ISSN 0377-4910

ICMR BULLETIN

Vol.22,No.11-12 November-December, 1992

HIV INFECTION : CURRENT DIMENSIONS AND FUTURE IMPLICATIONS

The din of our celebrations of victory over smallpox had barely died when mankind was struck by a deadlier and more virulent infection - the human immunodeficiency virus (HIV) infection. Acquired immune deficiency syndrome (AIDS) is the final stage of this viral infection. First identified in 1981, in the USA, the infection has continued its relentless march from one continent to another.

PROFILE OF THE PANDEMIC

By July 1992, a cumulative global total of over 500,000 adult AIDS cases have been reported to the WHO in 168 countries[1]. But it is estimated that the actual number may be nearer 1.7 million (Fig1). It is believed that over half of all adult AIDS cases thus far have occurred in sub-Saharan Africa. In addition, it is estimated that by early 1992 more than 500,000 paediatric AIDS cases also may have occurred with more than 90 per cent in sub-Saharan Africa.

Based on currently available data the WHO estimates that a cumulative total of 10-12 million adults and 1 million children have been infected with the HIV since the beginning of the epidemic. The sub-Saharan Africa has over 7 million infections; North America and Latin America (including the Caribbean Islands) have over 2 million, South and South-East Asia over 1.5 million; Europe (including countries comprising the erstwhile Soviet Union) has over 500,000; North Africa and the Middle East have 75,000; Australasia has over 30,000 and East Asia and the Pacific have approximately 25,000.

It is believed that nearly 1 million persons have newly acquired the infection during the first six months of 1992. Of these about half live is sub-Saharan Africa, about one quarter in Asia and the Pacific (vast majority in South and South-East Asia), and a little more than a tenth live in Latin America and the Caribbean. It is also estimated that nearly one half of the new adult infections have occurred among women.

As of 1 November 1992, a total of 1,250 cases of AIDS have been reported from South-East Asia, 95% of these are from Thailand and India.

Epidemic in India

The first HIV seropositive individual in India was identified in 1986 among the prostitutes of Madras city. Since then the surveillance activities were gradually expanded, resulting in HIV testing of over 1.5 million persons by the end of October, 1992. The surveys covered various groups, including heterosexual promiscuous males and females, injecting drug users (IDUs), pregnant women, blood donors, and recipients of blood and blood products. The data for all groups

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This issue commemorates the World AIDS Day (December 1, 1992)

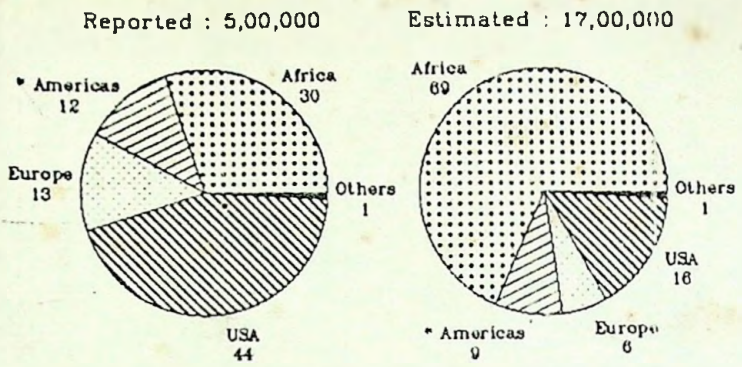

Fig.1 Cumulative percentage of adult cases (Mid - 1992).
(* not including USA)

combined, showed that the HIV prevalence rates grew from 0.2% in 1986 to 0.7% in 1992. In Bombay HIV prevalence among commercial sex workers has jumped from 2% in 1988-89 to about 40% in 1991. In Manipur the prevalence of HIV was about 54% in IDUs. Studies conducted at the Christian Medical College (CMC), Vellore on time trends of HIV infection among the three promiscuous groups combined (*ie* prostitutes and male and female STD patients) show a 1.5 fold increase in prevalence from about 15 per 1000 in 1986-87 to about 23 in 1991-92. Time trends of infection among prostitutes alone show that the prevalence increased by a factor of 12, from 37 per 1000 in 1986-87 to 452 per 1000 in 1990-91. Similarly there is a trend of increasing prevalence among the male and female STD patients, but at a lower rate than in the prostitutes. In pregnant women, and blood donors the prevalence has remained stationary or has increased very slightly.

Through these surveys, it was established that female sex workers in the States of Maharashtra and Tamil Nadu and IDUs in three North-Eastern States of Manipur, Nagaland and Mizoram are leading risk groups for HIV infection. There are indications that injecting drug use is practiced in Calcutta and Madras and a large homosexual population was identified in Bombay, but HIV prevalence in these groups has not been studied.

The first AIDS case in India which was reported in May 1986 was infected by blood transfusion during coronary bypass surgery in the USA. The second case, a hemophiliac was reported a month later. Since then, 242 full blown AIDS cases have been reported till October 31, 1992,to the Ministry of Health & Family Welfare from 16 States and Union Territories of the country.

HIV Infection in India: Current Figures

According to the reports provided by the Government of India, New Delhi the situation as on 31st October, 1992 in India was that of the 1,528,567 individuals screened, 10,856 were seropositive; a seropositivity rate of 7.1/1000.

Current status in the AIDS cases, state-wise breakup, probable source of infection and category of seropositives is shown in Tables I-IV.

Table I.AIDS cases in India

	Male	Female	Total
Indians	177	51	228
Foreigners	10	4	14
Total	187	55	242

Table II.Probable source of infection in Indians

Category	In India	Abroad
Heterosexual promiscuity	152	21
Blood transfusion	27	3
Blood product infusion	6	1
Homosexual contact	0	1
Spouse of AIDS patient/ seropositive person	8	0
Injecting drug addict	9	0
Total	202	26

Table III.Breakup of seropositives

Category	Seropositives	%
Heterosexually promiscuous	4483	41.3
Homosexuals	29	0.3
Blood donors	1682	15.5
Patients on dialysis	44	0.4
Antenatal mothers	49	0.5
Recipients of blood/bld pdts.	209	1.9
Relatives of AIDS patients	83	0.7
Suspected ARC/AIDS cases	383	3.5
Drug users IV	1647	15.2
Others	2247	20.7
Total	10856	100

Table IV.State-wise number of reported AIDS cases (as on 31.10.92)

State	No. of cases
Maharashtra	93
Tamil Nadu	73
Delhi	29
Kerala	16
Punjab	8
Pondicherry	6
Manipur	4
West Bengal	3
Goa	2
Gujarat	2
Jammu & Kashmir	1
Himachal Pradesh	1
Haryana	1
Rajasthan	1
Andhra Pradesh	1
Uttar Pradesh	1
TOTAL	242

ROUTES THE INFECTION TAKES

Summary information prepared by WHO on the basis of reports available at the beginning of 1992, shows the following routes of infection (TableV)[2].

Australasia, North America and Western Europe

The population group mainly affected have remained homosexual or bisexual men and injecting drug users, although heterosexual transmission is on the rise. Marked differences continue to exist in the relative proportion of AIDS cases among homosexual men and IDUs. The incidence of HIV infection among homosexual men appears to have decreased markedly since the mid 1980s. Perinatal transmission was not considered a major route of infection during 1980s, but is increasing as the number of HIV infected women has grown.

Sub-Saharan Africa

Heterosexual transmission of HIV continues to be the predominant mode of spread. Because of this, the numbers of HIV infections in men and women are more or less equal. As with other STDs there is a slight excess of women infected with HIV for a variety of sociological and biological reasons; the male and female ratio is approximately 1:1.2. HIV transmission from an infected woman to her foetus or infant is a widespread and increasing problem. High rates of STDs are believed to be important factors that have facilitated heterosexual transmission of HIV in this region. Parenteral transmission through HIV infected blood continues to be relatively small,accounting for less than 10% of all infections. The problem is declining as routine screening of donated blood for HIV is being implemented widely. It is estimated that about 750,000 HIV infected infants had been born in Africa by 1992.

South and South-East Asia

Although the spread of infection began only in mid or late 1980s, its progress has been rapid. In South Asia the predominant mode of transmission is heterosexual. There is some transmission through drug injecting. In South-East Asia, HIV transmission was initially predominant among injecting drug users. Heterosexual transmission has been increasing rapidly among multiple sex partners, and since 1989 this appears to be the predominant mode of transmission. The pandemic in this region is still at an early stage, but indications are that it is growing quickly. There is concern that the pandemic in this region may be growing at a pace reminiscent of sub-Saharan Africa in

the early 1980s, but may have an even greater potential for spread given the adult population of nearly 500 million as compared with 225 million in the sub-Saharan Africa.

Latin America and Caribbean

Estimates of total HIV infections are difficult to make for this region because of relatively limited data available. In Central America there has been a 40 - fold increase in the rates of reported clinical AIDS cases in women in the last four years.

According to recent analysis 10,000 children in Latin America have already been born with HIV infection. In addition to the groups of HIV infected homosexual or bisexual men, there is increasing heterosexual transmission. HIV infection among injecting drug users also appears to be growing in some countries.

The cumulative total of HIV infections as of 1992 is estimated to be over 1 million, and the total number of AIDS cases is estimated to be about 150,000.

East Asia, Pacific, Eastern Europe and former USSR, North Africa and Middle East

The predominant modes of transmission in these areas are not fully delineated because of the relatively recent spread of HIV in these areas. Limited data are available on the prevalence of HIV infection and the number of AIDS cases.

Table V.Summary of predominant modes of HIV transmission

Mode of transmission	Estimated efficiency %	% Total infection (Global)
Sexual intercourse	0.1 -10	75-80
Vaginal		60
Anal		15
Blood borne		
Transfusion	> 90	5
Injecting drug use	0.5-1.0	10
Others (*eg* tattoos)	< 0.5	small
Perinatal	20-40	10

PROJECTING THE COURSE OF THE EPIDEMIC

Estimates and Projections

Estimates of the current situation and projections for the future of HIV/AIDS are crucial to health care planning and for designing of prevention and treatment strategies. Such estimates are necessarily made by using the available data however incomplete, and then extrapolating these data to specific populations. Mathematical models are used to bridge the gaps in information. Forecasts of the future course of the epidemic depend largely on the underlying assumptions about the transmission dynamics of HIV infection.

Even if some adjustments are made for reporting delays, based on calculations of average past reporting delays, there is little assurance that such adjustments will be adequately correct for current or future reporting delays.

Modelling these dynamics is extremely difficult because of the large number of biological and behavioural variables required to describe the spread of HIV. A range of models exists for the purpose. But none appears to be simple enough to be useful and complex enough to reflect the realities of the disease.

Estimates of HIV infections can be made using the available HIV prevalence data and then extrapolating it. In the other commonly used model AIDS case reports and annual progression rates of HIV infection to development of AIDS have been used to estimate the number of annual HIV infections by back calculation. A simplified variation of this method uses an estimated ratio of HIV infections to AIDS cases to calculate total HIV infections. All these methods have limitations.

In 1988 the WHO used a Delphi survey to project HIV prevalence to the year 2000. In mid 1992, the Harvard School of Public Health, USA, estimated and projected the numbers of HIV infection which may occur globally. Their projections are depicted in TableVI [James Chin, Second International Congress on AIDS in Asia and Pacific (SICAP), 1992].

Table VI.Cumulative adult HIV projections to the year 2000 (in millions)

Area	WHO	Harvard 'Low'	Harvard 'High'
North America	01.63	01.80	08.15
Western Europe	00.85	01.19	02.33
Sub-Saharan Africa	15.00	20.78	33.61
South-East Asia	10.25	11.28	45.06
Latin America & Caribbean	02.37	02.14	15.51
Total	30.10	37.20	104.66

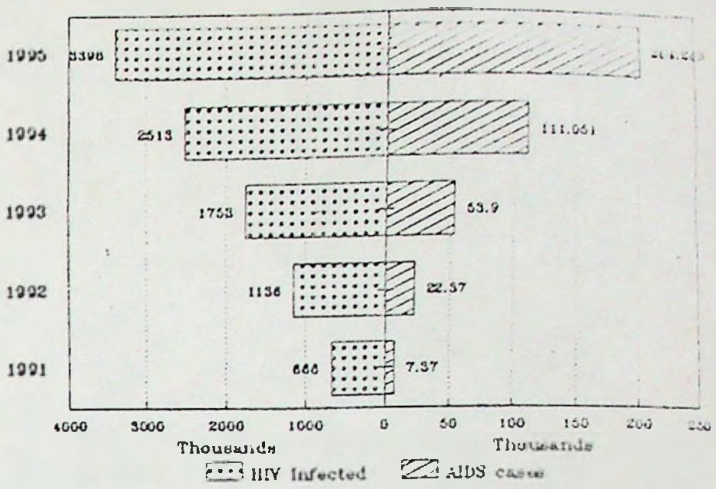

Fig.2 Cummulative projections for India.

Estimates and Projections for India

The data generated through sero-surveillance activities has been used for making projections (Fig2) and estimates (TableVII) for India also. Using a model developed by the WHO the following scenario is predicted for India (Shiv Lal, SICAP,1992).

Table VII.Estimates of the number of HIV infections in urban India based on serosurvey data (1991)

Group	Estimated number (in million)	Prevalence (%)	Estimated no. of +ves
Female prostitutes	1	15	150000
Clients of female prostitutes	3	7.5	225000
Injecting drug users	0.05	50	25000
Male homosexuals	0.15	20	30000
S A females (15-45 yr)	43	0.07	30000
S A. males (15-45 yr)	52	0.34	177000
Rural S A population	263	NK	NK
Total			> 637000

S A : Sexually Active, N K : Not Known

The Delhi Chapter of the Institute for Research in Medical Statistics has developed a mathematical model for estimating the current number of HIV infected persons in India. According to their calculations the estimated number of infected persons in India in 1991/92 is between 0.44 and 0.61 million (Dr. Padam Singh,SICAP,1992).

In order to make realistic projections it is necessary to collect more reliable data on HIV prevalence and disease progression in specific risk groups. Better information is needed about sexual behaviour. More data are required on size of IDUs and patterns of sharing needles and interaction between drug abuse and sexual behaviour. Knowledge is needed about the effects of other infections, the infectiousness of an infected person, the factors that are crucial in converting an asymptomatic to symptomatic state, and the percentage of people who will progress from HIV infection to AIDS.

Predictions/projections of HIV is a tricky business. It relies heavily on the accuracy of the data used for modelling. Seroprevalence studies, thus form the corner stone for generating reliable information that is representative of specific population groups. In India, ELISA based test has been used for screening purposes and Western Blot as the supplemental test. Cost of the hard and software of these tests has hindered the expansion of serosurveillance activity. There is a need to use an alternative strategy to conduct these activities economically.

ALTERING THE COURSE OF THE EPIDEMIC

Evolution of AIDS/HIV Control in India

Whatever is known today about HIV/AIDS in India is largely due to the foundations laid by the Indian Council of Medical Research (ICMR) in close collaboration and cooperation of the Ministry of Health & Family Welfare and the Directorate General of Health Services, Government of India. The existence of HIV infection in India was shown through the efforts of ICMR. Centres were established throughout the country for serosurveillance and they were linked to Reference Centres for supplemental Western Blot testing and quality control. The results of serosurveillance provided insights to the main routes of transmission and identified the major high risk groups. Further, operationalizing the blood donor screening programme, and testing of blood products for HIV infection was undertaken by the ICMR. Training and human resource development was an important contribution in setting up the screening facilities in the country. The surveillance activities also highlighted the fact that no section of the community is safe and that more and more people were getting infected. The virus was spreading rapidly.

Based on the information generated by the Council's efforts the Government of India formulated and launched the National AIDS Control Programme (NACP) in 1987 - with a year of detection of HIV infection in India. The programme had three main components *viz.* surveillance, screening of blood and blood products, and health education and information. In 1990, a three year medium term plan was prepared in consultation with the WHO. The plan at an estimated cost of US $ 20 million, focussed on four metropolitan cities (Delhi, Bombay, Calcutta and Madras) and four States (Maharashtra, Tamil Nadu, Manipur, and West Bengal). During this period the rapid evolution of the epidemic became clearer and it was decided to expand and accelerate the activities of the Programme. With this in view an expanded comprehensive strategic plan for a period of five years (1992-96) for control of HIV/AIDS in India was formulated. The plan envisaged a broader range of activities and required extensive inter-sectoral and inter-disciplinary co-ordination.

The Government of India sought the assistance of the World Bank for implementing the strategic plan for prevention and control of AIDS in India, and subsequently a US $ 100 million project was drawn up with the World Bank loan acting as a start-up investment. For the nation-wide implementation of this project it was considered necessary to have an organization at the centre dealing exclusively with AIDS prevention and control. Thus was born the National AIDS Control Organization (NACO) in July 1992.

Establishment of NACO

The HIV/AIDS control strategy under the NACO would have seven components[1]

Strengthening programme management, monitoring, review and evaluation

A strong and effective programme management structure is foreseen at the national and state levels. Four co-ordinating bodies have been formed at the central level: a National AIDS Committee - representing all ministries, selected private organizations and NGOs; a Board for AIDS Control - formed from officials of the Ministry of Health and Family Welfare to oversee the programme, funding and policy; National Programme Co-ordinating Team operating as a technical mission to implement programme activities; and a National Technical Advisory Committee to provide technical support to the Programme. Simultaneously at the state level, an Empowered Committee headed by the Chief Secretary/ Additional Chief Secretary will oversee the programme. The State AIDS cell will be strengthened/established with appropriate resources and staff. The technical aspects of the programme will be reviewed periodically by the State Technical Advisory Committee.

Surveillance and research

The objectives of this component are monitoring the development of the HIV/AIDS epidemic, providing relevant information required for mobilization of the national political and social leaders and external support, programming target-oriented intervention activities, and measuring their impact on the epidemic development. The surveillance would include two aspects: HIV surveillance and AIDS case surveillance.

Information education and communication(IEC) and social mobilization for prevention of HIV transmission through behaviour

This component seeks to identify and formulate strategies for raising awareness among general public about HIV and AIDS so as to inculcate positive values, attitudes and behaviour for self protection from the disease. A comprehensive information, education and communication strategy must seek to garner and fully utilize the communication skills available within and outside the government, and mobilize allies in the effort at every level to work for preventing the spread of AIDS on a participatory basis.

To accomplish this a comprehensive programme will be developed with the following elements: media campaigns utilizing standardized messages, targeted interventions for high risk groups, collaboration and support of the NGOs, social mobilization, training, operational research, evaluation and monitoring. This component will link closely with other components of the programme.

Control of sexually transmitted diseases

Sexually transmitted diseases (STD) are associated with the same risk behaviours that put a person at risk for HIV infection, and ultimately AIDS. In addition, STDs are now recognized as an independent risk-factor for HIV infection and AIDS, facilitating both the acquisition and transmission of the HIV. It is this relationship to HIV infection that renders STD control imperative in the control and prevention of HIV infection.

In the first place, control of STDs will remove these diseases as a risk factor and so reduce HIV transmission. In the second place, comprehensive STD control programmes, by providing good quality clinical services to STD patients, also provide access to this sometimes heterogeneous and often elusive group. As STD patients are an important risk group for HIV infection, including for example prostitutes and their clients, this provides a unique opportunity for IEC, counselling and social mobilization interventions.

The existing STD control programme will be revitalized, pilot programmes will be initiated in the major metropolitan cities.

Condom programming

Heterosexual intercourse is the dominant mode by which HIV is transmitted in India. . Recent WHO estimates suggest that in 1991 there may have been more than 6,50,000 HIV infected individuals in India who have relations with a monogamous, uninfected partner. The only feasible method recommended to avoid transmission of infection during sexual intercourse is by the proper and consistent use of condom.

Recognizing that some people have multiple sex partners and engage in risky sexual behaviour, and acknowledging the experience of expanding HIV seroprevalence rates in other countries with HIV transmission patterns similar to those in India, the Government of India has established a strong position of support for condom promotion for STD/HIV prevention to ensure that people who choose to engage in risky sexual behaviour have access to good quality, low cost (or free) condoms with information that is needed for proper and effective use.

Blood safety

There are 1018 blood banks in the country, handling an estimated 2 million units of blood per annum. This works out to be about 3.3 units per hospital bed, which is much lower than the WHO norm of 7 units per annum per bed. Of the 1018 banks, 605 are under government/public sector. A significantly high number, *ie* 203 blood banks are run by private profit-making institutions. These are the commercial blood banks which primarily obtain their blood from professional donors. In addition, voluntary organizations such as the Red Cross run 56 blood banks in the country. With the rapid expansion of health services to the periphery and specialities such as cardiac and neurosurgery being established in metropolitan and bigger cities, the demand for blood and components is expected to rise rapidly. Major expansion of the voluntary donor base, largely by NGOs and other agencies, is the greatest single need for improving blood safety in India.

The Government has established a network of HIV testing centres for the testing of blood which are located in metropolitan cities, capitals of States and in towns having a population of more than 0.5 million. These

are now being expanded with the intention that every unit of blood collected will be tested for safety.

The blood safety programme will develop and strengthen the national blood transfusion system, ensure adequate supply of blood to the blood centres, and ensure safety of blood and blood products. This will involve upgrading existing centres, extensive training, and the expansion of the voluntary blood donation system. The Drugs and Cosmetics Act has been amended to ensure that all blood and blood products available in India, are HIV-free, and that standard manufacturing practices are followed. Simultaneously 30 component separation facilities would be established to ensure more optimal and rational use of blood.

Reduction of impact of AIDS/HIV

Counselling for HIV infected individuals and AIDS cases will be integrated into the existing counselling and health care systems. Training of AIDS counsellors will be given priority. In addition, an assessment will be made of potential home care schemes to accommodate future AIDS cases. Guidelines for the management of people with AIDS are being prepared, and training for health workers caring for AIDS patients will be an ongoing activity.

The project takes a multi-pronged approach and focuses on the most critical interventions to limit HIV transmission today. It also sets the basis for more extensive HIV/AIDS control activities in the future. The project activities will be integrated to the maximum extent within the existing health infrastructure and there will be extensive collaboration with the private sector and NGOs in areas in which they have a comparative advantage.

Birth of National AIDS Research Institute

AIDS is a reality in India. It cannot be wished away. There is enough data to indicate the devastating course the infection is taking in several countries especially in the African continent. The current estimates and future projections for India are alarming. During the last seven years the Council had pioneered AIDS related work in India and played a key role in generating information about all aspects of HIV infection in India that we know today.

Having done its bit in assisting the Government to formulate and operationalise NACP, the Council can now focus with greater zeal and vigour on research issues. The emerging picture of HIV infection, which is likely to engulf the entire country, is one that will challenge the nation's capabilities in terms of biomedical research, health care, and health education and economics. Encouraging news about development of a vaccine and therapeutic agents offer a glimmer of hope. India should be in a state of preparedness to field test, adopt and adapt the emerging technologies needed, for control of HIV/AIDS in India.

There is an urgent need to develop self-reliance, indigenous technology and expertise to deal with the AIDS problems in India. Information on natural history of the disease, clinico-pathological spectrum should be generated. Isolation of virus and its characterization is to be taken up on priority to know the degree of similarity with the strains known in the Western World. If the Indian strain turns out to be different, the suitability of using in India, diagnostic kits and vaccines developed for the Western strain would need to be re-examined, and if possible, develop our own tools for the purpose.

Realizing the importance of the HIV infection and the crucial role it would play in shaping the health of the people of India, the Government has set-up the NACO. It is the focus for the implementation of the NACP. To spearhead India's research efforts on HIV/AIDS a National AIDS Research Institute (NARI) has been established by the ICMR at Pune, Maharashtra. The Institute is expected to be multi-disciplinary in nature, initiating, co-ordinating and evaluating multifaceted studies on HIV infection.

The objectives of NARI includes the following (i) provide leadership in research on HIV infection and AIDS; (ii) conduct in-depth virological, immunological, clinico-pathological, epidemiological studies to define the natural history of HIV infection in India; (iii) study sociological, anthropological and psychological aspects; (iv) establish suitable hospital facilities for clinical studies and laboratory research in AIDS related opportunitistic infections with training in case management; (v) develop suitable preventive and

counselling strategies; (vi) impart training for human resource developments; and (vii) undertake field and clinical trials of chemotherapeutic, immunoprophylactic and immunotherapeuctic agents as and when they become available.

UNDERSTANDING THE EPIDEMIC: RESEARCH STUDIES

HIV Infection among IDUs

The AIDS scenario in India has been rapidly changing with the tremendous increase in HIV seropositivity among the prostitutes in Maharashtra Tamil Nadu as well as in other states. The prostitutes and the professional blood donors have been identified as the major high risk groups in these areas. However, an alarming situation has been created due to an explosive epidemic of HIV infection in some North-Eastern states *viz.* Manipur, Nagaland, and Mizoram, primarily due to the presence of a large number of intravenous heroin users during last couple of years.

Heroin is available freely in these states from the Golden Triangle through the international border with Myanmar and along National Highway 39.

Following detection of the first HIV positive IDU in Manipur in 1989, systematic studies have been carried out by the ICMR Unit in these states. Community based survey by key informant technique and snowballing has revealed that the prevalence of IDUs varies between 1-2% of the total population in urban areas of the three states. The prevalence of HIV varies between 10-50% in IDUs. The substance abused are heroin and analgesics. Over 10,000 HIV positives among estimated 25,000 IDUs are fast spreading the infection to prostitutes and other sex partners. Condom use is low (1.3%). The studies have highlighted the urgent need for targeted intervention among IDUs and their sex partners, prostitutes and their clients including truck drivers.

Manipur, Mizoram and Nagaland represent only 3% of India's population but contribute about 15% of the country's seropositive cases.

HIV Infection and Tuberculosis

The epidemic of HIV has trigerred off a secondary epidemic of tuberculosis worldwide. It is estimated that more than 3 million people are dually infected with the tubercle bacillus and HIV. Of these, 2.4 million are in sub-Saharan Africa where the AIDS epidemic is having a devastating effect. There has been upto 100% increase in reported tuberculosis cases in the last 4-5 years. HIV seropositivity rates vary widely from region to region (from 17 to 55%) among those with tuberculosis. Tuberculosis has emerged as the most common presenting condition of AIDS in Thailand.

At the Tuberculosis Research Centre (TRC), Madras, 220 HIV positive persons are being followed up for development of tuberculosis. Of these, 115 had an abnormal chest radiograph. The sputum of 34 of these patients showed *Mycobacterium tuberculosis* on culture. Another 34 had grown non-tuberculous mycobacteria. Tuberculin reaction of 12 mm or more was seen in 113 patients (51%). Forty two infected individuals (34 with positive bacteriology and 8 with persistent abnormalities on X-ray) have been started on a 9 month short course anti-tuberculous therapy. Another study from the National Institute of Virology(NIV), Pune, shows that of the 269 HIV positive persons, 11 had concomitant tuberculosis infection.

In order to study the trend of HIV infection in tuberculosis patients,screening of all cases of tuberculosis who reported to TRC, Madras, the District Tuberculosis Centre(DTC) and TB sanatorium, Vellore, has been undertaken. Of the 3071 tested during 1991, 12 were positive on WB. At NIV, Pune 359 tuberculosis patients were screened for HIV, 4 tested positive by WB.

PPD reactivity has been used in several countries to estimate the risk of development of tuberculosis in HIV infected persons. Tuberculosis skin test with 5 tuberculin units of PPD producing an induration of 5 mm or more in HIV positive persons has been suggested to indicate *M.tuberculosis* infection. The validity of this test in Indian conditions should be assessed. Guidelines for clinical management of tuberculosis in HIV positive persons and role of chemoprophylaxis (using isoniazid alone or in combination with other drugs) in tuberculin reactive individuals need to be worked out.

HIV in Andamans & Nicobar Islands

Recent investigations carried out by the ICMR among the jail inmates at Port Blair, Andaman & Nicobar Islands revealed that 23% of Thais, 3% Burmese and 1 Pakistani were infected with HIV. These foreigners had entered illegally through sea-route for fishing and smuggling. A good number of them admitted to have sexual contact with local girls which included both the sex workers at Port Blair as well as tribal girls in different peripheral islands. Therefore, study on seropositivity for HIV infection risk behaviour of several sub-groups is being undertaken in different islands. There is an urgent need to implemen intervention methods rapidly to contain the spread of infection which is still believed to be low.

Detection of HIV-2

Until recently epidemiological investigations had indicated that, with a few notable exceptions, HIV-1 and HIV-2 had occupied quite distinct geographical areas. As a consequence the laboratory differentiation of HIV-1 and HIV-2 infections was not considered to be a major problem. However, HIV-2 has made substantial and rapid inroads into countries, such as some of those of West Africa, where HIV-1 had been by far the more prevalent HIV infection. Moreover, recent serosurveys utilising combined HIV-1+2 screening tests and appropriate supplemental procedures have now identified several countries in which substantial number of HIV-2 infections have been diagnosed, where formerly only HIV-1 had been recognized. HIV-1 and HIV-2 are circulating in the same risk groups and a proportion of infected individuals appear to be infected with both HIV-1 and HIV-2. Elsewhere HIV-2 infection occurs much less frequently than HIV-1 and the occurrence of dual infection is likely to be a rare event.

The simultaneous circulation of both HIV-1 and HIV-2 in more geographical regions increases concern about the frequency of and interpretation of dual reactivity in serological tests for anti HIV-1 and anti-HIV-2.

The modes of transmission for HIV-2 have been shown to be identical to those of HIV-1 and it is clear that infection with either virus leads to immunosuppression and AIDS. Some data suggest that the incubation period for AIDS may be longer for HIV-2 and that transmission may occur less readily, particularly from mother to child. However, apart from the risk to offspring of HIV-infected women the significance of the diagnosis in terms of prognosis and preventive counselling are the same and consequently a differential diagnosis is of little value for these purposes.

On the other hand, specific data on the prevalence of HIV-2 infection is valuable for the purposes of mapping the spread of HIV-2 infection and will influence the choice of appropriate screening tests and supplemental strategies. Studies of the pathogenesis of HIV-2 and its comparison with that of HIV-1 will be dependent upon feasible and accurate discrimination between the two infections and dual infections. The valid analysis of the efficacy of future expected interventions by chemotherapy, immunotherapy and or vaccination will in most instances depend upon accurately identifying whether subjects are, or become, infected with HIV-1, HIV-2 or both viruses.

Studies carried out at the NIV, Pune; CMC, Vellore, Institute of Immunohaematology (IIH), Bombay and other centres have shown that HIV-2 infection exists in India. During 1991/92, screening of 200 blood samples for HIV-2 at NIV, Pune, showed that 75 (37%) were reactive to HIV-1 only, 14 (7%) to only HIV-2, and an equal number 14 (7%) was reactive to both HIV-1 and HIV-2. HIV-2 infection was detected mostly in prostitutes and STD patients. All the 14 HIV-2 positive samples were indeterminate by HIV-1 Western Blot (WB). Thus it is suggested that HIV-1 WB indeterminate samples should be tested for presence of HIV-2 antibodies. As the prevalence of HIV-2 is increasing, it may be necessary to use combined HIV-1 and HIV-2 kits for surveillance purposes.

Virus Isolation and Characterization

Laboratories at the All India Institute of Medical Sciences (AIIMS), New Delhi; and NIV, Pune, have continued their efforts on HIV isolation and characterization. In addition to these laboratories, National Institute of Cholera & Enteric Diseases (NICED), Calcutta, has also standardized newer techniques including PCR, reverse transcriptase and

antigen detection assays. P-3 facilities are being established at these centres. At NIV, Pune, virus isolation was attempted from the blood of 55 seropositive individuals. Two of the 55 were found positive by reverse transcriptase enzyme assay, and one proved reactive also for antigen by the Abbot antigen detection kit. Further work is in progress.

Follow up of Seropositives

At AIIMS, New Delhi; NIV, Pune; IIH, Bombay; and CMC, Veliore, seropositive individuals are being followed up for clinical and immunological profile. At NIV, Pune, the mean CD4/CD8 ratio, and percentage of CD4 cells were found to be significantly decreased in HIV seropositives as compared to the healthy controls. At CMC, Vellore, the ratio and counts of CD4 and CD8 of asymptomatic HIV infected individuals, AIDS patients, sexual partners of seropositives who remained HIV negative and normal controls have been studied. Of the three parameters studied, CD4 numbers correlated well with HIV infection, progression to clinical disease and subsequent result. The WHO criteria for diagnosis of a clinical case of AIDS was applied to Indian cases at AIIMS, New Delhi. The study showed that delayed cutaneous hypersensitivity, CD4+ cell counts and CD4/CD8 ratios were good indicators of immunodeficiency. Absolute lymphopenia was a relatively rare feature. Studies are in progress.

Social Aspects of HIV Infection

To obtain baseline data on the psychosocial habits and characteristics of different risk groups, a study on jail inmates of the Central Jail, Pune was undertaken. During 1991/92, 998 inmates (952 males, 44 females and two eunuchs) were interviewed. The inmates were found to have come from a poor socio economic background. Their exposure to sex was early; premarital and extramarital sex was prevalent with an average of four partners; maximum being 9 in the case of the eunuch interviewed, though 51 inmates (including four prostitutes) had more than 50 partners. The partners were mainly of the opposite sex, though homosexuality was reported by a few. These findings are of serious concern because as many as 42 inmates (35 males, 6 females and one eunuch) were found to be positive for antibodies to HIV.

Sentinel Surveillance

Sentinel HIV testing for surveillance purposes is being pursued by the Council to monitor the trend in HIV infections over time and place. In sentinel surveillance, selected groups within a population act as 'sentinel' groups. It is believed that these data would provide information of sufficient accuracy for monitoring and targeting HIV/AIDS prevention and control activities. Testing is unlinked and anonymous.

It is essential that laboratory quality assurance procedures be maintained by all HIV testing laboratories, and procedures that ensure as far as possible the correct laboratory diagnosis of HIV reactive sera are vital to HIV/AIDS prevention and control efforts. Both internal and external quality assurance are essential and be adhered for monitoring the standard of local laboratories.

IMPLICATIONS FOR THE 1990s

Based on the available data on the current global status of the pandemic, WHO estimates that during 1990s, 10-20 million new HIV infections may be expected in adults, mostly in developing countries[2]. During the same decade, the WHO projects that 5-10 million children will have been born with HIV, the majority of them in sub-Saharan Africa. The number of AIDS cases will increase rapidly during the 1990s, from an estimated 1.7 million in mid 1992 to a cumulative total of close to 10 million by the year 2000. This increase is inevitable because it is estimated that about 10-12 million have been infected with the virus that leads to AIDS, a figure likely to increase four fold (30-40) by the end of the century. In addition, there will be 10 million or more children less than 10 years of age orphaned as a result of AIDS, primarily in developing countries.

Through the 1990s, homosexual men and injecting drug users will continue to be the population groups most affected by AIDS in Australasia, North America and Western Europe, but it is expected that new infections will occur predominantly in heterosexuals with multiple sex partners.

The projected total of HIV infected infants in sub-Saharan Africa by the end of 1990s is 4.8 million.

These figures are based on perinatal transmission rate of about 30%. Upto 70% of infants of HIV infected mothers will be born uninfected. These uninfected infants will constitute a growing group of potential orphans, since most of their HIV infected mothers will die of AIDS within 5-10 years of their birth. AIDS may increase child mortality rate by as much as 50%

many countries this would wipe out the gains in child survival achieved over the past two decades. In large urban areas of sub-Saharan Africa, especially in East and Central Africa, AIDS deaths in young children and in those aged 15-49 years may reduce the expected population growth by more than 30%. The adult mortality rate may more than triple.

Projections derived from HIV modelling in Thailand indicate that if no major changes occur, there may be a cummulative total of 2 to 4 million HIV infections by the end of 1990s.

It is expected that the developed countries would be better equipped to combat the HIV/AIDS problems because of greater literacy, better financial resources, and lower prevalence of STDs. During the 1990s the major issues will focus on health care cost, and equity in benefits and burdens. In the developing countries the disease is likely to bring fundamental changes in the economic structure. There will be impact on the work force as the age of highest economic productivity coincides with the age group of highest infection rate. Regional trade may be hurt. Foreign investors will be discouraged. Revenue from tourism would be hard hit. AIDS may be a huge drain on economies of highly infected countries. Health care expenditures on caring for AIDS affected persons may put a severe drain on national resources. Finally, AIDS may in time, undermine political stability in some countries.

The interaction between HIV and other infectious agent is likely to be of great public health concern. The most significant may be *M.tuberculosis*. It has been shown that individuals with dual infection of HIV and TB develop clinical tuberculosis more rapidly than persons without HIV infection. WHO estimates that by early 1992, about 4 million or more adults had become infected with both HIV and *M.tuberculosis*. There is a high prevalence rate of *M.tuberculosis* infection in sub-Saharan Africa, Latin America and Asia. As prevalence of HIV infection in these regions increases, the 1990s is likely to witness a secondary epidemic of tuberculosis in wake of the HIV infection. In some countries infection with drug resistent *M.tuberculosis* is emerging as a serious problem. It is feared that several other countries may have to face this as major public health issue.

Anti HIV Drugs

At present there is no cure for HIV infection. However, with the help of drugs it has been possible to prolong the life of an infected individual and postpone the onset of AIDS symptoms. The drugs licensed for use include azidothymidine(AZT), dideoxyinosine(ddI) and dideoxycytidine(ddC). These drugs are toxic, and expensive. Efforts are underway to develop safer, effective and economical anti-HIV drugs. One option is to develop non-nucleoside RT-inhibitors, benzodiazepines (also called TIBO compounds). These are very specific and highly potent drugs but unfortunately the virus rapidly develops resistance to them. Drugs acting on virus replication at other stages, such as TAT (a regulatory gene) inhibitors and protease inhibitors are undergoing preliminary clinical trials. Combination therapies to improve the efficacy and reduce side effects are also being tried out viz AZT + ddI or AZT + ddC(Kallings L.O.SICAPP, 1992).

Prospects of a Vaccine

Medical opinion varies on the prospects for a vaccine against HIV infection. Some think it is in the realm of reality others feel that the technical barriers may never be fully overcome. About 14-15 candidate vaccines are in the early stages of testing. Some of these have already been shown to be safe and capable of producing immune response, and will go on to be studied for effectiveness to protect against infection, disease or both. It should be envisaged that efficacy trials of preventive vaccines will be conducted in populations with high HIV incidence, both in developed and developing countries. With the support of the WHO, the national plans for HIV/AIDS vaccine development and evaluation are being prepared in Brazil, Rwanda, Thailand, and Uganda to facilitate the collaborative participation of the scientific community in the conduct of HIV vaccine trials. The candidate vaccines of interest include those developed by using recombinant virus envelope structure, gp 120, and also by using peptides from V3 loop of the gp 120 envelope glycoprotein. (Kallings L.O, SICAAP, 1992)

The findings from phase I/II human trials of candidate vaccines show that induction of cytotoxic T lymphocyte has been infrequent with the candidate vaccine to date. Moreover, the neutralizing antibodies have been low and of limited duration of few weeks to few months. (Barker, FL, SICAAP, 1992).

It appears that the first large scale efficacy trials of preventive vaccines could be initiated as early as 1994/95. The first vaccine may need to be further improved to enhance its efficacy. This could take another 5-10 years. Therefore, best estimates are a minimum of ten years before a preventive vaccine is fully evaluated and available.

Cost Effective Strategies for Selection and Use of HIV Antibody Tests

Recently the WHO has proposed alternative laboratory HIV testing strategies which do not require the Western Blot testing for routine public health purposes[4]. Currently the procedure uses a highly sensitive enzyme-linked immunosorbent assay (ELISA) followed by the WB assay. WB is relatively expensive and technically demanding. Advances in technology have produced tests which alone or in combination provide results of equivalent accuracy and at much lower cost from those obtained with WB tests. In addition to newer ELISA tests, these tests include 'simple' and 'rapid' tests. Three types of strategies have been suggested. They are independent of each other and not sequential. The use of type of strategy (I/II/III) depends upon the objective of testing and prevalence of HIV infection.

Strategy I : The serum sample is tested only once. Sera are tested for HIV antibody by one ELISA/Rapid/Simple (ERS) test. Serum that is reactive is considered HIV positive and non-reactive as HIV antibody negative.

Strategy II : In this strategy the positive sera is tested once again. Any serum found reactive when tested once is retested with a second ERS based on a different antigen preparation and/or different test principle. Serum that is reactive on both tests is considered HIV antibody positive. Serum that is non-reactive on first test is considered HIV antibody negative. Any serum that is reactive on first but non-reactive on second is also considered antibody negative.

Strategy III : Any serum found reactive when tested once, is tested twice again. This strategy involves 3 serial ERS tests on sera. As in strategy II, the 3 tests should be based on different antigen preparations and/or different test principles. Serum that is non-reactive on the first test is considered HIV antibody negative as is serum that is reactive in the first test but non-reactive in the second. Serum that is reactive in the first and second test but non-reactive in the third is considered to be equivocal.

In the selection of HIV antibody tests for use in strategies II and III, the first test should have the highest sensitivity, whereas the second and third test should have higher specificities than the first.

Where the objective of HIV testing is identification of asymptomatic HIV infected individuals, strategy III is proposed where HIV prevalence is less than 10%, and strategy II where HIV prevalence is more than 10%. Where confirmation of HIV antibody status is required for diagnosis of HIV related disease strategy II is recommended. For objective of surveillance, strategy II is recommended when HIV prevalence is less than 10% and strategy I at prevalence more than 10%. Where the objective is transfusion safety, or safety of transplantation at all HIV prevalences, strategy I is to be used (TableVIII).

Table VIII. Proposed HIV testing strategies by objective of HIV testing, HIV prevalence

Objective of testing	Strategy to be used HIV prevalence	
	<10%	>10%
Transfusion/donation safety	I	I
Surveillance	II	I
Diagnosis		
Clinical signs/symptoms of HIV/AIDS	II	II
Asymptomatic	III	II

Use of such alternative testing strategies will lead to considerable cost saving. It is believed that at 10% HIV prevalence, the estimated cost of strategy III would be about half the cost of a WB based strategy.

CONCLUSIONS

The result of the studies conducted in India since 1986 allow the following conclusions to be drawn:

(i) considering the incubation period of AIDS, and that several full-blown adult AIDS cases resulting from indigenous transmission have been recorded, it is presumed that HIV was introduced to India somewhere in the early 1980s. An epidemic spread of the virus started in 1985-1986;

(ii) by 1992 the virus has spread to most of the States and Union Territories of the country;

(iii) there are two distinct patterns of HIV transmission: sharing of syringes and needles by IDUs in North-Eastern India, and multipartner sex in the rest of the country;

(iv) in some population groups with identified risk behaviour HIV has been transmitted at an alarming speed, so that 30% of prostitutes have been infected in a 3-4 years period in Bombay and about 50% of injecting drug users just in one year in the city of Imphal.

Due to the timely initiative of the ICMR, the surveillance for detection of HIV infection was started at a time when the number of cases was very small. This has provided us with an advantage denied to majority of nations where HIV infection and AIDS was already high by the time the presence of infection was detected. India also has the advantage to learn from the experience of other countries in planning and operating successful national AIDS control programmes, and the advantage of also avoiding failed policies and approaches. The advantages should not be allowed to slip away.

The view that HIV/AIDS is a 'health' problem - though important, is far too narrow a frame work to examine the wider implications it has. Its impact must be visualized in the context of social and economic problems which plague the country, and which stem from this infection. The potential for HIV/AIDS spread should be perceived keeping in mind the general conditions of human development, and its interaction with socio-economic change. The HIV/AIDS epidemic threatens to tear apart the very fabric of our society.

Setting up of a National AIDS Control Organization by the Government of India for implementation of the control programme, and the National AIDS Research Institute by the ICMR to provide leadership for multi-faceted research in AIDS signals a major commitment of the Government of India for prevention and control of HIV infection and AIDS. Within a decade of identification of the infection tremendous advances in scientific research on HIV/AIDS have explored new frontiers of knowledge bringing hope for cost-effective diagnostic approaches, therapies and preventive vaccines.

But as of 1992, there is nothing to stop the HIV infection in its tracks, except communication, information and education. There is no cure. A massive research programme has been mounted to identify drugs effective against HIV. Some anti HIV drugs have shown encouraging results, but these are expensive and can cause severe adverse reaction, which prevent their widespread use in developing countries. Even if an effective vaccine is developed within the next couple of years, technical and financial obstacles probably will limit its use and thus, its impact on the spread of the disease. The upward trend of HIV/AIDS in 1990s is unlikely to be checked, unless those at risk are encouraged to change their life-styles. The current dimensions and future implications are indeed frightening. Like science, the community too should gear itself to meet the challenge. Only through a spirited and committed response by the community can we hope to emerge victorious against this viral disease—AIDS, once again as we had against smallpox.

References:

1. Current global situation of the HIV/AIDS pandemic. WHO/GPA July, 1992. S/C AAP, 1992.

2. Current and future dimensions of the HIV/AIDS pandemic. A capsule summary. *WHO/GPA/RES/SFI/92.1*, 1992.

3. *Strategic Plan for the Prevention and Control of AIDS in India, 1992-96*. Ministry of Health & Family Welfare, Government of India, 1992.

4. Recommendations for the selection and use of HIV antibody tests. *Wkly Epidemiol Rec.*, 67:145, 1992.

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