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KASBIT Business Journal

10 September 2010

Online at <https://mpra.ub.uni-muenchen.de/50726/>

MPRA Paper No. 50726, posted 19 Oct 2013 17:59 UTC

## A study on Global Human-Immunodeficiency Virus and its Effect in Bangladesh

Jamal Nazrul Islam<sup>1</sup>, Haradhan Kumar Mohajan<sup>2</sup>, Pahlaj Moolio<sup>3</sup> and Raymond Peter<sup>4</sup>

### ABSTRACT

This paper deals with global Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) and situation of this disease in Bangladesh. The disease is alarming in poorer areas as like Africa, Latin America, Caribbean islands and some parts of Asia. This paper aware the people who have very few knowledge about HIV/AIDS. Due to ignorance of people, HIV/AIDS is spreading to the developing countries. An attempt is taken here to show the world about the discrimination to the societies and their effects to spread HIV among deprives. Some medicines help the patients to live comfortably and find a longer life than those who do not take any medicine. But yet no vaccine/medicine is invented to prevent the diseases or to cure the diseases completely. Prevention is the only way to get rid of from this fetal disease. The origin and some treatments of HIV are discussed in this paper. The paper will give proper knowledge to the ignorant people to become consensus about HIV/AIDS.

**JEL. Classification:** H75; I11; I12

**Key words:** DNA, Drugs, Unsafe sexual activities, Discrimination in societies.

### 1 INTRODUCTION

In this paper we have described global situation of HIV/AIDS. Later we have enlightened on the HIV of Bangladesh. Bangladesh is a small country but dense in population, as a result risk of HIV is alarming here. The happy news

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<sup>1</sup> Emeritus Professor, Research Centre for Mathematical and Physical Sciences, University of Chittagong, Chittagong, Bangladesh. Phone: +880-31-616780.

<sup>2</sup> Assistant Professor, Premier University, Chittagong, Bangladesh. E-mail: [haradhan\\_km@yahoo.com](mailto:haradhan_km@yahoo.com)

<sup>3</sup> Professor, Paññāsāstra University of Cambodia, Phnom Penh, Cambodia. E-mail: [pahlajmoolio@gmail.com](mailto:pahlajmoolio@gmail.com)

<sup>4</sup> Deputy Director, International Relation, International University, Phnom Penh, Cambodia. Email: [peter.raymond99@gmail.com](mailto:peter.raymond99@gmail.com) Corresponding Author: Pahlaj Moolio. Email: [pahlajmoolio@gmail.com](mailto:pahlajmoolio@gmail.com)

**Acknowledgements:** Authors would like to thank the editors and anonymous referees for their comments and insight in improving the draft copy of this article. Authors further would like to declare that this manuscript is Original and has not previously been published, and that it is not currently on offer to another publisher; and also transfer copy rights to the publisher of this journal.

Received: 10-09-2010; Revised: 28-09-2010; Accepted: 20-12-2010; Published: 31-12-2010

is that in Bangladesh HIV is not spread in a pandemic way. We do not involve with HIV microscopic, biological, chemical and other experimental researches. To clarify how HIV/AIDS originated and transmitted we have taken full help from the papers of Parks (2004), Levy (1998) and others who are involved with microscopic, biological, chemical and other experimental researches. UNAIDS(2001), UNICEF, UNAIDS and WHO, Children and AIDS, Country Fact Sheet 2008, UNAIDS (2008) and some other papers provided useful information about global and Bangladesh HIV/AIDS situation. Larson et al. (2007) has discussed HIV/AIDS of Bangladesh in detail. As no sufficient treatment of HIV/AIDS is invented for those who have infected, so that prevention is the only way to escape from HIV infection. We have emphasized on prevention and intervention on HIV, especially in developing countries. So women education and self dependent is necessary in these areas. The women whose only income source is their body selling, they are in heavy risk of HIV infection. The intravenous drug users with sharing syringes are also in heavy risk of HIV infection. We have enlightened on these in some detail.

## 2 ORIGIN AND MICROSCOPIC STRUCTURE OF HIV

The human immunodeficiency virus (HIV) was first isolated in 1959 from an African male (Levy 1998). In the last 50 years, several subtypes or clades, of HIV have been identified including the most common, HIV-1, and the less common HIV-2. Currently there are three groups of HIV-1 isolates: M, N and O. The major strain isolate M, consists of at least ten clades, A to J. Among them B is the most common in Europe and North America, and A, C, D in Africa, and C being the most widespread among all clades. HIV-2 has similar symptoms but appears closely related to the simian and feline lentiviruses SIV and FIV, respectively (Levy 1998, Parks 2004). For the very close similarity between HIV-2 and SIV many scientists believe that HIV originated from primates (Levy 1998, Parks 2004). However, the existence of distinct clades of HIV raises difficult questions about the origin of HIV, namely whether HIV was introduced by multiple transfers between primates and humans or if distinct clades of HIV can be explained by evolution from either a common primate derived virus or a common ancestor between primates and humans 600 to 1200 years ago (Eigen and Niest-Struwe 1990, Levy 1998, and Parks 2004).

HIV infection develops into the disease AIDS (acquired immunodeficiency syndrome), a clinical syndrome characterized by a marked reduction in CD4<sup>+</sup> lymphocytes and the frequent development of infections (Levy 1998, Parks 2004). HIV binds to CD4 molecules in order to invade and infect CD4<sup>+</sup> T cells. As the disease progresses, the number of CD4<sup>+</sup> T cells declines from its normal level of about 1000 per microliter to as low as 400 per microliter, effectively diminishing the patient's ability to mount an immune response such that the

patient eventually dies from any infection. Electron microscopy images of the mature HIV-1(2) virion reveal a cone-shaped core consisting of the viral p24(25) Gag protein (Levy 1998, Parks 2004). Inside the nucleoid structure are two identical strands of RNA 9.8 kb in length that contain multiple ORFs and are closely associated with the viral RNA-dependent DNA Polymerase Pol (RT) and nucleocapsid proteins p9 and p6. HIV's primary full length mRNA transcript is translated into Gag, Pol, and Env precursor proteins. The Gag precursor is cleaved by viral protease to give rise to capsid (CA, p24), matrix (MA, p17), nucleocapsid (NC, p9), and p6. The Pol precursor protein is cleaved to the viral enzymes RT, protease, and integrase (Göttlinger 2001, Levy 1998 and Parks 2004). The Env precursor gives rise to viral envelope proteins gp120 and gp41. There are numerous accessory HIV gene products that affect assembly, budding, and infectivity and include Vif, Vpr and Vpu(x) (Levy 1998, Parks 2004).

HIV-1 assembles on the plasma membrane of the host cell and is released by budding from the cell surface. In the early stages of HIV-1 virion assembly, myristylated Gag precursor molecules associate in a patch on the inner leaflet of the host plasma membrane (Göttlinger 2001). Precursor Gag molecules are continuously added to form a stable spherical structure called the immature capsid, which protrudes from the cell surface and eventually pinches off to release an immature viral particle into the extracellular environment.

To become infectious, the immature viral particle must undergo a maturation step, which involves a series of proteolytic processing events within the Gag and Pol proteins (Göttlinger 2001). The surface of the mature virion is composed of highly glycosylated trimeric complexes of the envelope glycoproteins gp120 and gp41 (Levy 1998, Parks 2004). Upon infection, gp120 binds to host cell CD4 receptors and undergoes a major conformational change and subsequent proteolysis, resulting in the exposure of binding sites for cellular coreceptors CCR5 or CXCR4 on the viral fusion peptide gp41 (Cormier and Dragic 2000). Consequently, fusion is induced between the virion and host cell membranes and the virus enters the cell. Although the exact mechanism of virus: cell membrane fusion remains a mystery, it is known to be dependent on the cleavage of gp120. It is unknown whether transmission between host cells and infected cells occurs through a similar mechanism, although preliminary trials in macaques suggest that both mechanisms are dependent on cleavage of gp120 (Estcourt et al. 2004, Moore et al. 2001, and Parks 2004).

Upon entry of HIV into the cell, viral RNA is copied into DNA and the proviral genome is transported to the nucleus and integrated into the host cell genome (Karn 2000). Once integrated into the host chromosome, the virus is subject to regulation by cellular transcription factors, as well as its own

regulatory proteins. Such processes are executed by three enzymes on the HIV Pol precursor, which display distinct activities at different stages of the virus. The RNA-dependant DNA Polymerase acts early in replication to form a double-stranded DNA copy (cDNA) of the virus DNA (Levy 1998, Parks 2004). Integrase then functions inside the nucleus of the host cell to integrate the viral cDNA into the host chromosomal DNA. HIV DNA is then transcribed to RNA, which reenters the cytosol and is translated by host ribosomes.

HIV encoded RNA binding proteins regulate the interaction of the virion with cellular proteins and are vital for infectivity. The three major viral RNA binding proteins are Tat (transactivating protein), Rev (regulator of viral protein expression), and Nef (negative factor). Tat interacts with the Tat-responsive element, an RNA loop in the 3' viral long terminal repeat, and acts to up regulate HIV replication and transcription (Levy 1998, Karn 2000). Rev interacts with the cis-acting RNA loop of the Rev-responsive element and is localized to viral envelope mRNA (Levy 1998, Parks 2004). Rev appears to affect the function of the spliceosome by controlling the relative amounts of unspliced, singly, and multiply spliced mRNAs. In an infected cell, Rev interacts with cellular proteins as a multimer to permit unspliced mRNA to enter the cytoplasm from the nucleus and to give rise to full length viral proteins needed for progeny production. Rev can also function as a negative regulator, as production of Rev in the late phase of viral replication down-regulates Rev, Tat, and Nef expression. Nef is abundantly produced early in viral gene expression and stimulates viral growth in cell culture and *in vivo* (Piguet and Trono 1999). Nef downregulates CD4 by interfering with components of the trafficking machinery to redirect CD4 from the trans-Golgi network (TGN) to the endosomal compartment and finally the lysosome for degradation (Piguet and Trono 1999, Parks 2004). Currently, vaccines directed against Tat, Rev, and Nef are being tested.

### 3 TRANSMISSION OF HIV

The number of virus-infected cells as compared to free virus particles is found to be higher in blood, semen, vaginal fluid, breast milk, and saliva (Levy 1998, Parks 2004). Therefore, HIV is transmissible through blood, seminal fluid, vaginal fluid, and breast milk. Infectious HIV is rarely detected in other bodily fluids such as saliva, sweat, bronchoalveolar lavage fluids, synovial fluid, feces, and tears (Levy 1998, Parks 2004).

In males, HIV infected cells have been found in the urethra, prostate, and testes (Levy 1998, Lecatsas et al. 1985). Infectious virus was reported in 10-30% of seminal fluid samples from HIV positive men. The highest levels of infectious virus in semen were observed in males in the

preliminary acute phase, with AIDS, and/or low CD4<sup>+</sup> T cell counts (Levy 1998, Vernazza et al. 1994). In women, HIV infected cells can be found in the secretory glands of the vagina and cervix, the transfer zone of the glandular epithelia, the uterine cavity, as well as cells in menstrual blood (Levy 1998, Nuovo et al. 1993). However, vaginal fluid rarely contains infectious HIV as it was found in only 28% of cervico-vaginal secretions of infected women (Levy 1998, Nielsen et al. 1996). Higher viral titers have been reported in pregnant women, and women with cervical ectopy, abnormal discharge, vitamin A deficiency, or taking oral contraceptives (Levy 1998, John et al. 1997 and Parks 2004).

The viral transmission involves the interaction between virus and cell surface receptor and the penetration of the viral nucleocapsid through the cell membrane and into the cell. The efficacy of HIV transmission is affected by both the number of free HIV particles and the number of HIV-infected cells. HIV detected in blood is found to infect CD4<sup>+</sup> T cells and peripheral mononuclear blood cells. Viral titers typically rise to high levels during the development of AIDS and in individuals with low CD4<sup>+</sup> T cell counts. There is an increased risk of HIV transmission among IV Drug users, homosexual men, and highly sexually active persons (Levy 1998, Parks 2004). There is also a high risk of infection for blood transfusion recipients, hemophiliacs, and newborns of HIV positive mothers. The risk of HIV transmission for all these groups has decreased significantly due to successful needle exchange programs, condom use/ safe sex education, technology for detecting infections and HIV particles in blood, and antiviral therapies. Increased education and availability of sterile needles and syringes has dramatically reduced HIV transmission among IV users. Between 1970 and 1983 blood donations were not screened for HIV, and as a result, by 1982, many transfusion recipients and 50% of hemophiliacs were HIV positive (Levy 1998, Goedert et al. 1989). Hemophiliacs are at an increased risk of HIV infection because they receive multiple preparations of clotting factor over the course of their lifetime. Increased technology for screening HIV in blood samples has reduced the risk of transmission to 1 in 450,000 - 660,000 (Levy 1998, Lackritz et al. 1995, Schreiber et al. 1996, and Parks 2004).

Statistics acquired from genital fluids in infected individuals are variable and limited by sample size and demographic representation. In sexual transmission, the receptive partner is at a higher risk of infection. In a heterosexual couple the male to female infection rate is 2-5 times higher than in female to male (Levy 1998, De Vincenzu et al. 1992). If occurring combination with an STI, increased HIV transmission is predicted, as HIV transmission has been found to increase in combination with herpes virus by facilitating infection of keratinocytes. If in combination with treatment for an STI (sexually transmitted infection), viral titers generally decrease.

Infectious HIV from an infected mother has been found to transfer through breast milk to the newborn. HIV-1 core antigen has been found in 24% of milk samples in days of/after delivery, but none in subsequent days (Levy 1998, Ruff et al. 1994). Further, RT-PCR detected HIV RNA in 58% of milk samples from 100 infected African women. Low CD4<sup>+</sup> cell counts and Vitamin A deficiency were also found to associate with increased virus in breast milk (Levy 1998, Nduati et al. 1995). There is an even greater risk of transmission if mother becomes newly infected after birth, causing an acute increase in viral titer in combination with the lack of maternal antiviral response (Levy 1998, Dunn et al. 1992, and Parks 2004).

#### **4 SEXUAL DOMINATION, HOMOPHOBIA, AND VIOLENCE AGAINST WOMEN**

Due to homophobia and the stigmatization men who have sex with men keep their behavior secret and deny their sexual risk, thereby increasing their own risk as well as the risk of their partners, female or male (UNAIDS 1999, Gupta et al. 2003). Men always dominate on sexually physically over women. In population-based studies conducted in a wide range of countries worldwide, 10 to over 50% of women report physical assault by an intimate partner. One-third to a half of physically abused women also report sexual coercion (Heise and Ellsberg 1999). Research conducted in a wide range of countries, including Guatemala, Haiti, India, Jamaica and Papua New Guinea found that violence against women contributes both directly and indirectly to women's vulnerability to HIV. Most obviously, violent sexual acts such as rape are likely to result in vaginal tearing or lacerations, thus dramatically increasing the risk of contracting an STI or HIV from the rapist (Maman and Campbell 2000).

The nexus between violence, risky behavior, and reproductive health has been documented by a review of literature on sexual and physical violence, which showed that individuals who have been sexually abused as children are more likely to engage in unprotected sex, have multiple partners, and trade sex for money or drugs (Heise and Ellsberg 1999). This relationship is also apparent from the results of a study conducted in India in which men who had experienced extramarital sex were 6.2 times more likely to report wife abuse than those who had not. In addition, men who reported symptoms of sexually transmitted infections were 2.4 times more likely to abuse their wives than those who did not (Martin and Brian 1999, Parks 2004).

#### **5 DISCRIMINATION IN SERVICES**

The countries in which *son preference* is the norm, in times of scarcity, families allocate resources for men and boys first, and women and girls later or not at all. For example, in Pakistan, lower income households seek health care more often for boys than girls and are more likely to use higher quality providers for boys. Women themselves continue this pattern because of being socialized to sacrifice their own interests. They often put the health of their children and families first and do not seek medical attention until they are seriously ill (Buvinic and Yudelman 1989). In some regions of the world, women are further constrained from using services because of gender norms surrounding their mobility. Practices such as *purdah*, common in Islamic and Hindu societies, where women are confined to their homes, prevent women from traveling to use services (Mehra and Bruns 1992). As a result men become consensus and women remain in dark, and find no information about HIV/AIDS.

## 6 SEX AS A PART OF BUSINESS

In developing countries due to poverty women compel to sell bodies for economic gain or survival (Weiss and Whelan 2000). When sex ‘buys’ food, shelter, or safety, it is very difficult to follow prevention messages that call for a reduction in the number of sexual partners. For example, in Haiti, faced with trying to balance the multiple demands of family and economic survival, single mothers often enter into a series of sexual relationships, called *plasaj*, in order to obtain food and housing for themselves and their children. Alarmingly, research has shown that women in this setting who entered a sexual relationship out of economic necessity had increased odds of having syphilis and HIV infection (Fitzgerald and Whelan 2000).

## 7 IMPACT OF MIGRATION

A lot of men and women migrate to foreign in search of income and employment which expose both men and women to increase risk of HIV infection. Research from Africa has shown that rural to urban migration of men leads them to form new sexual networks in areas where an unequal ratio of men to women and a higher discrimination rate is likely to make them more vulnerable to infection (Bassett and Mhloyi 1991, Sanders and Sambo 1991). When men are engaged in seasonal migration for work, and often return home to their community of origin, the vulnerability of their female partners who are left behind is significant. The situation is often further exacerbated by the fact that wives and other long-term sexual partners of migratory workers find it extremely difficult to insist on the use of condoms when their men have been



away for so long working hard to send money home. Migratory women workers also face similar risks. Being away from home makes it likely that they will establish new sexual networks or engage in multiple partnerships for economic gain or security.

## **8 THE VULNERABILITIES OF ADOLESCENTS AND YOUTH**

Adolescent and youth are in the heavy risks of HIV/AIDS epidemic, as they remain involve in unsafe sexual activities. Younger members of a society have less power than older individuals and younger women or girls have less power than younger men or boys.

In some societies adolescents have no guidance by their parents, adolescent in those societies misguided by their friends. Sometimes they involve in unprotected sexual activities and remains in the risk of HIV/AIDS. Adolescents sometimes involve with anal sex activities which is also a risk for HIV infection. The percentage of adolescent girls who have had sex before the age of 18 years varies greatly between countries, ranging from 66% in Ghana to 20% in Mexico ([Alan Guttmacher Institute 1998](#)).

Young people's risk of infection is also greatly affected by their lack of economic options. Frustrated youth with few economic opportunities are more likely to engage in a range of risk behaviors, such as using drugs and engaging in unprotected sex in exchange for gifts, money, or favors ([Mathur and Malhotra 2001](#)). A notable trend is that the number of young women who are having sex with older men only for money, material goods, or gifts ([Rao and Weiss 1993](#), [National AIDS Programmes of Trinidad and Tobago 1995](#), & [Zelaya and Marin 1997](#)). This is a troubling trend because older men are likely to have had more previous sex partners and therefore are more likely to have been exposed to HIV or other sexually transmitted infections. When parents or other family members become ill or die, adolescents become providers and even heads of households, forced to take on the economic responsibility for themselves and their families. Then they compel to engage in unsafe sexual activities and remain in heavy risk of HIV.

As this section underscores, adolescence is a particularly vulnerable time. But it is equally true that the adolescent years provide a window of opportunity to bring about changes in levels of knowledge, attitudes and behaviors before they are fully formed. In order for HIV/AIDS interventions to use this window of opportunity to reduce young people's vulnerability to HIV and address their needs within this epidemic, it is critical not only to ensure that boys and girls get accurate information and skills but that interventions also help them develop more equitable and respectful gender norms of behavior.

## **9 THE IMPACT OF GENDER ON THE HIV PANDEMIC**

Epidemiological and biomedical research has long established a link between an individual's sex and his or her risk of HIV infection. It is well known, for example, that physiological factors account for the more efficient transmission of infection from an infected man to a woman than from an infected woman to a man. The ratio of HIV infection in society is men: women = 2:3 due to a result of power imbalance men and women. More recently, however, research has also identified the role that gender plays in determining individual risk and vulnerability in the HIV epidemic. In human society usually women required to remain monogamous but men may be polygamous and it sometimes cause HIV infection to a healthy person.

## **10 IGNORANCE OF THE RISK OF HIV**

In many societies the dominant ideology of femininity dictates that *good women* are expected to be ignorant about sex and passive in sexual interactions (Rao and Weiss 1993). A recent analysis of levels of knowledge about HIV/AIDS prevention in 23 developing countries found that levels of knowledge are almost always higher among men than among women, with 75% of men, on average, having accurate knowledge about HIV/AIDS transmission and prevention as compared to roughly 65% of women (Gwatkin and Deveshwar 2001). This knowledge imbalance greatly hinders women's ability to be informed about risk reduction. Some studies have shown that a lack of knowledge or incomplete knowledge also fosters the development of fears and myths about condom use. For example, studies conducted in diverse settings – Brazil, Guatemala, India, Jamaica, Mauritius and South Africa – have found that women did not like using condoms because they feared that if the condom fell off inside the vagina it could get lost or travel to the throat, or that a woman's reproductive organs would come out when the condom was removed (Rao and Weiss 1993).

## **11 HIV SCENARIO IN ELDERLY PEOPLE**

Usually scientific research of HIV among elderly is ignored (Nolan 2004). It is estimated that about 15% regarding HIV infection among people whose ages are over 50. The percentage of HIV infection is decreasing in younger people comparative to elderly due to over care and awareness for young people (Fitzsimmons 2004, Goodroad 2003). Goodroad (2003) indicated that heterosexually transmitted AIDS and drug induced AIDS are increasing among elderly population and they remain unaware of HIV/AIDS prevention

strategies. So that they are involve in unsafe sexual activity and continually increasing HIV infection. Treating AIDS in the elderly is complicated by the aging process and other illness that typically occur among the elderly. Szirony (1999) points out those physicians who rarely question older adults concerning risk factors associated with AIDS. Older women are at greater risk than younger women for HIV transmission, because their vaginal thinning allows for easier transmission. Diagnosis and prevention are routinely overlooked in the elderly population. Nurses also do not take adequate care of older adults. Szirony (1999) aims to increase the knowledge and awareness of HIV/AIDS among gerontological nurses. The surveys over co-morbidity results were much higher for the older adults than the younger adults (Skiest et al. 1996). The intravenous drug use and male-male sex relations are great risk factor due to lack of awareness among elderly people.

## **12 CARE FOR THE CHILDREN ORPHANED BY HIV/AIDS**

In African continent most of the countries orphan children increasing in largely as a result of the pandemic of HIV infection, which is difficult to track. These orphans caused by HIV/AIDS, heavily suffer by deprivations and vulnerabilities (Hunter and Williamson 1998). Additionally they suffer with the loss of their families, lack of immunization and any kind of health care, homelessness, starvation, malnutrition, depression etc. As a result crimes and newly infection of HIV/ AIDS of these children increase in the society. The main affected area is sub-Sahara Africa. In recent survey orphaned by HIV is increasing in Asia, Latin America and Caribbean. These countries threat to the prospects for economic growth and development in the society. Government, USAID, UNDP, WHO, World Bank, Red Cross, NGOs, religious bodies, and other local and international organizations take this trend seriously and must work for the welfare of the children. The good news is that UNICEF has taken a leadership role in collaborating with situation analyses of donors to conduct situation analyses of children and families affected by HIV/AIDS. According to the U.S. Census Bureau, 34.7 million children will have lost their mother or father or both of their parents by 2000 in 23 countries heavily affected by HIV/AIDS. That number will increase to 41.6 millions by 2010, largely as a result of HIV pandemic (Hunter and Williamson 1998). HIV has transformed orphaning into a long-term, chronic problem that will be extended into the 21<sup>st</sup> century. In poorer areas of the world orphan children lack access to basic needs, social care and support, psychological support, protection of HIV and other diseases, legal advice and legislative support. Orphan children sometimes can be adopted and fostered but there is a reluctance to do this when they are already infected by HIV. Sometimes HIV infected orphan children are completely neglected by the society due to the ignorance of that society.

### **13 HIV INFECTION AND PROTECTION AMONG THE CHILDREN**

About 90% of HIV cases are sexually transmitted. HIV is not only a problem for poorer nations but it is a global problem related to all nations. 60% of HIV infection is in the 15-24 year old age group which indicates the vulnerability of young people. Over half of the world's population is under 25 and over half of the world's population will have had unprotected sex before the age of 16. Increasing intravenous and recreational drug use also contributes to HIV infection in young people. According to [UNICEF, UNAIDS and WHO, Children and AIDS: Country Fact Sheets 2008](#), 90% of infants living with HIV contracted the virus from their mother. Save the children fund (SCF) UK recognizes that many factors contribute to the spread of the virus. Some of these are poverty, social deprivation, gender inequality, non-strictly obeying religious rules, non-separate operation units for HIV positive and negative patients, a lack of preventive education, non-prevention of child labor, discrimination in education and welfare services, conflict and war, the movement of people and growing urbanization etc. There is evidence that first sexual experience globally occurs between 7 to 15 years and usually occurs without any protection against HIV or pregnancy. But society does not take it seriously. Sometimes HIV preventive education is received when they are already using drugs and engage in sexual activities. As a result they are HIV infected before receiving sufficient information of prevention of HIV.

As HIV infected children suffer from very early age so that prevention of HIV is essential for them. They are biologically more vulnerable through unprotected anal sex with other young boys and men. Needy young boys whose ages in 7 to 20, are HIV infected through unprotected anal sex with other young boys and men, as they take it as a profession and later they spread HIV to healthy customers. The poor HIV infected children lack access to quality diagnosis, extra care, proper treatment, social support and prevention. Again they can not inform society about their HIV infection, due to stigmatism and discrimination.

In the poorer parts of the world health, education, welfare system for the children have collapsed as interventions of HIV are very expensive. Nations heavily affected by HIV will become poorer and as a result more children will die either as a direct or indirect result of the HIV pandemic. Those who remain alive will create an uneducated sick nation and may be burden to the country. Infection free society for children is necessary, since an infected HIV child will die early, and often in an unpleasant and undignified way.

### **14 TREATMENT OF HIV**

To date, a total of 60 million people have been infected with HIV, 2.2 million of whom have died (Estcourt et al. 2004, UNAIDS 2001). Few medicines are invented which can not save life of an infected HIV/AIDS patient.

### 14.1 Drug Treatment

In recent years a number of therapeutic antiviral agents and increased diagnostic capabilities have been developed, which have greatly improved the quality and length of life for those with access to adequate medical treatment. One common type of treatment, Highly Active Antiretroviral Therapy, has markedly reduced progression of the disease in the United States and Europe, and involves the combination of three or more drugs. The most common classes of drugs used to treat HIV infections are reverse transcription inhibitors, protease inhibitors, and fusion inhibitors (Parks 2004).

Reverse transcriptase inhibitors act as nucleoside analogs, wherein they are taken up by cells and incorporated into the growing DNA strand to effectively halt DNA synthesis. Protease inhibitors block viral protease such that proteins needed to assemble new viruses cannot be cleaved from the large protein precursor. Antiviral drugs such as RT and protease inhibitors have been effective in reducing plasma viremia to undetectable levels in many HIV patients (Levy 1998, Parks 2004). Fusion inhibitors interfere with the allosteric change in gp41 that enable virus: host cell membrane fusion. Enfuvirtide, a synthetic polypeptide containing 36 of the amino acids in the fusion domain of gp41, interferes with this process, most likely by through a competitive mechanism.

Death rates due to HIV-1 infection have decreased significantly since the development of specific inhibitors of viral enzymes (Cormier and Dragic 2000, Parks 2004). The drugs are so expensive (\$7,000 to \$10,000 per year) that the richer countries can provide the drugs to the patients, and are simply unavailable to many poor countries where the epidemics rage. With over a dozen drugs or cocktails on the market to target these enzymes, a significant percentage (approximately 25%) of individuals cannot tolerate them (Cormier and Dragic 2000, Parks 2004). There is considerable worry about the long-term side effects of these drugs; including nausea, diarrhea, and liver damage (Cormier and Dragic 2000, Parks 2004). There is further concern that particularly virulent cocktail resistant HIV isolates will emerge (Cormier and Dragic 2000, Parks 2004). Such fears emphasize the need to identify new classes of antiviral drugs that can supplement or partially replace existing drug cocktails (Cormier and Dragic 2000, Parks 2004).

## 14.2 Vaccine Development

Over two dozen experimental anti-HIV vaccines have been developed and clinical trials of some of these have been, and are presently being, undertaken (Korber 2003, Parks 2004). Most of these vaccines are designed to induce antibody production against one or more specific viral proteins, and, for the most part, have had disappointing results. HIV has developed a number of mechanisms to escape the antiviral immune response and to persist long-term (Emini and Koff 2004, Parks 2004). Numerous antibody-mediated vaccines have been developed which bind to and neutralize viral envelope proteins gp120 and gp41. However, the most essential components of these proteins for interaction with host cells are structurally buried and inaccessible to antibody (Emini and Koff 2004, Parks 2004). Additionally, the high error rate of the viral reverse transcriptase leads to the rapid occurrence of mutations and consequentially, an increase in a patient's viral genetic diversity over time (Emini and Koff 2004, Parks 2004). Such a process leads to anti-viral drug resistance and the emergence of new strains of HIV in the human population, making antibody design extremely challenging, as intra- and inter-subtype sequences are extremely variable, as high as 20% and 35%, respectively (Estcourt et al. 2004, Parks 2004). Researchers have attempted to handle the complexity of this problem in a variety of ways, such as making cocktails of immunogens from two or three common clades or making immunogens against conserved or average sequences (Estcourt et al. 2004, Parks 2004). Some success has been observed using cocktails of neutralizing antibodies against gp120 and gp41 in preventing vaginal or oral mucosal infection with SHIV and HIV (Lehner 2003, Emini and Koff 2004, Burton et al. 2004, and Parks 2004). However, the high variability in such proteins renders such an approach unsuitable for a vaccine, which must be broadly active against many viral isolates.

A number of vaccines have been designed to favor the development of cell-mediated immunity by cytotoxic T cells, which target and kill cells expressing viral antigens (Lehner 2003, Emini and Koff 2004, and Parks 2004). Such a cellular response is advantageous because it can destroy infected cells unsusceptible to antibodies. The objective of many cell-mediated vaccines is to greatly enhance the pool of anti-HIV CD4<sup>+</sup> memory cells and CD8<sup>+</sup> CTLs in uninfected persons. The idea is that upon viral infection, the memory cells will proliferate rapidly and act to clear the infection (Emini and Koff 2004, Parks 2004). The downside of this type of immunity is that it is highly specific and the high rate of HIV mutation results in the frequent escape of resistant HIV isolates from CTL-mediated elimination (Lehner 2003, Emini and Koff 2004, and Parks 2004). The susceptibility of the CTL response to viral escape has led to an effort to redirect vaccine studies to target the mucosal immune system

and associated lymph nodes, enhance the rapid immune response, stimulate broad based adaptive immune responses, and utilize host antigens (Lehner 2003, Parks 2004).

Currently, DNA vaccination is one of the hottest areas of HIV vaccine research. DNA vaccines contain DNA incorporated on a plasmid that encodes one or more protein antigens. The DNA sequence incorporates a eukaryotic promoter to enable efficient transcription and translation within the transfected cell (Estcourt et al. 2004, Parks 2004). Translated proteins are then cleaved into peptides, which are then exposed at the cell surface of class I histocompatibility molecules and serve to stimulate a protective immune response. A crucial requirement for a DNA vaccine is that the genetic information delivered should not integrate into the genome of the host. Chromosomal integration can cause deleterious effects, such as activation of oncogenes, inactivation of tumor-suppressor genes, and/ or chromosomal instability. DNA vaccines, after relatively short follow-up periods, have been invariably safe. DNA vaccines are delivered by injection into muscle and are often enhanced by the addition of genetic adjuvants that encode cytokines, chemokines, or costimulatory molecules.

There are a few DNA vaccines under clinical evaluation designed to help contend with diversity that have had encouraging preliminary results (Korber 2003, Parks 2004). The vaccine VRC-HIVDNA009-00VP carries the gag, pol, and nef proteins from a clade B isolate, and an env protein from each of the clade isolates A, B, and C, and has been shown to induce CD4<sup>+</sup> and CD8<sup>+</sup> responses against the corresponding peptides. Several other polyvalent DNA vaccines directed against envelope protein variants from several different clades have also shown encouraging preliminary results in terms of antibody production (Parks 2004).

## 15 HIV/AIDS IN BANGLADESH

The first case of HIV/AIDS in Bangladesh was detected in 1989. Population of Bangladesh in 2008 was 162,200,000 among them UNAIDS (2008) estimates that 13,000 were living with HIV/AIDS and about 3,000 women aged above 15 were infected, and a total of 500 AIDS infected had died. Bangladesh is vulnerable to HIV/AIDS for its poor regulation, poverty, lack of adequate health support, illiteracy, lack of health education, lack of awareness about HIV/AIDS etc. Approximately 250,000 people leave Bangladesh every year for employment as workers in the middle-east, Malaysia and other countries such as in India, Thailand for leisure, business and health. Though this temporary immigration increases our remittances, at the same time it increases the risk of HIV/AIDS in our society. The risk is that they will get infected

during their stay abroad and return to Bangladesh where they may transmit the virus to others, especially to their wives who could in turn transmit infection to their babies. Garment workers are also in high risk because of their age, ignorance and isolation from the family.

A multi-item, structured, sex-matched survey was applied to a representative sample of young people aged 15-24, selected using data from the Bangladesh Bureau of Statistics. A total of 12,729 youth, 727 parents/guardians, 722 teachers and community/religious leaders, 875 health service providers and 10 policy planners were interviewed. Blood samples were collected from a sub-sample of youth, and males who were aged 18 years and above, out of school and earning money were assessed separately as a potential target group (Larson et al. 2007).

More than 85% of youth had heard of HIV/AIDS, however knowledge regarding transmission and prevention was poor. Only 21.7% of youth had correct knowledge of at least two routes of HIV/AIDS transmission, and only 22% could identify at least two ways of preventing HIV/AIDS.

About 22% of unmarried males and 2% of unmarried females reported a history of premarital sex. The most common sex partner for males was girlfriends (58%), however in more than 25% of cases, the partners were sex workers. 55% of youth with a history of premarital sex reported that they had never used condoms. Only 35% percent of males reported that they used condoms in the last sex act. Among married youth, 7% had a history of extramarital sex and the most common sex partners were sex workers (57%).

Sexual transmission accounts for more than 90% of HIV transmission globally but less than 15% of youth in Bangladesh know about such transmission. More than one-third of youth do not know about transmission of HIV/AIDS and do not know how to prevent HIV/AIDS.

An increasing number of women are engaged to sell their bodies, as this is the only way to survive and provide for their children. Men who buy sex from women are often reluctant to use condoms, because they pay for high pleasure but condom gives them less comfort in enjoying.

Risky sexual behavior is common in Bangladesh and condom use is very low here. Adolescents aged 10-24 constitute one-third of the people in Bangladesh and some of them are involve intercourses without any prevention. About 20,000 - 40,000 people in Bangladesh inject drugs, 57% share needles and only one in three use disposable syringes. This percentage is much higher in female injecting drug users (74%). More than half (57%) of injecting drug users (IDUs) are married and most of the IDUs are sexually active (Larson et al.



2007). Men having sex with men are largely hidden due to the powerful stigma and they face discrimination in Bangladesh. As a result they are in heavy risk of HIV infection due to inexperience and lack of consciousness. It is estimated that without any intervention the prevalence in the general adult population could be as high as 2% in 2012 and 8% by 2025.

Knowledge about STIs (sexually transmitted infections) was poor among the youth. More than 50% of males and 75% of females had not heard about STIs, while 33% of males and 14% females had correct knowledge about two or more methods of prevention. Of the infected persons, approximately 63% visited some type of health service providers, however only 10% visited hospitals or clinics. Laboratory testing found 0.6% of youth had been previously or currently infected with syphilis, and 1% of married males below the age of 24 were positive for syphilis. Over 16% of youth had exposure to genital ulcer disease (herpes simplex virus 2) before the age of 24, and of them 10% were currently infected. Knowledge about STI symptoms also influences care seeking behavior. As STIs increase the vulnerability to HIV/AIDS, knowledge about STI symptoms will be improve in care seeking behavior.

## **16 IGNORANCE ABOUT HIV OF BANGLADESH**

HIV is not infected by coughing/sneezing, sharing plates and cups for taking food, taking bath in same pond or bathroom, biting by mosquito, sharing clothes, and during handshake, embrace and kissing with HIV/AIDS infected person.

More than half of the young generations believe that coughing/sneezing can spread HIV, while 50% believe that sharing food and water with an HIV infected person can cause infection. 57% percent of youth interviewed believed that washing after intercourse and 73% that using a lubricant during intercourse can prevent transmission of HIV. More than half of the youth believe that antibiotics can protect them from infection of HIV.

Only 2.2% of males and 1.1% of females perceived themselves at risk of HIV infection.

## **17 ADVICE OF GATEKEEPERS AND POLICY PLANNING**

About 80% of parents, 97% of community/religious leaders and 100% of teachers were aware of HIV/AIDS, with 96% believing that the epidemic is likely to spread among youth in Bangladesh. However, only 8% of parents, 30% of teachers and 18% of religious/community leaders know that unprotected intercourse with a HIV/AIDS infected person is a leading cause of transmission. All three groups were in favor of HIV intervention programmes: 94% of parents and community/religious leaders supported the participation of youth in HIV prevention programmes and 94% of teachers were in favor of providing such information to youth in school. Although more than 90% of these gatekeepers agree that condoms should be used for prevention of sexually transmitted infections only 25% of them support condom sales to unmarried youth (Larson et al. 2007).

All policy planners agreed that youth in Bangladesh are most vulnerable for HIV/AIDS infection and concerted efforts are essential for prevention. The most important programme activities identified by policy planners are i) increasing awareness; ii) introduction of HIV/AIDS education in the school curriculum; iii) ensuring youth-friendly health services; iv) involving community/religious leaders in prevention programmes; and v) more active involvement of policy planners in prevention programme development.

## **18 STREET SEX WORKERS ARE VULNERABLE TO HIV/AIDS IN BANGLADESH**

There are various street sex workers such as men, transgender people and women. People who are engaged in selling sex obviously have multiple sex partners with unprotected sex and are therefore highly vulnerable to several STIs and HIV/AIDS infection. Street sex workers in Bangladesh would play a critical role of HIV/AIDS infections. Due to the types of their work, the lack of STI knowledge and low acceptance of condom use, represent a highly vulnerable group in Bangladesh (Government of Bangladesh World AIDS Day Report 2008). Street sex workers are closely associated with the tourism and transport industries where they find a large supply of potential clients. They get their clients by waiting on the streets. Most of them run on their work separately, though some rely on brokers for help in getting clients. The favored method of work is to wait on busy streets, which make available custom as well as relative confidentiality to the contract, as opposed to the less frequented localities. Bus stops, railway stations, cinema halls and river-bank are the usual locations where the contract is negotiated, from where they go to comparatively cheaper hotels, under construction building, darkness park-place and lodges with their clients.

## **19 HOMOSEXUALITY IN BANGLADESH**

Homosexuality growing HIV/AIDS risk in Bangladesh. Estimated more than 10 million gay and lesbian are living in Bangladesh. Everyday more and more people are joining with homosexual activities. However, all advocacy and campaigns of government and various NGOs ignore this type of risk. This may occur as early as 8 or 9 years old, but the most appear to be in the 13-15 year old age group, with initiating partners in the 17-24 year old group. These are often relatives, such as brother-in-laws or cousins. In some cases, groups of older boys rape younger boys. Sex with boys is seen as a safe substitute for sex with dangerous female sex workers.

## **20 CONCLUSIONS AND RECOMMENDATIONS**

In this study examined origin and transmission of HIV, and treatment and prevention of HIV/AIDS and stressed that prevention is the best process to avoid HIV infection. The paper indicates that women and children are in the high risk of HIV infection. HIV is scattered in poorer areas of the world where citizens are not educated or have no knowledge of transmission or prevention of HIV. Different aspects of this fatal disease are discussed in briefly.

From the detailed discussion, it is concluded that the overall prevalence of HIV in Bangladesh is less than 1%. Bangladesh is in better statistics than its neighbors because of cultural attitudes and religious restrictions, but with the inflow of modern trends, the cultural practice is gradually changing the society. The current survey shows that although youth in Bangladesh have awareness about HIV/AIDS they also have many misconceptions and very low risk perception. These misconceptions and low risk perception may lead them to risky behavior and a reduced sense of vulnerability. Information about HIV/AIDS is important but knowledge is not enough. Appropriate interventions are essential to increase the perceptions of risk.

Condoms have been introduced in Bangladesh as a contraceptive method and are mainly used in pregnancy prevention in non-commercial sex. The role of condoms in the prevention of HIV and STIs needs to be emphasized to increase condom use in commercial sex. Strong barriers to accessibility of condoms for unmarried youth must be removed, which requires strong public sector support.

Risky sexual behavior is common among youth, and although condom availability is high, their use is unacceptably low due to the social norms and stigma associated with purchase. As a result, a significant number of youth are exposed to sexually transmitted infections, but diagnosis and care facilities are limited. Gatekeepers' awareness about HIV/AIDS is high but knowledge on

transmission and prevention is low. They are willing to act but only few have taken any step to action, even they know very little about existing prevention programmes in Bangladesh. General support for school-based HIV/AIDS education exists, however barriers regarding sex and condom education also exist.

Women and children are more vulnerable. Some women are innocent housewives but were infected by their husbands. Some female commercial sex workers are HIV positive, but most of them are unidentified due to the insufficient diagnosis and are increasing risk in alarm.

Bangladesh needs special steps to aware the public covering the lower economic class, impose laws and regulations irrespective of class, practice its own culture and religion, practice safe sex, meticulous screening of the blood donors and blood products, rehabilitate the drug addicts and sex workers, identify the HIV infected patients and ensure access to necessary treatment for these patients etc.

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