awareness generation to bringing about behaviour change. NACO has focused on reduction of stigma and discrimination, promotion of services viz., counseling & testing, ART, routinisation of condom use and blood safety. Special emphasis has been given to youth and women who are more vulnerable to HIV infection. A cadre of village level Link workers are going to be set up in A & B category districts for focused interventions of BCC. Intensive IEC among general populations has resulted in increasing awareness of HIV/AIDS among rural populations to about 75% (BSS 2006). Under the adolescent education program, over 1,14,345 high schools have been covered with HIV/AIDS and life skill education programs. The Red Ribbon Express launched on 1.12.2007 has traversed over 180 stations and 27,000 kms. It has drawn huge crowds at all the stations.

Mainstreaming

In order to reiterate the Government's multi-sectoral response to prevent the spread of HIV and to facilitate a strong multi-sectoral response to combat it effectively, a National Council on AIDS (NCA) has been constituted, under the chairmanship of Hon'ble Prime Minister with representation of 33 ministries and departments. Private sector, civil society organisation, PLHA networks and government departments would all play crucial role in prevention, care, support, treatment and service delivery.

MANAGING HIV INFECTION

First of all, there is no evidence that people infected with HIV can be cured by the currently available therapies. In fact, individuals who are treated for years and are repeatedly found to have no virus in their blood experience a prompt rebound in the number of viral particles when therapy is discontinued. Consequently, the decision to start therapy must balance the risk

versus the benefits of treatment. The risks of therapy include the short- and long-term side effects of the drugs, described in subsequent sections, as well as the possibility that the virus will become resistant to the therapy which can limit options for future treatment.

A major reason that resistance develops is the patient's failure to correctly follow the prescribed treatment, for example, by not taking the medications at the correct time. If virus remains detectable on any given regimen, resistance eventually will develop. Indeed, with certain drugs, resistance may develop in a matter of weeks, such as with lamivudine (Epivir, 3TC), emtricitabine (Emtriva, FTC), the drugs in the class of nonnucleoside analogue reverse transcriptase inhibitors (NNRTI) such as nevirapine (Viramune, NVP), delavirdine (Rescriptor, DLV), and efavirenz (Sustiva, EFV), and the integrase inhibitor raltegravir (Isentress, RAL). Thus, if these drugs are used as part of a combination of drugs that does not suppress the viral load to undetectable levels, resistance will develop rapidly and the treatment will lose its effectiveness. In contrast, HIV becomes resistant to certain other drugs, such as zidovudine (Retrovir, AZT), stavudine (Zerit, D4T), and protease inhibitors (PIs), over months. In fact, for some PIs whose effects are enhanced by giving them in combination with the PI ritonavir (Norvir, RTV) to delay their clearance by the body, resistance appears to be markedly delayed. These drugs are discussed in more detail in subsequent sections, but it is important to note that when resistance develops to one drug, it often results in resistance to other related drugs, so called cross-resistance. Nevertheless, HIV-infected individuals must realize that antiviral therapy can be and typically is very effective. This is the case even in those who have a low CD4 cell count and advanced disease, as long as drug resistance has not developed.

Factors to consider before starting antiviral therapy

One of the biggest questions related to the management of HIV disease is, when is the best time to start antiviral treatment. Clearly, therapy is appropriate for those with low CD4 cells (for example, <200 and even between 200 and 350 cells/mm³) as well as in those with even mild symptoms of disease such as oral thrush, chronic unexplained diarrhea, fever, weight loss, opportunistic infections, or dementia (for example, forgetfulness). For asymptomatic patients with CD4 cells greater than 350 cells/mm³ there is more uncertainty as to whether therapy should be routinely recommended. Specific considerations related to this issue are discussed below. Regardless, prior to initiating antiviral therapy, everything possible should be done to ensure that the patient is committed to the treatment, able to adhere to the regimen, and will follow up with his or her health-care provider to assess whether medications are tolerated and working.

ANTIVIRAL THERAPY

Guidelines for starting antiviral therapy have been proposed by panels of experts from several groups, including the DHHS (<http://www.aidsinfo.nih.gov>) and IAS-USA. For several years, these guidelines have recommended treating all patients who have symptoms of HIV infection as well as those who have CD4 cell counts of less than 350 cells/mm³. Recent data supporting even earlier initiation of therapy includes analyses of groups of patients followed over time. Although the data is imperfect, a recent study showed that those who started treatment with CD4 cells greater than 500 cells per mm³ actually were less likely to die than those who did not start treatment until their CD4 cells declined to less than 500 cells/mm³. In addition, there is increasing evidence that ongoing viral replication, even in the setting of high CD4 cells may be associated with damage to the brain, kidneys, heart, and possibly even liver. Along with these studies arguing for earlier treatment, there is growing evidence that

currently used treatments are usually very well tolerated and effective in suppressing viral load. Guidelines will continue to change with time, but for now, the emphasis should be on providers discussing with patients all of the potential benefits and risks of therapy and deciding when is best for each individual. Regardless, all agree that HIV is generally a slowly progressive disease, and therapy rarely needs to be started abruptly. Therefore, there usually is time for each patient to carefully consider options prior to starting treatment.

Before starting treatment, patients must be aware of the short- and long-term side effects of the drugs, including the fact that some long-term complications may not be known. Patients also need to realize that therapy is a long-term commitment and requires consistent adherence to the drugs. In addition, clinicians and patients should recognize that depression, feelings of isolation, substance abuse, and side effects of the antiviral drugs can all be associated with the failure to follow the treatment program.

INITIAL THERAPY FOR HIV

Guidelines for using antiviral therapy have been developed and are updated on a regular basis by an expert panel assembled by the DHHS, the IAS-USA panel, and others. The DHHS guidelines are available at <http://www.aidsinfo.nih.gov>. The most recent IAS-USA guidelines were published in the Journal of the American Medical Association (JAMA) in the summer of 2010.

Antiviral treatment options have primarily included combinations of two nucleoside analogue reverse transcriptase inhibitors (NRTI), often referred to as "nucs," and one PI, typically with a low dose of RTV, a PI used at low doses to increase the level of the principle PI being used, so called "boosting." Alternative, preferred options include the use of two NRTIs with a nonnucleoside analogue reverse transcriptase inhibitor (NNRTI), the latter often called "non-nucs." These NNRTI-containing combinations generally are easier to take than PI-containing combinations and tend to have different side

effects. Recently, NRTIs were combined with the integrase inhibitor raltegravir with very good viral suppression and tolerability. This novel combination has now been approved by the Food and Drug Administration as another treatment option for those initiating therapy for the first time and is considered along with NNRTIs and PIs as one of the preferred options.

Nucleoside and nucleotide analogue reverse transcriptase inhibitors

NRTIs block an enzyme of the human immunodeficiency virus called reverse transcriptase that allows HIV to infect human cells, particularly CD4 cells or lymphocytes. Reverse transcriptase converts HIV genetic material, which is RNA, into human genetic material, which is DNA. The human-like DNA of HIV then becomes part of the infected person's own cells, allowing the cell to produce RNA copies of the HIV that can then go on to attack other not yet infected cells. Thus, blocking reverse transcriptase prevents HIV from taking over (infecting) human cells. In general, most antiviral regimens for HIV disease contain a

backbone of at least two NRTIs. The NRTIs include ZDV, d4T, ddI, zalcitabine (HIVID, ddC), 3TC, FTC, abacavir (Ziagen, ABC), or TDF. The NRTIs FTC and 3TC are highly related compounds and, although data is somewhat limited, most experts agree that they probably can be used interchangeably. That said, many combinations of NRTIs can be used together, with current guidelines generally recommending the fixed-dose combination of TDF with FTC with alternatives being the fixed-dose combinations of ABC/3TC or ZDV/3TC. Other options would include ddI plus 3TC or FTC. ABC has been associated with severe allergic reaction in approximately 5% of patients. Recent studies have shown that a blood test (HLA-B*5701) can be performed to determine who is at risk for this reaction so that the drug can be avoided in these individuals and be used in others with greater confidence that there will not be such a reaction.

TABLE-1 Usual dosing schedule and meal restrictions for NRTIs

	ZDV	d4T	ddI	ddC	3TC	ABC	TDF	FTC
Dose in each pill (mg)	300	30 or 40	100 or 400	0.75	150 or 300	300	300	200
Schedule	1 twice/day	1 twice/day	2 (100) twice/day or 1 (400) once/day	1 thrice/day	1 (150) twice/day or 1(300) once/day	1 twice/day or 2 once/day	1 once/day	1 once/day
Meal restrictions	None	None	30 minutes before or 60 minutes after a meal	None	None	None	None	None

ZDV, zidovudine; d4T, stavudine; ddI, didanosine; ddC, zalcitabine; 3TC, lamivudine; ABC, abacavir; TDF, tenofovir; FTC, emtricitabine.

The following are available fixed-dose combination pills of NRTIs:

- ZDV/3TC (300 mg/150 mg) as Combivir; one twice per day
- ZDV/3TC/ABC (300 mg/150 mg/300 mg) as Trizivir; one twice per day
- ABC/3TC (600 mg/300 mg) as Epzicom; one per day
- TDF/FTC (300 mg/200 mg) as Truvada; one per day

These are standard doses for average-sized adults, and dosing may vary depending upon the weight of a patient. When TDF is taken with ddI, the standard ddI dose should be reduced to 250 mg per day and can be taken with food.

Nonnucleoside analogue reverse transcriptase inhibitors

Like NRTIs, NNRTIs block the reverse transcriptase enzyme preventing uninfected cells from becoming infected.

NNRTIs include NVP, DLV, EFV and the recently approved etravirine (Intelence, ETR). ETR was developed specifically to be an option for patients that have developed resistance to the earlier drugs in the class. NVP, DLV, and EFV are typically used with two NRTIs, and ETR is primarily being used as part of regimens for those with a history of different types of treatment to which they have developed resistance.

TABLE-2 Usual dosing schedule and meal restrictions for NNRTIs

	NVP	DLV	EFV	ETR
Dose each pill (mg)	200	200	600	200
Schedule	1 twice/day (start with 1 once/day for first 14 days)	2 thrice/day	1 once/day	1 once/day
Meal restrictions	None	None	Avoid high-fat meals	After meals

NVP, nevirapine; DLV, delavirdine; EFV, efavirenz; ETR, etravirine.

For people without a history of drug resistance, there is a very effective fixed-dose combination pill that includes TDF with FTC and EFV as a single pill that can be taken once per day.

Protease inhibitors

PIs block the action of an HIV enzyme called protease that allows HIV to produce infectious copies of itself within HIV-infected human cells. Thus, blocking protease prevents HIV in already-infected cells from producing HIV that can infect other, not yet infected cells.

PIs include

- saquinavir (SQV) which comes as the hard gel capsule Invirase (INV),
- ritonavir (Norvir, RTV),
- indinavir (Crixivan, IDV),
- nelfinavir (Viracept, NFV),
- fosamprenavir (Lexiva, FPV),

- lopinavir/ritonavir (Kaletra, LPV/r)
- atazanavir (Reyataz, ATV),
- tipranavir (Aptivus, TPV),
- and darunavir (Prezista, DRV).

Each of these drugs has been shown to effectively reduce the viral load when used in combination with other active drugs.

Table-3 Usual dosing schedule and meal restrictions for PIs

	SQV ⁺	IDV	NFV	FPV	LPV/r	ATV	TPV	DRV
Dose in each pill (mg)	500	400	625	700	200/50	200 or 300	250	400 or 600
Schedule	2 ¹ twice/day	2 every 8 hours	2 twice/day	2 twice/day or with RTV ²	2 twice/day or once/day	2 (200) or 1 (300) with RTV ³ once/day	2 ⁴ twice/day	800 ⁵ once/day or 600 twice/day
Meal restrictions	With meals	1 hour before or 2 hours after meals, or with low-fat meals	With meals	None	With meals	With meals	With meals	With meals

SQV, saquinavir; IDV, indinavir; NFV, nelfinavir; FPV, fosamprenavir; LPV/r, lopinavir plus ritonavir; ATV, atazanavir; TPV, tipranavir; DRV, darunavir.

¹Administered with RTV at a dose of 100 mg twice/day.

²FPV can be given without RTV in patients without resistance to PIs or at a dose of 1,400 mg once daily with either 100 mg or 200 mg of RTV once daily. In treatment-experienced patients, FPV is given at a dose of 700 mg twice daily with RTV 100 mg twice daily.

³ATV can be given alone at a dose of 400 mg once daily or at a dose of 300 mg once daily with RTV 100 mg once/daily.

⁴TPV is always given at a dose of 500 mg

twice/daily with RTV 200 mg twice daily.

⁵DRV can be given to those with a history of drug resistance at a dose of 600 mg twice daily with 100 mg RTV twice daily. For those without resistance, it can be given at a dose of 800 mg (two 400 mg tablets) with 100 mg RTV once daily.

Although RTV is approved for treatment of HIV-infected patients at a dose of 600 mg twice daily, it is virtually never used at this dose because of severe side effects. Because of this, it is not

included in the above table. However, PIs are frequently dosed with low doses of RTV. RTV delays the clearance of the other drugs from the system, making them easier to take and more effective. The dose of RTV varies depending upon which drugs it is being taken with and how it is being administered. The only PI that is not substantially affected by RTV is NFV.

LPV/r comes coformulated as Kaletra while all other RTV-containing regimens require taking RTV along with the other PI. In the case of TPV, RTV must be given as 200 mg with each dose of TPV twice per day. In contrast, ATV can be given without RTV at a dose of two 200 mg capsules once daily or 300 mg with 100 mg RTV once daily. The latter should always be used in PI-experienced subjects and when used in combination with TDF or NNRTIs which can reduce the drug levels of ATV. Similarly, FPV is also used differently in PI-naïve and experienced individuals. In treatment-naïve individuals, it can be given as two 700 mg tablets twice daily or two 700 mg tablets (1,400 mg total) with either 100 or 200 mg RTV, all once daily. In treatment-experienced patients, or when used with NNRTIs, it should be given as one 700 mg tablet with 100 mg RTV, both twice daily. The most recently approved of the PIs is DRV which was initially used exclusively in treatment-experienced patients with drug-resistant virus. In this setting, it is given as 600 mg with 100 mg RTV, both given twice daily. More recently, DRV was approved for those who have never been treated before given at a dose of two 400 mg tablets (800 mg total) once daily with 100 mg of RTV once daily.

Fusion inhibitors

A fusion inhibitor blocks an early step in the viral life cycle. Enfuvirtide (Fuzeon, T-20) attaches to the envelope surrounding the virus and prevents it from entering the CD4 cells. This prevents the infection of CD4 cells by HIV. T-20 is the first approved drug in this class. It is given as a twice daily subcutaneous injection (90 mg). It is used primarily in individuals who have developed

resistance to other classes of drugs in order to create a new potent combination. Like all other antivirals, it is most useful in those taking other active drugs at the same time in order to optimize the chance of getting viral loads to undetectable levels and to prevent the development of drug resistance.

CCR5 antagonist

The first available drug in this class is called maraviroc (Selzentry, MVC), which is now approved for use in combination therapy in treatment-experienced and native patients who do not have detectable CXCR4-using virus as determined by a tropism assay. This is a unique drug in a new class that blocks viral entry by interacting with the CCR5 molecule on the surface of the CD4 cell. It is known that HIV first binds to the CD4 molecule on the surface of CD4 cells and then connects with the CCR5 or CXCR4 molecule. Only after this second step is the virus able to enter the cell. The CCR5 antagonist prevents viruses that use CCR5 from getting into the cell. What is unique about this drug compared to others is that 20%-50% of patients have viruses that are able to use the CXCR4 receptor. In these cases, CCR5 antagonists do not appear to be active at suppressing virus. Therefore, in order to know if the drug will work for a given patient, a new test needs to be performed, the so called "tropism" assay. This test will tell the provider and patient whether there is virus that uses CXCR4, in which case the patient would not be a candidate for MVC, or if they only have viruses that use CCR5, in which case MVC should be an active drug. Without tropism results, it is impossible to know whether MVC will be an active drug for a given patient. MVC is typically dosed at either 300 mg or 150 mg twice daily, depending upon what other drugs it is given with. If the patient is taking any RTV, then they would usually receive the 150 mg dose. If RTV is not being used as part of the regimen, they would generally receive the 300 mg dose and sometimes even higher if it is being used with drugs like ETR. HIV providers are aware that whenever

using any anti-HIV medications attention must be given to possible drug interactions.

Integrase inhibitor

The first available drug in this class is RAL and represents a new drug in a new class that appears to be very potent at suppressing HIV in all patients who have never been on this drug or other integrase inhibitors in development. It was initially approved for treatment-experienced patients with drug-resistant virus. It is also now approved for those starting therapy for the first time. The approved dose of RAL is 400 mg twice daily.

Drugs in development

There are many drugs currently in development that may simplify therapy and provide important options for those who have developed extensive drug resistance. Drugs that show promise in early clinical trials are often made available by the manufacturer with approval of the Food and Drug Administration (FDA), to certain individuals. In particular, these drugs are used in individuals no longer responding or able to tolerate currently available agents. The most promising new drugs in the advanced stages of development are those in existing classes, such as new integrase inhibitors, and a new NNRTI.

SIDE EFFECTS OF HIV THERAPY

There are many potential side effects associated with antiviral therapies. The most common ones for each class of drug are summarized in readily available product information. Some specific toxicities are summarized by class below.

NRTIs

Most NRTIs can cause mild nausea and loose stools. In general, these symptoms resolve with time. ZDV has been associated with decreased

production of blood cells by the bone marrow, most often causing anemia, and occasionally hyperpigmentation (most often of the nails). D4T can damage nerves and cause peripheral neuropathy, a neurological condition with numbness and/or tingling of the feet and hands, and inflammation of the pancreas (pancreatitis) that causes nausea, vomiting, and mid upper abdominal pain. DDI also causes pancreatitis and, to a lesser extent, peripheral neuropathy. Peripheral neuropathy can become permanent and painful, and pancreatitis can be life-threatening if therapy is not discontinued. The drug ddC also is associated with peripheral neuropathy as well as oral ulcers. ABC can cause a hypersensitivity reaction during the first two to six weeks of therapy in approximately 5% of individuals. The hypersensitivity reaction most often causes fever and other symptoms, such as muscle aches, nausea, diarrhea, rash, or cough. The symptoms generally get worse with each dose of ABC and, if suspected, therapy must be discontinued and never restarted for fear of developing a life-threatening reaction. There is now a simple blood test (HLA-B*5701) that can be performed to determine whether a patient is at risk for developing the hypersensitivity reaction. If the test is positive, the patient should never receive this medication. TDF is generally well tolerated although there may be rare kidney damage. FTC is also well tolerated except for the occasional development of hyperpigmentation, most often on the palms and soles. This hyperpigmentation occurs more frequently in people of color. Although all NRTIs can be associated with lactic acidosis (a serious condition in which lactic acid accumulates in the blood), it may occur more often with some drugs, such as d4T. Although this complication of treatment is rare, it can be severe and life-threatening. Early symptoms of lactic acidosis are nausea, fatigue, and sometimes, shortness of breath. Lactic acidosis needs to be watched for and, if suspected, requires that therapy be discontinued until symptoms and laboratory test abnormalities resolve. There has been a great deal of attention given to the more recently identified problem of "lipodystrophy." Individuals suffering from this

syndrome can be categorized as having lipohypertrophy (fat accumulation) syndromes, such as the "buffalo hump" on the back of the neck, breast enlargement, or increased abdominal girth. Others primarily suffer from lipoatrophy with fat loss under the skin with complaints of prominent veins on the arms and legs, sunken cheeks, and decreased gluteal (buttock) size. These syndromes appear to be related to multiple factors, including, but not limited to, drug therapy. The NRTIs appear to be most closely linked to lipoatrophy, in particular D4T and to a lesser extent ZDV. In fact, some studies have suggested slow accumulation of fat in those who modify the NRTI component of their regimen. Some NRTIs also have been linked to elevation in lipid (fat) levels in the blood. While switching therapy is always a consideration in those experiencing potential drug-related toxicity, this should only be done under the careful supervision of an experienced HIV provider.

NNRTIs

The most common side effect associated with NNRTIs is a rash, typically occurring during the first weeks of therapy. This is most common in individuals treated with NVP. In this case, the overall risk of rash is reduced if therapy is started as a single, 200 mg NVP pill once per day during the first two weeks before increasing to the full dose of 200 mg twice per day. If the rash is mild, therapy usually can be continued if antihistamines are given, and if the rash resolves, treatment with the NNRTI can be continued. If the rash is severe, associated with liver inflammation or blisters, changes in the mouth or around the eyes, or with high fevers, therapy with the NNRTI usually needs to be discontinued. Decisions regarding continuing or stopping treatment need to be made with the primary-care provider. In some patients, NVP can cause a severe allergic reaction characterized by fever, rash, and severe liver inflammation. Recent data suggests that the groups at the greatest risk for the severe reaction are those with stronger immune systems, such as HIV-

uninfected people given this treatment after an exposure to HIV, women with CD4+ T cells >250 cells per mm³ and men with CD4+ T cells >400 cells per mm³. There is also likely to be increased risk in pregnant women and individuals with other underlying liver diseases. Consequently, NVP probably should not be used in any of these groups, or if used, used with caution. In addition, whenever NVP is started, liver tests that are markers for liver inflammation should be monitored at regular intervals during the first several months of treatment. Side effects associated with EFV are mostly dizziness, confusion, fatigue, and vivid dreams. These tend to be most prominent during the first weeks of therapy and then often decrease in severity. It is generally recommended that EFV be taken at bedtime so that the patient is asleep during the time dizziness and confusion may be most severe. It is also noteworthy that there may be an increased risk of depression associated with the use of this drug, and it should be used with caution in those with poorly managed depression. Rash and liver inflammation can occur with both EFV and DLV, and these drugs may also be linked to abnormalities of lipids in the blood. The most common side effect reported with the most recently approved NNRTI, ETR, is rash and it was generally mild and rarely required that medications needed to be stopped.

PIs

There are currently nine approved PIs that all have distinct toxicities. The most common side effects associated with these drugs are nausea and diarrhea, which occur more often with some PIs than others. For example, diarrhea is more common with NFV than other PIs but can occur with any and all drugs in this class. Many of the drugs in this class also increase blood lipid levels, some more than others with ATV and possibly DRV appearing to have less effect on lipids than other drugs in the class. Other unique toxicities associated with various PIs are kidney stones with IDV and ATV and increased blood

bilirubin levels with IDV and ATV. Some of these drugs also have been associated with elevations in blood sugar levels and bleeding in hemophiliacs. Finally, little is known regarding the role these drugs may play in the development of lipodystrophy.

Fusion inhibitors

The only drug in this class is T-20, which is administered as a twice daily subcutaneous injection. The most common side effect is redness and pain at the site of injection. Rarely, infection can occur at the injection site. There also are reports of generalized allergic reactions.

CCR5 antagonist

Although there were some early concerns of liver inflammation for drugs in this class, MVC appeared to be well tolerated in clinical trials without any specific toxicities attributable to the drug. However, it is a new drug in a new class and the first to actually target the cell. For these reasons, longer follow-up from clinical trials and those followed in the clinic will be very important for assessing the overall safety of the drug.

Integrase inhibitor

RAL has not been strongly linked to any specific side effect in clinical trials. However, there have been some cases of muscle problems and of increasing depression that needs to be watched for when starting this or any new medications. As with all new medications, more data will come from extended follow-up of patients in the clinic and in clinical trials.

Monitoring antiviral therapy

The goals of antiviral therapy are to enhance immunity and delay or prevent clinical advancement to symptomatic disease without inducing important side effects or selecting for

drug resistant virus. Currently, the best marker of a drug's activity is a decrease in the viral load. Ideally, prior to initiating treatment, the viral load and the CD4 cell count should be checked and the viral load test then repeated after approximately four weeks of treatment. If the patient is beginning a regimen that includes two to three drugs for which the patient's virus does not appear to be resistant, it is expected that the amount of virus should decrease by at least hundredfold during this interval. The ultimate goal is for the viral load to decrease to undetectable levels which should occur by approximately 24 weeks. Those that are not having an appropriate response to therapy need to be questioned to make sure that they are taking their medications correctly, and if not, why. If the viral load is not going to undetectable levels and the patient is taking the medications correctly, then it is likely that there is a resistant virus to some of the medications. Drug-resistance testing then should be performed and the patient managed as described in the next section.

Viral load increasing while on HIV therapy

If the patient does suppress their virus to undetectable levels on antiviral therapy but then develops detectable virus, several things should be considered. First, it must be established that the patient is taking the medications correctly. If they are missing doses, then every effort must be made to understand why this is happening and correct the situation, if possible. If the poor adherence is a result of drug side effects, efforts should be directed toward managing the side effects or changing to a better-tolerated regimen. If poor adherence is occurring because of the medication schedule of dosing, new strategies should be discussed such as placing medications in a pillbox, associating the dosing with certain daily activities such as tooth brushing or possibly changing the regimen. Finally, if the reason for poor adherence is depression, substance abuse, or another personal issue, these issues need to be addressed and managed. It is important to remember that sometimes, for reasons not

entirely understood, the viral load can briefly increase. Unexpected increases, therefore, necessitate repeated testing of the viral load before any clinical decisions are made. If, however, the viral load is continually detected despite proper adherence to the prescribed therapy, serious consideration must be given to the possibility that the virus has become resistant to one or more of the medications being given. There is now an abundance of data showing that the use of drug-resistance tests can improve the response to a follow-up regimen. Testing can be used to determine if an individual's HIV has become resistant to one or more of the drugs that are being taken. There are currently two main types of resistance tests available in the clinic: one that is called a genotype and the other a phenotype assay. The former looks for mutations in the virus and the latter the actual amount of drug it takes to block infection by the patient's virus. The genotype test is very helpful in those being screened for the presence of resistant virus prior to initiating treatment and those experiencing viral rebound on one of their first treatment regimens. The phenotype test is particularly useful in those who are highly treatment-experienced and have substantial amounts of drug resistance. The information derived from these tests, along with a tropism test will ultimately tell the provider which of the many approved drugs are likely to be fully active against the specific patient's virus. Using this information, the goal is to include at least two and ideally three fully active drugs in the next regimen in order to optimize the chances of suppressing the viral load to undetectable levels.

Missing doses or stopping antiviral therapy

It is strongly advised that individuals on an antiviral regimen not miss any doses of their medications. Unfortunately, life is such that doses often are missed. Reasons for missing doses range from just forgetting to take the medication, leaving town without the medication, or because of a medical emergency, such as the need for urgent surgery. For example, after

an appendectomy for acute appendicitis, a patient may not be able to take oral medication for up to several days. When a dose is missed, the patient should contact his or her physician without delay to discuss the course of action. The options in this situation are to take the missed doses immediately or simply resume the drugs with the next scheduled dose. Although every missed dose increases the chance that the virus will develop resistance to the drugs, a single missed dose should not be cause for alarm. On the contrary, it is an opportunity to learn from the experience and determine why it happened, if it is likely to happen again, and what can be done to minimize missing future doses. Furthermore, if a patient cannot resume medication for a limited time, such as in a medical emergency, there still is no cause for alarm. In this circumstance, the patient should work with their HIV provider to restart therapy as soon as is feasible. Stopping antivirals is associated with some risks of developing drug resistance, and those who wish to stop therapy for any one of a number of reasons should discuss this with their health-care provider in advance to establish the best strategy for safely accomplishing this.

CONCLUSION

Despite significant efforts, there is no effective vaccine against HIV. The only way to prevent infection by the virus is to avoid behaviors that put you at risk, such as sharing needles or having unprotected sex. In this context, unprotected sex means sex without a barrier such as a condom. Because condoms break, even they are not perfect protection. Many people infected with HIV don't have any symptoms. There is no way to know with certainty whether a sexual partner is infected. Here are some prevention strategies: Abstain from sex. This obviously has limited appeal, but it absolutely protects against HIV transmission by this route. Have sex with a single partner who is uninfected. Mutual monogamy between uninfected partners eliminates the risk of sexual transmission of HIV. Use a condom in other situations. Condoms

offer some protection if used properly and consistently. Occasionally, they may break or leak. Only condoms made of latex should be used. Only water-based lubricants should be used with latex condoms. Do not share needles or inject illicit drugs. If you work in a health-care field, follow recommended guidelines for protecting yourself against needle sticks and exposure to contaminated fluids. If you have engaged in risky behaviors, get tested to see if you have HIV. The risk of HIV transmission from a pregnant woman to her baby is significantly reduced if the mother takes medications during pregnancy, labor, and delivery and her baby takes medications for the first six weeks of life. Even shorter courses of treatment are effective, though not as optimal. The key is to get tested for HIV as early as possible in pregnancy. In consultation with their physician, many women opt to avoid breastfeeding to minimize the risk of transmission after the baby is born.

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