

HIV/AIDS epidemic in India: risk factors, risk behaviour & strategies for prevention & control

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Since the first report of HIV infection in India in 1986, the virus has spread all over the country although there is geographic variation. There are estimated 5.1 million people infected with HIV with an overall estimated adult prevalence below 1 per cent. Surveys carried out in different sub-populations have yielded prevalence estimates, but data on HIV incidence are limited. Both HIV serotypes 1 and 2 exist in India and HIV-1 C is the commonest subtype reported. Sexual transmission of HIV is most predominant. Spread of HIV in intravenous drug use settings is localized mostly in the north eastern region and metropolitan cities and parent to child transmission is on the rise. Dual epidemics of HIV and tuberculosis, increase in the number of infected women, stigma and discrimination are the main concerns in the Indian HIV/AIDS scenario. There is an increasing political will and commitment for HIV prevention and control efforts in India. A multi-disciplinary approach combining targeted interventions like early identification and treatment of STDs, condom promotion, blood safety, drug de-addiction programs and expanding and strengthening VCTCs and long-term strategies like awareness oriented to behavioural change especially among vulnerable populations, young people and women, steps towards improvement of literacy, status of women and overall development, reduction in poverty and development of primary prevention interventions like vaccines and microbicides will have to be considered for effective prevention and control of AIDS in India.

Key words Control & prevention - HIV - risk factors - risk behaviours

Reacting to the global reports of HIV/AIDS, Indian Council of Medical Research (ICMR) initiated surveillance for HIV infection in India in 1985-1986 and the first evidence of HIV infection in sex workers in Chennai, Madurai and Vellore was obtained in 1986-1987^{1,2}. Gradually centers were established in the State Capitals of India. National AIDS Control Organization (NACO) set up under the Ministry of Health and Family Welfare mandated to implement initiatives like establishing HIV testing centers,

strengthening blood-safety and controlling hospital infection took over surveillance activity in 1992³. The epidemiologic data on HIV/AIDS in India has emerged primarily from the network of sentinel surveillance, ongoing testing in antenatal clinics and blood banks, research studies, reporting of AIDS cases and information generated from mortality statistics. The geographic distribution of the HIV epidemic in India is varied and based on the prevalence of HIV infection in the low and high risk groups, various

Box I. Some milestones of HIV/AIDS epidemic in India at a glance

1985-86	Indian Council of Medical Research (ICMR) initiated HIV surveillance at specified sites. First report of HIV infections in sex workers in Chennai and first report of AIDS in Mumbai.
1989	HIV infection reported among intravenous drug users in Manipur State.
1990-91	National AIDS Control Organization (NACO) was established. Indian National AIDS Control Programme was launched.
1992	ICMR established National AIDS Research Institute (NARI) in Pune city.
1998-99	Majority of intravenous drug users investigated in Manipur were found to be HIV infected, sexual transmission to partners of HIV infected drug users documented.
1999	The Supreme Court ruling made HIV testing of all blood bottles mandatory. NACO estimated 3.87 million HIV infections in 1998 in India.
2000-01	Feasibility studies for prevention of parent-to-child transmission of HIV with zidovudine and nevirapine were initiated by NACO.
2001	Indian pharmaceutical companies marketed antiretroviral (ARV) drugs with considerable price reduction.
2002-03	Tripartite agreement between NACO (Ministry of Health), ICMR and International AIDS Vaccine Initiative signed to facilitate HIV vaccine development and testing in India.
2003	The central government announced the policy to provide highly active anti-retroviral therapy (HAART) to those who suffer from AIDS.
2004	Programme implementation begins for phased scale-up programme of antiretroviral therapy by NACO. NACO estimates 5.1 million persons currently living with HIV in India by end of October 2003.
2005	First AIDS Vaccine Trial was initiated.

States have been categorized in high, medium and low prevalence areas. Andhra Pradesh, Tamil Nadu, Maharashtra, Karnataka, Goa and Manipur are classified as high prevalence States with HIV prevalence of over 1 per cent even in low-risk populations⁴.

Urban and rural spread: Surveys carried out in different sub-populations have yielded prevalence estimates, but data on HIV incidence are limited. Boxes 2 and 3 summarize the observed HIV prevalence by risk categories in various geographic areas in India. A large cohort study was initiated in Pune in 1993 to estimate the prevalence and incidence of HIV infection in persons with high risk behaviour. Screening of 5321 sexually transmitted disease (STD) patients during 1993-1995 provided a HIV-1 prevalence rate of 21.2 per cent⁵ and the first estimate of HIV incidence of 10.2 per cent per year in a high-risk population in India⁶. Although most of the initial research was focused on high risk populations, some community-based studies attempted to identify the extent of spread in the community. A cluster survey

in three randomly selected urban and rural districts of Tamil Nadu State among 1157 women and 824 men (age 15-45 yr) from 1114 households reported that the overall community prevalence of STDs, HIV and hepatitis B infection was 14.6, 1.8 and 5.3 per cent respectively⁷. This indicated that the STD and HIV epidemics in Tamil Nadu had become generalized and were not restricted to high risk populations. In northern States of India, the HIV prevalence is comparatively low. Among persons reporting to Voluntary Counselling and Testing Centre (VCTC) for AIDS in Rohtak (Haryana) during 1986-2002, 0.64 per cent (1178/183912) were HIV sero-positive indicating a low prevalence over nearly 14 yr⁸. Studies have documented that the HIV epidemic has reached rural areas of India. In a study on 1251 pregnant women in villages in three Primary Health Centers in Pune district of Maharashtra, 15 (1.2%) were detected to be HIV seropositive. The prevalence was higher among the villages on the highways and awareness about HIV/AIDS was found to be low⁹. Increased mobility of individuals might be contributing in dissemination of HIV infection from urban to rural

areas. Screening of the 2063 individuals in rural and urban areas in south India revealed the HIV prevalence to be 7.7 per cent¹⁰. Men move to urban areas for work leaving their spouses behind to look after their farms, the children and elderly; remain away from their families for a long time and might indulge in high-risk behaviour. The infected men carry the infection back to their spouses in the rural areas. Living away from the family has been reported to be an independent predictor of HIV acquisition in men⁶. The HIV epidemic has reached the general population as suggested by data from metropolitan cities with rates of HIV infection crossing 2 per cent in Mumbai, >1 per cent in Hyderabad, Bangalore, Chennai and <1 per cent in Kolkata, Ahmedabad and Delhi. The community-based studies done in Tamil Nadu have documented community prevalence of HIV to be 1.8 per cent¹¹.

HIV - serotypes and subtypes: Both HIV serotypes 1 and 2 have been shown to exist in India. In western India, HIV-2 and dual infections with HIV-1 and HIV-2 have been reported since early nineties¹²⁻¹⁴ and in South India in late nineties¹⁰. However, in Kolkata in eastern India, HIV-2 has been only recently detected although HIV surveillance is being done since 1986¹⁵. In addition to heteroduplex mobility assay (HMA), peptide enzyme immunoassay (PEIA), and DNA sequence analysis have been used for subtype analysis¹⁶ and HIV-1 C has been the commonest reported subtype in India. Other subtypes like A and B have been found and some recombinants have also been reported¹⁷⁻¹⁹.

Sexual transmission: Sexual behaviour as reflected by more number of sexual partners, sex with sex workers, being in sex work and receptive anal sex, has been reported to be strongly associated with HIV infection^{6,10,20}. Risky sexual behaviour of mobile and traveling populations has been linked to HIV infection. A study among 263 truck drivers/assistants recruited at a highway clinic in south India in 1999-2001 reported frequent female sex workers (FSW) contacts, alcohol consumption, presence of various STDs and high positivity rates of HIV, Venereal Disease Research Laboratory (VDRL) reactivity and HBsAg (15.9, 13.3 and 21.2% respectively)²¹. Poor educational background has been often reported to

be linked to higher risk of STD and HIV acquisition^{6,22}. Low and inconsistent condom use and genital ulcer disease or genital warts have been associated with prevalent and incident HIV infection in high risk populations like FSWs¹². Men tend to have preferences in condom use as seen in a STD patients' cohort where condom usage by men with sex workers increased over time, but over 70 per cent of them continued to have sex with their spouses without condoms even in presence of active STDs²³. Married women do not have adequate understanding or perception of risk of STD/HIV from their spouses²⁴.

Few studies have been done on men having sex with men (MSM). In a cross-sectional population-based random sample survey in 2001²⁵, 774 randomly selected residents of 30 slums in Chennai were interviewed for behavioural risk factors and 46 (5.9%) of them reported sex with other men. MSM were 8 times more likely to be seropositive for HIV and over twice more likely to have a history of STD than non-MSM. Risk behaviour assessment of 10,785 men attending 3 STI clinics in Pune from 1993 to 2002 indicated that 708 (6.6%) were MSM. Hence specific interventions targeting MSM should also be included in the control of HIV and STDs²⁶.

Certain biological factors like age, STDs and circumcision have been reported to be significant in sexual transmission of HIV. In a study of 1872 male STD patients seen during 1998-2000²⁷, risky sexual behaviour like early initiation of sex, premarital sex and bisexual orientation was common in younger men. Such evidence highlights the need for introducing targeted interventions among adolescents²⁷. Past high risk behaviour (history of STDs or VDRL reactivity)^{10,12} and present risk behaviour (presence of active STD) have been associated with high HIV prevalence as well as HIV transmission⁶. In a cohort of HIV-1-seronegative patients attending STD clinics in Pune²⁸, the incidences of herpes simplex virus 2 (HSV-2) and HIV-1 were and 5.8 cases/100 person-years respectively. Recent incident HSV-2 infection was found to be associated with the highest risk of HIV-1 infection²⁸. This suggests that prevention and effective treatment of STDs including HSV-2 infection might reduce the risk of HIV-1 acquisition

considerably^{6,28}. Circumcision has been reported to be protective against STDs and HIV^{29,30}. In a prospective study of 2298 HIV-uninfected STD patients in Pune, India³¹, circumcision was found to be strongly protective against HIV-1 infection but not against herpes simplex virus type 2, syphilis or gonorrhoea. Thus, the protective effect of male circumcision could be primarily due to biological rather than behavioural reasons. With majority of the male population being uncircumcised, it is important to stress penile hygiene and condom use in the context of prevention of sexual transmission of HIV in India.

Transmission in couples: In a study among women attending STD clinics in Pune from 1993 to 1996³², prevalence of HIV infection was observed to be 49.9 per cent in FSWs and 13.6 per cent in those who were not sex workers with majority reporting single sexual partner. This was the first evidence of a high HIV prevalence in married monogamous women in India with a strong suggestion of risk from their husbands³². Similarly sexual partners of intravenous drug users (IDUs) in Manipur in north east India have been shown to have a high risk of HIV infection³³. A study among STD patients in a district hospital in Maharashtra state documented difficulties and deficiencies in communication with regular sexual partners on sexual matters³⁴. Specific strategies need to be considered for improving sexual communication and negotiation of safe sex in couple settings. In the first couples' cohort study in India, 242 HIV sero-discordant couples were enrolled in 2002-2003 and the incidence of HIV infection was observed to be 1.97 per cent per year³⁵, much lower compared to that reported in Africa^{36,37}.

Parent to child transmission: Consequent to spread of HIV in women there is a potential for perinatal HIV transmission resulting in paediatric HIV epidemic. Studies from India^{38,39} documented mother-to-infant HIV transmission rates between 36 and 48 per cent. It has been reported that 63 per cent of the multi-transposed thalassaemic HIV infected children became symptomatic in infancy with a 9 per cent fatality rate within 14 months of age⁴⁰. Another study reported median survival of 8.5 months (range: 0.3-2 yr) in 26.3 per cent perinatally infected children⁴¹. Hence, prevention of perinatal HIV infections is

important. In Mumbai, in a non-randomized study, an intervention involving administration of zidovudine (AZT) for the last 6 wk of the pregnancy, delivery by elective caesarian section, oral AZT administration to the infant and avoidance of breast-feeding resulted in 5.9 per cent transmission rate compared to 24 per cent in the non-intervention arm⁴². NACO instituted a multi-site study in 11 institutions selected from the 5 high prevalence States in India to assess the feasibility of administration of AZT in pregnant women to reduce mother-to-child transmission of HIV infection⁴³. Acceptability of AZT prophylaxis among pregnant women in this study was 43.6 and 22 per cent of the women opted for breast-feeding at birth. Subsequently NACO also undertook feasibility study of one dose nevirapine for the prevention of parent-to-child transmission of HIV. The results of both these studies would provide guidelines while deciding strategies for scaling up efforts to prevent parent-to-child spread of HIV.

Transmission of HIV in injecting drug users: Although injecting drug use is known to be prevalent in many major cities of India, the problem of HIV has been investigated in the north-eastern States and in cities like Chennai, Kolkata and Delhi. The prevalence of HIV infection among injecting drug users in Manipur State increased rapidly from 2-3 per cent in 1989 to over 50 per cent in 1991⁴⁴ and has been estimated to be above 75 per cent at present. Majority of the injecting drug users in Manipur; primarily young males, using drugs for a median of five years, in spite of high level of awareness about the possibility of HIV transmission through sharing of needles routinely share injecting equipment. A study among women in Manipur⁴⁵ in 1997 revealed a high HIV prevalence of 57 per cent among drug users compared to 20 per cent among non-injecting drug users. Majority of them also had genital discharge disease⁴⁵. A study in Chennai also reported multiple risk behaviours like exchanging money for sex or having sex with men among men who used illicit drugs²⁵. Thus, in addition to prevention of parenteral transmission through measures like reducing availability of drugs, de-addiction programmes, education for safe injecting practices and providing clean needles; prevention of sexual transmission also needs to be focused in the drug use settings.

Box II. Seroprevalence of HIV infection among persons with high risk behaviour					
Population subgroup	Geographic Area	Reference	Period	Prevalence (%)	
STD patients	New Delhi	Ray K <i>et al. Int J STD AIDS</i> 1996; 7: 48-50	1986-1997	0.2 - 4.1	
	Vellore	Jacob M <i>et al. Indian J Med Res</i> 1995; 101: 6-9	1986-1993	0.26 - 3.9	
	Mumbai	Pedhambkar R, <i>et al. Sexually Transmitted Infect</i> 2001; 77: 388-9	1992-1995	11.3 - 30	
Sex Workers	Pune	Rodrigues J, <i>et al. Br Med J</i> 1995; 311: 283-6	1993-1996	18-22	
	Mumbai	Mehendale S, <i>et al. Indian J Med Res</i> 1996; 104: 327-35	1986-1995	2.5 - 69	
	Pune	Lal S. <i>J Indian Med Assoc</i> 1994; 92: 3-4 Bhave G. <i>AIDS</i> 1995; 9 (Suppl): S21-30	1993-9	34-54	
Truck Drivers	Surat	Rodrigues J, <i>et al. Br Med J</i> 1995; 311: 283-6	2000	43.2	
	Nagpur	Mehendale S, <i>et al. Indian J Med Res</i> 1996; 104: 327 - 35	2000	15.2	
Spouses of sero-positive High risk persons	Tamil Nadu	Desai V, <i>et al. Sex Transm Infect</i> 2003; 79: 111-5	1994	2.6 - 9.4	
	Pondicherry	Gawande A, <i>et al. J Commun Dis</i> 2000 Sep; 32: 212-5	1999-2001	15.9	
	Haryana	Manjunath JV, <i>et al. Int J STC AIDS</i> 2002; 13: 612-7	1986-2002	22.8	
IVDU's	Calcutta	Arora D, <i>et al. Int J STD AIDS</i> 2004; 15: 178-82	1999-2000	40	
	Manipur	Gupta P, <i>et al. Arch Sex Behav</i> 2003; 32: 339-49	1989-1998	3-70	
IVDU (Females)	Imphal-Manipur	Sarker S, <i>et al. Bull Narc</i> 1993; 45: 91-105 Chakrabarti S, <i>et al. Indian J Med Res</i> 2000; 111: 189-94	1997	57	
Non injecting drug users (Females)	Imphal-Manipur	Panda S, <i>et al. Natl Med J India</i> 2001; 14: 209-11	1997	20	
STD, sexually transmitted disease; IUD, intravenous drug users					

Transfusion associated AIDS: Various studies have reported a gradual increase of HIV prevalence in blood donors over the last two decades and this observation generally reflects the trends seen in the sentinel surveillance. In replacement donors in New Delhi, HIV prevalence increased from 0 in 1991 to 0.06 per cent in 1997⁴⁶. A five year study (1994-1999) among 46,957 donors in north-western India reported overall HIV prevalence of 0.44 per cent, more in replacement (0.461%) as compared to voluntary (0.279%) donors⁴⁷. Between 1993 and 1996, 1.81 per cent of the 12,235 replacement blood donors in Mumbai were found to be seropositive for antibodies to HIV types 1 and 2¹⁴. Prevalence of HIV infection among non-professional blood donors at the Christian Medical College and Hospital, Vellore increased from 1.6 per 1000 in 1988-1989 to 3.8 per 1000 in 1996-1997⁴⁸. Majority of the blood donors are normally healthy adult males and HIV prevalence of over 2-3 per cent in replacement blood donors could be indicative of generalization of the epidemic in the country. It is important to promote voluntary donor movement to ensure that the donors are free from transfusion transmissible infections like hepatitis B and C, HIV-1 and HIV-2, syphilis and malarial parasites. The first cases of paediatric AIDS in India were reported in multitransfused thalassaemic children, in two different studies from Delhi and Manipur, showing the same HIV prevalence of 8.9 per cent^{40,49}. Although transfusion associated AIDS contributed significantly to the total HIV disease burden in India in the late 1980s to early 1990s, this proportion rapidly fell thereafter.

HIV disease burden in India: There has always been some controversy around this issue in India. The estimates of the Indian Government and the United Nations agencies have always been at variance. NACO has based its estimations on the sentinel surveillance system in specific high and low risk groups and generated point estimates of 3.50, 3.70 and 3.86 million for the years 1998, 1999 and 2000, respectively. Considering that all risk groups were not adequately represented in these estimations and that AIDS cases were not included in this exercise, a 20 per cent range was applied and the upper bounds were taken as working estimates for the country^{4,50}. Subsequently, exercises were employed for validating

community based STD prevalence in rural and urban areas. Additionally Behavioural Sentinel Surveillance data of 2001⁵¹ and HIV Sentinel Surveillance data from urban and rural subsets were used for HIV burden estimation in 2003. As of October 2003, an estimate of 5.1 million was provided by NACO with an overall adult prevalence below 1 per cent (59.9% of all infections in the rural areas and 61.75% in the high prevalent states)⁵². For the year 2004, annual round of sentinel surveillance has been planned at 670 sites, inclusive of 124 rural sites in high prevalence States and relocation of 18 STD sites in private sector hospitals in order to ensure participation of private sector STD clinics.

Some studies were done to estimate the actual burden of HIV disease and economic impact on the society. A study in Mumbai estimated 85,200 individuals to be HIV infected in 1997 and at least 4120 excess deaths due to AIDS⁵³. A study in Pune⁵⁴ used micro level estimates and documented that district level disease burden estimates (in DALYs per 1000) based on locally generated data were higher than the Global Burden of Disease estimates for India. The community prevalence in Pune district for 2000 was estimated to be 1.28 per cent, with at least 5729 persons qualifying for antiretroviral therapy⁵⁴. A simplistic model of two scenarios with and without HIV/AIDS and steady state population demographics and life table approach estimated life years lost per case of HIV infection to be 44.4 yr with a total economic loss of Rs.1014 billion in 1997 in India⁵⁵. It is important to have well-set surveillance network with wide and uniform coverage, reliable community-based incidence and prevalence data on HIV and STDs and mortality data due to AIDS as well as HIV related illnesses for realistic estimation of HIV disease burden in the country.

Consolidating the national response for prevention and control

When HIV infection was discovered in India in 1986, the health authorities set up the NACO which prepared an outline for National AIDS Control Programme (NACP)⁵⁴ that was primarily funded by the World Bank and technically supported by WHO. NACP operates with a multi-directional approach

Box III. Seroprevalence of HIV infection among persons with low risk behaviour					
Population subgroup	Geographic area	Reference	Period	Prevalence (%)	
Pregnant women	Vellore	John T, et al. <i>Indian J Med Res</i> 1993; 97 : 227-30	1987-1992	0.05	
	Pune urban	Unpublished data, National AIDS Research Institute	1996-1999	2.5-3.87	
	Pune rural	Kunte A, et al. <i>Indian J Med Res</i> 1999; 110 : 115-22	2000	1.2	
	Mumbai	Kaul D, et al. <i>Indian J Pediatr</i> 2001; 68 : 623-31		0.1-2.0	
Blood donors	Mumbai	Kamat H, et al. <i>Indian J Med Sci</i> 2000; 54 : 43-51	1988-1997	0.75-5.9	
	Vellore	Elavia E, et al. <i>Indian J Med Res</i> 1991; 93 : 280 -5			
	Vellore	Rose D, et al. <i>Indian J Med Res</i> 1998; 108 : 42-4	1988-1997	0.13-0.38	
	Delhi	Ray K, et al. <i>J Acquir Immune Defic Syndr</i> 2001; 26 : 393-4	1990-1997	0.02-0.26	
	Chandigarh	Sharma R, et al. <i>Natl Med J India</i> 2004; 17 : 19-21	1996-2002	0.16-0.3	
Spouses of male STD patients	Pune	Gangakhedkar R, et al. <i>JAMA</i> 1997; 278 : 2090-2	1997	14	
Women reporting to RTI clinic	Pune	Unpublished data, National AIDS Research Institute	1999-2001	4.5	
STD, sexually transmitted diseases; RTI, reproductive tract infections					

and various strategies include blood safety, condom distribution, control of STDs, surveillance and information-education-communication. Nongovernmental and community based organizations are also active in the area of HIV prevention.

Improvements in programme management and application of appropriate interventions have documented successes. The Supreme Court of India banned paid donations by the end of 1997 and autonomous National Blood Transfusion Council and the State Transfusion Councils were established. Attempts are ongoing to improve the transfusion service in India. There has been a considerable decline in transfusion associated HIV transmission and change over to voluntary donor service would further reduce this number. National efforts are ongoing in this direction⁵⁷. Prevention of perinatal transmission of HIV is one of the few success stories in HIV prevention research. With the reduction in the cost of ART drugs and demonstration of ability to introduce HIV testing and chemotherapeutic intervention among the pregnant women in the feasibility studies of AZT and nevirapine by NACO⁴³, it is likely that this intervention will be made available for countrywide application as a part of the national programme soon. The programme to offer antenatal counselling, testing, and antiretroviral treatment to prevent mother-to-child transmission has already been expanded to 225 antenatal clinics, and is the largest national antenatal screening programme in the world⁵⁸. By enhancing access to treatment and through interventions like counselling, education, and provision of condoms for prevention of STDs, especially genital ulcer disease, among disadvantaged men, the disparity in rates of HIV incidence could be lessened considerably²². Interventions in MSM in Chennai slums suggested that HIV prevention strategies aimed at changing unsafe drug and sexual practices should target the general population of men rather than giving specific attention to areas with high rates of MSM²⁵.

During the beginning of the African epidemic, Uganda faced a severe crisis, with almost 30 per cent of the adult population infected with HIV/AIDS in 1980s and 1990s. Uganda responded through a mix of rationalist and creative policy approaches and after a decade of intervention a decline in HIV prevalence

was noted⁵⁹. Similarly, with limited resources the national programme for preventing mother-to-child HIV transmission in Thailand was successful due to focusing attention on counselling, communication, training and focused monitoring in the programme⁶⁰ and a behavioural intervention comprising of consistent condom use, reducing alcohol consumption and brothel patronage improving sexual negotiation and condom skills among conscripts in the Royal Thai Army for 15 months substantially reduced the risk of incident STI and HIV⁶¹.

There is an increasing political will and commitment to HIV prevention and control efforts in India. A recently constituted National Parliamentarian Forum has stressed support for additional HIV prevention programmes including a large school-based adolescent education programme and a national campaign to raise awareness about STDs and treatments. The annual budget for the NACP has doubled over the past 3 yr⁵⁸. Antiretroviral drugs are manufactured in the country and exported elsewhere, but their affordability to a common man (despite a drastic reduction in costs) and technical difficulties in creating facilities for monitoring for adverse reactions and resistance are in question. A recently started programme of Government of India to provide highly-active antiretroviral therapy (HAART) to 100,000 HIV infected patients in six high HIV prevalent states in India indicates the commitment to the cause of those who are living with HIV infection⁶². The Government of India has strengthened the collaboration between TB and AIDS control programmes for better management of dual HIV-TB epidemic and regions with higher prevalence of HIV infection have been prioritized for the Revised National TB Control Program (RNTCP) focusing on directly observed therapy-short course (DOTS) coverage⁶³.

Meeting the challenge

Evidence indicates that trajectory of the HIV epidemic in India is distinct from some African countries⁵⁸. However, there is no justification for complacency and the focus of HIV prevention in India should be on evidence based intervention among vulnerable communities, enhancing access to care and

treatment for people living with HIV/AIDS and decentralization of the programme financially and operationally by supporting States and districts to develop critical capacities^{64,65}. There appears to be a need for an integrated and all-inclusive approach than a compartmental AIDS prevention centered approach. Close co-ordination between the governmental, non governmental, international and community-based organizations in implementation of intervention programmes may prove to be cost-effective and cost-efficient⁶⁰.

The dual epidemic of HIV and tuberculosis is a cause for concern in India where these two infections are prevalent in epidemic proportions. The seroprevalence of HIV among tuberculosis patients in various parts of India has been increasing steadily⁶⁶. Among newly diagnosed tuberculosis patients in Pune, the overall seroprevalence of HIV infection increased from 3.2 per cent in 1991 to 20.1 per cent in 1996⁶⁷. It is expected that HIV will increase the number of TB cases in India by at least 10 per cent and by a considerably higher percentage if HIV becomes much more widespread. In India, TB is the indicator disease for HIV infection and most often the first AIDS-defining disease. The risk of development of TB in HIV infected patients in India has been estimated to be nearly 7 per 100 person-years⁶³. Though primary and acquired multi-drug resistant tuberculosis in India is a major likely threat, it is still not a major public health concern^{68,69}. There are challenges in the management of dual infections due to HIV and TB and clinicians will have to be trained adequately. India's experience shows that DOTS can achieve high cure rates⁷⁰, however, its effectiveness needs to be critically evaluated on the background of ongoing HIV epidemic.

Sexually transmitted infections play a significant role in HIV transmission and acquisition. A significant increase in the number of viral STDs and a decline in the bacterial diseases have been observed in recent years⁷¹. Whether the observed decline is a real phenomenon due to higher awareness of HIV/AIDS, success of control programme and syndromic management of STDs⁷¹ or this population has got diverted to unqualified persons and self-treatment by across-the-counter purchase of drugs to avoid HIV

testing needs to be investigated. So is the need to capture qualified health care providers in the private sector in the programme and address the issue of unqualified workers' needs.

Estimating disease burden in a community is always a challenge. In view of the limitations of the traditional cohort method of estimating incidence which is important for estimating disease burden, novel approaches of incidence estimation such as using mathematical models based on cross-sectional surveys⁷² or a multi-stage pooling method to detect RNA-positive pools and then re-analyzing smaller pools⁷³, or detuned ELISA tests may have to be tried. Planning is currently underway to estimate the disease burden of HIV infection in India because this is crucial for strategic planning for programme implementation.

HIV infected persons have repeatedly voiced their right to live with dignity. They experience discrimination from the health care workers due to inadequate knowledge and unduly high perception of occupational risk. Training of health care workers thus becomes a major priority. It is important to equip us with adequate and appropriate facilities for inpatient and outpatient care of HIV infected people with a focus on providing access to primary care and home-based care.

A large number of women in India are affected with no risk behaviour of their own. Community gender norms have a sanction for domestic violence that interferes while adopting and negotiating HIV-preventive behaviours by women. Given the choice between the immediate threat of violence and the relatively hypothetical threat of HIV, women often resign themselves to sexual demands and indiscretions that may increase their risk of HIV acquisition⁷⁴. It is therefore important to be sensitive about gender-related issues while designing strategies and interventions for AIDS prevention. Young women are often detected as HIV infected during their first pregnancy, majority of them within the first two years of marriage. Due to social and family pressures girls agree to early and "timely" marriages, because delayed wedding among girls carries social stigma and young males often aware of their risk behaviour and possibly also of their HIV status cannot remain

single. In India, HIV-related counselling services are still not readily available. Systematic efforts to eliminate stigma should be continued and establishments of voluntary counselling and testing centers (VCTCs) at the district level are expected to play a major role in this direction.

Though like many other developing countries, the main barriers to effective control of AIDS are reported to be insufficient resources, illiteracy, and stigma, there is a need to assess if the prevention and control efforts are directed to the right populations and if appropriate programmes are in place and are working optimally. AIDS is less of a medical problem, but more of a social, cultural and developmental problem. Thus, there is probably not going to be an easy solution. Short-term strategies like aggressive case detection and management of STDs, condom promotion, blood safety and drug de-addiction programmes might yield quick results. However, they should be effectively complemented by a multi-disciplinary approach and long-term strategies for HIV prevention and control. These include steps towards removing social injustice and inequity, improving economy and achieving overall development, efforts to increase the status of women in the community and development of safe and effective primary prevention interventions like vaccine or vaginal microbicides.

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