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Original Research Article

Zero transmission of HIV: Till date's only way leading towards its possible eradication

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Abstract

Background: AIDS emerged as one of the most important public health issues of the late twentieth and early twenty-first centuries. The AIDS epidemic has prompted wide-reaching changes in public health, clinical practice, and scientific research, and has had a great impact upon societies throughout the world.

Aim: This article gave an insight into beak up of mode of transmission seen in our studied area of Gujarat, which highlighted in which area one should focus more at least to control the prevalence of HIV**.**

Material and methods: In the present study, 961 HIV sero-positive patients (T group) were screened with respiratory tract infections and more 300 HIV sero-positive patients but without respiratory tract infections (C2 group) had been inquired and collected their information about mode of transmission and other demographic characters like age, literacy, financial status, gender etc.

Results: The highest patients had acquired HIV by hetero-sexual mode of transmission. In T group it was found to be in 773 (80.43%), while in C2 group it was seen among 257 (85.67%) HIV infected patients. But when both groups are merged which we consider TC2 group, this hetero-sexual mode of transmission was noted in 1030 (81.68%) HIV infected patients, followed by mother to child transmission (MTCT) which was found in 101 (10.51%) patients of T group while MTCT was seen in 29 (9.67%) HIV infected patients of C2 group.

Conclusion: If anybody knows exact percentage of acquiring HIV in the particular area, one can work on this direction, to reduce that particular mode of transmission so that at least prevalence of HIV could certainly be decreased tremendously in that particular area, state, country and ultimately from globe. Minimum transmission of HIV can be achieved by widespread of ABC (Abstinence, behavioral change, condoms) policy and with additional maximum and quick implementation of TasP (Treatment as prevention)**,** PrEP (Pre-exposure prophylaxis) and PEP (Post exposure prophylaxis) as and when required in the all ART Centres of our country.

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Key words

HIV, HAART, Mode of transmission, ART, CD4 counts, TasP, PrEP, PEP, ABC Policy.

Introduction

Everyone knows that prevention is better than cure, but in the case of HIV, when cure is yet to achieve, the role of prevention becomes very important and only way to control the spread of HIV. In the absence of a vaccine and widely available treatment, the primary focus for HIV control programs must be on reducing transmission. While treatment of other sexually transmitted diseases has some effect, the main method of reducing heterosexual transmission is by behaviour change.

AIDS emerged as one of the most important public health issues of the late twentieth and early twenty-first centuries and is now one of the leading causes of global morbidity and mortality. The AIDS epidemic has prompted wide-reaching changes in public health, clinical practice, and scientific research, and has had a great impact upon societies throughout the world [1]. HIV is transmitted from person to person. Each infected person interacts with other individuals in a variety of relationships, is a member of at least one cultural group, belongs to some type of community, and lives in specific social and economic environments. Thus, the conditions under which individuals transmit HIV to others vary in a highly complex manner across individuals, families, groups, neighbourhoods, regions, and countries. Such variation, when combined with the issues of transmission through sexual contact and drug use, presents a compelling challenge to the design and implementation of effective public health measures to control the AIDS epidemic [2]. Antiretroviral therapy has transformed a once universal fatal illness to that of chronic stable infection. As ART has to be started life long, with a high degree of resistance, patient readiness is of paramount importance. Goals of ART are to ensure maximal and durable suppression of the virus, to reconstitute and preserve immunologic quantity and function, to improve quality of life and to reduce morbidity and mortality due to HIV infection.

HIV spreads through coming in contact with infected blood, semen, vaginal fluid and breast milk. There are many activities that place people at risk; including unprotected sex and injection drug use are most common.

Prevention is the key to personal protection against HIV and AIDS. Being aware of behaviours that increase the risk of infection and taking preventive measures can substantially reduce a person's likelihood of becoming infected with HIV.

Prevention involves safer sex practices, drug use and limiting HIV exposure, minimizing HIV exposure from medical procedures.

Safe sex includes condoms, with or without spermicide, dental dams (squares of latex, originally used for dental work, now commonly recommended for safe oral sex) and latex gloves.

Besides above preventive measures for HIV about stopping transmission, there are more some additional measures which help in reducing the transmission of HIV. Among these first is updates on TasP (Treatment as prevention), PrEP (Pre-exposure prophylaxis) and PEP (Post exposure prophylaxis) of HIV infection [3].

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Keeping in view the ABC policy (Abstinence, behavioral change, condoms) and all the updates on TasP, PrEP, PEP and Test and Treat policy, and the scenario of implementation of zero transmission of HIV, probably we will find an answer with more intense research in near future [3].

India has a population of one billion, around half of whom are adults in the sexually active age group. The first AIDS case in India was detected in 1986 and since then HIV infection has been reported in all states and union territories. The spread of HIV in India has been uneven. Although much of India has a low rate of infection, certain places have been more affected than others. HIV epidemics are more severe in the southern half of the country and the far north-east. The highest HIV prevalence is found in Andhra Pradesh, Maharashtra, Tamil Nadu and Karnataka in the south; and Manipur and Nagaland in the north-east.

In the southern states, HIV is primarily spread through heterosexual contact. Infections in the north-east are mainly found amongst injecting drug users (IDUs) and sex workers. (NACO, 2008) Unless otherwise stated, the data on this page has been taken from a 2008 report by the Indian government's AIDS organisation – NACO (National AIDS Control Organisation).

While an outright cure or a preventive vaccine for HIV/ AIDS remains elusive, remarkable advances in HIV treatment have been achieved over the past two decades. Most significant among these advances is the development of highly active antiretroviral therapy (HAART). HAART is a combination of antiretroviral drugs that can fully suppress HIV replication and therefore renders the number of viral copies present in a patient's blood undetectable, as measured by commercially available plasma viral load assays.

In 1996, at the International AIDS Conference in Vancouver, two international clinical trials, INCAS1 and Merck 035,2 were presented demonstrating that HAART could drive plasma HIV viral load to undetectable levels on a sustained basis. Key evidence was also presented demonstrating that undetectable plasma HIV viral load was an independent predictor of disease free survival among untreated HIV infected individuals within the MACS cohort [4]. As a result, HAART emerged as the new standard of care for the treatment of HIV infection.

Within months HAART use significantly reduced morbidity and mortality among treated patients, allowing dramatic improvements in the quality and duration of life for HIV-infected individuals. In B.C., by 1999, (within three years of the establishment of the provincially funded HAART program) the BC Centre for Excellence in HIV/AIDS (BC-CfE) documented an 85% reduction in HIV/AIDS mortality among patients engaged in treatment.

HAART uptake today remains suboptimal, even in Canada despite the subsidized nature of our health programs. This is particularly apparent among hard to reach individuals who often have additional challenges related to drug dependency, mental illness, limited education, unstable housing and co-morbidities. Particularly affected are Aboriginal peoples who have greater risk of HIV infection and greater AIDS mortality than non-aboriginals in Canada [5, 6].

Material and methods

The present study got approval from the ethical committee of Government Medical College, Surat and even got permission of Gujarat State AIDS Control Society (GSACS), Ahmedabad. A predesigned and pretested questionnaire was used to collect data on mode of transmission

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and socio-demographic profile. Blood samples of these subjects were tested for HIV. The HIV-infected patients were all diagnosed as HIV reactive as per the NACO guidelines (2010). In the patients found HIV sero-positive even, CD4 count was calculated on FACS count, by flow cytometry method (Becton Dickinson) method from their blood samples.

Case definition for T group

Cases were defined as patients with both HIV sero-positive as well as having complaints of cough and fever for more than one week or in other words suffering from respiratory tract infections (RTI) at the time of sputum and data collection. One patient was included only once.

Case definition for C2 group

Cases were defined as patients with only HIV sero-positive as well as not having complaints of cough and fever for more than last three months or in other words not suffering from respiratory tract infections (RTI) at the time of sputum and data collection. One patient was included only once. This group had been primarily designed as a control group for predisposing factor of respiratory tract infections in HIV-infected group, which in this discussion becomes useless and both combined group will be mentioned as TC2 group in this research article.

Results

Distribution of genders in various groups was as per **Table – 1**. Distribution of patients according to their residential area was as per **Table – 2**. Socio-economic distribution in various groups was as per **Table – 3**. Mode of transmission of HIV in test and control groups C2 was as per **Table – 4**.

In this study hetero-sexual mode of transmission of HIV, was found in 773 (80.43%) patients of group T and 257 (81.68%) patients in the group C2. Second highest mode of transmission of HIV seen in this study, was vertical or placental mother to child transmission, observed in 101 (10.51%) and 29 (9.67 %) patients followed by blood transfusion mode of transmission observed in 46 (4.79 %) and 10 (3.33 %) patients, both seen from the group T and C2 respectively. **(Table - 5)** The lowest of mode transmission of HIV observed in this study was, intravenous drug user seen in 5 (0.52%) and 0 patients followed by probable unsafe injection seen in 10 (4.01%) and 1 (0.33%) patients, both observed from the group T and C2 respectively. **(Table - 5)**

Age group distribution in HIV+ve/ RTI+ve (T) group patients was as per **Table – 6**. Age group distribution in HIV+ve/ RTI-ve (C2) group patients was as per **Table – 7**. Marital status distribution in various groups was as per **Table – 8**.

Discussion

Though India is a very low HIV prevalence country, it has a large number of infected people. On the one hand, the HIV epidemic in India may be more “generalized” than the responses to the revised HIV estimate indicated given the weak social gradient of HIV according to household wealth among both men and women. On the other hand, the epidemic may be focused on socially disadvantaged groups who mainly suffer an educational disadvantage, regardless of gender. The complex nature of these results is similar to other studies. Some studies have found an inverse relationship between socioeconomic status and HIV in wealthy countries [7, 8, 9]. Other studies have illustrated a strong, positive relationship between socioeconomic status and HIV in sub-Saharan African countries [10, 11]. This study also suggests an independent influence of education on HIV status beyond any influence

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that household wealth may have on individual HIV status. Although India exhibited a relatively inconsistent relationship between household wealth and individual HIV status, the negative relationship between individual education and positive HIV status was stronger for both men and women [12].

Both behaviour and behaviour change are likely to be linked to educational level. Attendance at school may directly affect access to health services and exposure to health interventions [13], as well as the type and scope of contact with others. In the longer term, increased educational attainment may improve the ability to understand and act on health promotion messages [14]. However, the socio-economic and lifestyle changes that accompany increased schooling may be associated with behaviours that increase the risk of HIV infection [15]. It has been postulated that early in the epidemic HIV risk is linked to higher socio-economic status and travel, but that this pattern may dissolve as the epidemic spreads in a given population [16]. In the present study, prevalence was seen higher in illiterate individuals than educated, so extensive awareness and education towards the preventive measures of HIV is required urgently.

In China, the enrolment of full-time students (including kindergarten students) is over 245.98 million that constitutes 19.1% of the whole population of 1.28453 billion (2002). Among the enrolled students, over 103.68 million are in their adolescent stage. Adolescence is a critical stage when physical, psychological and social changes take place. Adolescents are curious about and want to have a try at everything including drug and sex. This kind of curiosity in a way increases the adolescents' vulnerability to HIV infection. Therefore, it is urgent and elemental to adolescents' school HIV/AIDS prevention education to help them develop a healthy life style. Children are the future of a country. To educate them on HIV/AIDS prevention is an efficient way to contain and control the spread of HIV/AIDS in China and in the world [17].

But in the present study 846 (67.08%) patients were found illiterate in the group of TC2 with 1261 total patients, means most of these patients who acquired HIV must not be aware of the HIV. So, we feel that education and awareness certainly help in our way towards achieving zero transmission of HIV at least in the area of our study. Therefore, it is urgent and elemental to adolescents' school HIV/AIDS prevention education to help them develop a healthy life style as started in China.

Some argue that poverty creates the conditions – limited access to education, employment, training – for risk-taking and high risk sexual activity, and, thus, increasing exposure to HIV [18]. Others argue that wealth is associated with HIV by enabling individuals to purchase sex and maintain multiple concurrent sexual partnerships which increase exposure to HIV [19]. The varying increased risk for positive HIV status by household wealth in India does not adhere solely to either of these theories. One reason for a weak wealth gradient may be that access to HIV prevention services does not depend on a household's ability to pay, for example, for free condom distribution. Furthermore, although increased wealth may improve access to healthcare facilities which offer services to help reduce HIV transmission, utilization is not guaranteed because agency may not be guaranteed. Thus, solely poverty reducing strategies [18], may not be the most effective intervention to reduce HIV prevalence in India. Similarly, the patterning of HIV status by education shown in this study (reduced risk associated with increased education) is confirmed by research in India [20], and in Africa [21], though contrasted by research in some

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developing countries [22]. People with greater education may have adopted risk-reduction behaviours more quickly than those with less education because the well educated were more exposed to health promotion messages or more empowered to negotiate protective behaviours with sexual partners [21, 22].

In the present study 486 (38.54%) patients belonged to very low socio-economic class, while 426 (33.78%) patients belonged to low socio-economic class in the group of TC2. Thus if both classes are merged together it was found that total 912 (72.32%) of the HIV patients belonged to average low socio-economic class.

The different demographic and behavioural patterning of HIV status between men and women suggests that groups differing on factors apart from just SES will be at high risk. Future studies should explore why age is important for men and not for women, and why multiple sexual indicators are predictive of a woman's HIV status, but not for men. These different patterns provide support for a generalized approach to HIV prevention so that all of the various groups at increased risk are likely to be reached by prevention programs. At the same time, if prevention interventions are targeted at a specific gender, taking into account age, marital status, and behavioural indicators may increase effectiveness because it may allow reaching out to certain groups of people beyond the typical “high risk” groups. Given these mixed results, India may want to be cautious in pursuing a solely “high risk” group strategy (referred to in the responses to the revised estimate) because it may not be the most effective way to combat HIV in India. However, the inverse relationship between education and HIV status should not be ignored as there is a clear relationship of increased risk for those with less education, presenting a different type of “high risk” group.

The epidemic continues to demand a serious and sustained national commitment [23]. The lack of a clear social gradient of HIV according to wealth may indicate a “generalized” epidemic in India. However, the evidence of an educational gradient implies that the lower educated represent a high risk group for targeted prevention efforts. Further, study of Jessica Perkin, et al. (2009) [12] had highlighted several types of high risk groups that represent people beyond those who are traditionally thought of as “high risk”, evidence which might be interpreted as supporting a picture of a more generalized epidemic than originally thought. Although the Indian Government's response to the country's HIV epidemic reflects a sincere, intensive, and long-term commitment to effective HIV prevention and care [24, 25], prevention efforts which ignore some evidence of a “generalized” epidemic of HIV, or ignore other types of “high risk” groups, may prove Among inadequate, at best, for national AIDS control policy in India.

HIV infected patients in present study, 18.27 % and 20% were singles in HIV-infected T and C2 group patients respectively, while in study of EJ Peters, et al. (2008) [26], found 53% singles in HIV-infected patients with RTI in Nigeria. They found 34% married HIV patients with RTI, while in the present study 59.73% and 59.67% such patients were found from group T and C2. Widows were seen only 8% in the study of E.J. Peters, et al. (2008) [26], while in the present study widows were seen 19.15% and 18.33% from HIV-infected T and C2 groups respectively.

Heterosexual contact was the commonest route of transmission with 85.67% (257/300) seen in our study in the HIV sero-positive control group C2. While in other HIV sero-positive group T, heterosexual transmission was found in 80.43% (773/961). The mean of both sero-positve group was 81.68% (1030/1261), all of which correlates

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well with other studies. Rate of heterosexual transmission were reported by NACO is 87.1% and Rangnathan, et al. (2004) [27] as well as Sangeeta Patel, et al. (2005) [28] both reported 95% heterosexual transmission in their studies.

In the present study 0.52% (5/961) injection drug use (IDU) mode was seen in only HIV sero-positive T group patients with RTI, while in other another sero-positive control group C2, not a single patients was found who got infected by IDU, which correlate with well with other studies which found IDU was a predisposing factor for respiratory tract infection in HIV patients, as in the present study HIV-infected patients without RTI, not a single patients found who acquired HIV by injection drug use.

In present study 33.86+3.1 years was found mean age of HIV sero-positive patients of C2 group, without RTI, and even in T group sero-positive patients with RTI also seen mean age 33.94+9.54 years. Our this findings resembles to findings of Hiroyuki Yoshimine, et al. (2001), who also found almost the same mean of age 33.2+9.8 years in HIV infected patients with RTI, and they found 37.2 + 21.2 years mean age in HIV-uninfected patients [29]. In present study 35.26+20.06 years mean age was detected in HIV-uninfected RTI patients, which mean RTI was found more prevalent in older age in HIV-uninfected patients than HIV patients. EJ Peter, et al. (2008) [26], also found almost same mean age of 34.6+1.2 years in their study in HIV patients with RTI in Nigeria also.

The global prevalence of HIV in the beginning years when compared with the today's HIV prevalence rate, it is very obvious that today's HIV prevalence rate is very low which was due to awareness, education and ART treatment. But still the global prevalence rate of HIV could have been lower down by planning and trying to achieve zero transmission of HIV.

Although men aged 20 years or more were associated with an increased risk of being HIV-positive as compared to 15–19 year old men, women showed no age gradient [12]. Marital status was not a strong predictor of HIV status among men as only divorced/separated men appeared to be at greater risk of being HIV-positive though this was not statistically significant. However, being a widowed or divorced/separated woman was associated with statistically significantly higher odds of being HIV-positive (OR 12.64, 95%CI 4.97–32.16 and OR 7.03, 95%CI 2.58–19.11, respectively). Men who were circumcised were statistically significantly less likely to be HIV-positive. Although the associated change in risk probability for the "risky" categories of the sexual behaviour/knowledge indicators was in the predicted direction among men, having a previous AIDS test was the only sexual behaviour/knowledge indicator that was statistically significantly associated with HIV status (OR 3.84, 95% CI 2.41–6.11), on average in the population after controlling for the other covariates. In contrast, among women who had more than one lifetime partner or had heard of AIDS, the odds of being HIV-positive were statistically significantly higher. Condom use at last time of sex was associated with reduced odds of being HIV-positive among women although this result bordered on statistical significance [12].

In the present study, the mean age for group T was found to be 33.94+9.4 years, with female's mean age was slightly lower which was 32.83 + 15.70 years, suggesting that girls were got infected by HIV at lower age then male, and became vulnerable to HIV as early as at the age of around sixteen years .The very much similar pattern had been observed in the group C2 too. The mean age for group C2 was found to be 33.86+3.1 years, with female 's mean age was slightly lower which was 32.49 + 16.44 years,

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suggesting that girls were got infected by HIV at lower age then male, and became vulnerable to HIV as early as at the age of around eighteen years.

HIV epidemic in India is less generalized than had been thought and that there are greater opportunities to control it [30]; HIV prevention efforts in India should concentrate on high risk groups such as commercial sex workers and their clients, men who have sex with men, mobile populations such as migrant labourers and truckers, people with other sexually transmitted infections, and injection-drug users [31]. These narrow interpretations of the revised HIV prevalence estimate may not, however, improve the effectiveness of HIV prevention efforts because the revised estimate does not necessarily imply a lack of a generalized epidemic.

In the present study the very much same results had been observed, about 827(65.74%) patients of group TC2 were belonged to this high risk group, means either they were drivers, migrant labourers from other districts or states and commercial sex worker's clients. Thus looking to this restricted pattern of distribution of HIV among society, it is evident that by screening of this high risk group and observing following ways of preventive measures, it should not be very difficult to eradicate HIV from our country, but there is a long way to go.

Ways towards achieving theoretical zero transmission

Antiretroviral treatment as prevention (TasP)

As per World Health Organization (WHO) suggestion, with the right prevention and interventions delivered within a human rights framework, HIV can be controlled and possibly even eliminated. WHO, UNAIDS and the United Nations General Assembly have called for 15 million people to be on ART by 2015. ART has considerable benefit, both as treatment and in preventing HIV and TB. Treatment as prevention (TasP) is a term used to describe HIV prevention methods that use ART in HIV-positive persons to decrease the chance of HIV transmission independent of CD4 cell count [32]. There is enough evidence to suggest that once you treat HIV infected patients, their ability to transmit the infection is minimized. The Rakai study from Uganda demonstrated that plasma viral load is the main predictor of heterosexual HIV transmission, and that transmission is rare when plasma viral load is < 1500 copies/ml [33].

Spanish study of serodiscordant couples showed no HIV transmission in the sexual partners of HAART-experienced patients, and that HAART was associated with a substantial reduction (80%) in HIV transmission [34]. Observational studies among diverse patient populations have provided data regarding the immune restorative effects of HAART as well as the role of HAART in decreasing HIV transmission to uninfected individuals. Donnel, et al. (2005) [35] in a prospective cohort analysis in African population showed that lower CD4 counts and higher viral loads are associated with increased transmission of HIV and provision of ART to HIV-1 infected patients could be an effective strategy to achieve population-level reductions in HIV-1 transmission6. The vertical transmission of HIV has been reduced to < 2% in developed countries due to HAART. It is certain that TasP needs to be considered as a key element of combination HIV prevention and as a major part of the solution to ending the HIV epidemic. In the short and medium term, while countries are concentrating their efforts on scaling up treatment according to the eligibility criteria recommended by WHO, it is expected that they will concurrently identify opportunities to maximize the use of ART for prevention purposes (TasP). The focus should be on specific

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populations in whom the prevention impact is expected to be greatest (e.g. serodiscordant couples, pregnant women, key populations). WHO is working with countries to address programmatic and operational challenges in order to derive the consolidated guidelines which are to be release (WHO Publications on HIV/AIDS: Mother-to-child transmission of HIV, 2014) [36].

Pre-exposure prophylaxis for HIV (PrEP)

PrEP refers to preventative treatment before exposure to an infectious agent i.e. HIV. It is not a new concept. It is similar to malaria prophylaxis commonly given for travellers who proceed to endemic areas. PrEP involves prevention of acquisition in HIV-negative persons. Pre-exposure prophylaxis, or the use of antiretroviral drugs by HIV negative people to prevent infection, is an emerging biomedical approach to HIV prevention. Several studies have been presented at scientific conferences including National and International AIDS conferences or reported in peer-reviewed journals, with somewhat differing results

Antiretroviral drugs for PrEP

Data suggesting that ARV prophylaxis may be effective as indicated by effectiveness of ARVs for prevention of parent to child transmission (PPTCT), post-exposure HIV prophylaxis in HCWs (needle-stick), monkey models for SHIV transmission with the available ARVs which are safe and which can be used once daily like - TDF (tenofovir disoproxil fumarate: Viread), – FTC: emtricitibine: Emtriva, – TDF/FTC: Truvada [37].

Ideal antiretroviral chemoprophylaxis should have a long half life, low toxicity, high tolerability, inexpensive, stable in heat and humidity, there should be no food requirements, safe in pregnancy, minimal drug interactions and should have highest barrier to resistance.

Various RCTs were carried out in different parts of the country. In West Africa Phase II PrEP Trial was carried out with daily TDF 300mg and placebo on women (n=936) in Ghana, Cameroon and Nigeria during June 2004 - March 2006with no evidence of increased clinical or laboratory adverse effects, no evidence of risk compensation, inadequate power to assess efficacy which included 8 HIV seroconversions: 2 TDF, 6 placebo (RR = 0.35, p=0.24) [38].

In US (CDC) also a clinical and behavioral safety trial of Tenofovir was conducted on 400 HIV-ve MSM (Atlanta, San Francisco and Boston) in two arms (immediate: Oral TDF vs. placebo, 1:1) and the study was completed in 2009 (Lynn Paxton, CDC personal communication). Preliminary analyses suggest no serious safety concerns and no increased risk in men taking a study pill, compared to those not taking a study pill during their first nine months of study participation.

These were randomized, double-blind, placebo-controlled and assessed safety and efficacy in preventing HIV infection. Similarly, various studies were carried out by CDC (CDC 4940, CDC 4370), NIH, BMGF (IPREX), USAID (CAPRISA 004), Bangkok Tenofovir Study (BTS), Botswana TDF-2 Study which showed the effectiveness of tenofovir (Tab and gel) with incidence rate ratio: 0.61 (CI: 0.4 to 0.94); p = 0.017. 39% lower HIV incidence in tenofovir gel group8. The iPrEx trial, a study of PrEP in men who have sex with men (MSM) and transgender women, found an overall 44% reduction in HIV infections for people taking tenofovir/emtricitabine (Truvada) compared to placebo. In people with detectable drug in their blood, a strong indicator of adherence, the efficacy was over 90% (IAS 2011: HIV PrEP Effective for Heterosexuals, Discordant Couples., 2014).

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Various studies were also carried out showing efficacy of intermittent PreP (IAVI) in Kenya and Uganda in 2009. Fixed doses of PrEP; either daily dosing or fixed Monday and Friday dosing (intermittent), had similar and relatively high adherence rates among the study populations. Regimens of one tablet of FTC/TDF, administered daily or intermittently also had good safety profiles. Intermittent dosing is feasible in important at-risk populations in Africa. However, post-coital adherence was low (In an oral presentation at the ASICON Conference on HIV Pathogenesis, Treatment and Prevention in Hyderabad). There are many issues to work out around the implementation and use of PrEP. All of the PrEP studies fully analyzed to date have found significant differences in efficacy based on treatment adherence. PrEP works for people who are able to take it regularly. Adherence education and support will be critical in any efforts to implement PrEP [38] and also there are various questions to be answered namely, who will use it? Who will pay for it? Will it get to the people who need it most? Can we afford to give antiretroviral drugs to HIV negative people when millions of HIV positive people worldwide do not have access to treatment? Looking at all these as well as interaction with HIV/AIDS experts and review of literature, PrEP can be possibly implemented in a closed and smaller population, where finance is not a problem but it still requires accurate RCTs to overcome benefits viz harms.

We now know that condoms, clean needles, male circumcision and prophylaxis to prevent mother-to-child transmission have worked well in preventing infection. It is known that PrEP works for men who have sex with men and transgender women, and there is conflicting but generally positive evidence of its effectiveness for heterosexuals. Vaginal and anal microbicides are another promising approach currently being studied. Having a diverse array of effective prevention options can go a long way to controlling and possibly halting the HIV/AIDS pandemic. While more research is needed to better understand the new approaches of PrEP and treatment as prevention, drug companies, policymakers, and communities affected by HIV must do even more work to meet the challenges presented by these recent advances and to maximize their impact. As UNAIDS Executive Director Michel Sidibe said at the IAS meeting, —We have to remember that history will judge us not by our scientific breakthroughs, but how we apply them [39, 40].

"Test and Treat" Policy

This policy advocates testing of individuals and treating all those who are positive so that it acts as prevention to others while controlling the infection in positive ones. Studies showed that early treatment, when compared to standard guidelines would lead to 0.75% reduction in death rates and 0.50% reduction in incidence of active TB [41, 42].

Increasing evidence suggests that insidious damage occurs during - asymptomatic HIV infection which underscores the potential benefit of ART. The prominence of non-AIDS events as a major cause of morbidity and mortality in those with ongoing HIV replication suggests that early ART initiation may further improve the quality and length of life for persons living with HIV [43].

Early initiation "CD4 > 500"?

Benefits are significant - 94% reduction in mortality, >70% reduction in hospitalization, ~ 70% reduction in TB, Minimizing the risk of non AIDS defining events and malignancies [44]. However a debatable issue with pros and cons. WHO now recommends starting of ART at CD4 count at 500.

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Weighing the options Prevention Viz Treatment
Prevention - Target audience is 1 billion. Various methods which include use of condom, circumcision, safe blood transfusion, etc. 2400 crore already spent to create awareness (88.6 % of HIV transmission has happened because of unprotected sex) Is this strategy really working?

Treatment- 2 million people are left untreated (~15% Tx rate). Patients on effective treatment can minimize the risk of transmission, we spent only ~ 120crore, could treatment to all be a possible way forward?, Door steps are opened but it will be the future research which will provide definitive findings.

In 1996, Brazil granted free universal access to antiretroviral therapy to all of its HIV-infected citizens, regardless of socioeconomic status, and rates of new HIV infections have since stabilized.[45] An ecological study from Taiwan provided evidence of the dramatic impact of HAART in curbing a regional epidemic and reported a 53% reduction in individuals testing positive for HIV following the availability of free access to HAART [46]. Granich, et al. published in Lancet a mathematical model which showed that universal HIV testing coupled with immediate HIV treatment and prevention strategies regardless of the disease stage could lead to elimination of the epidemic [47]. If we treat all infected patients, there is a chance of significant reduction in incidence, significant reduction of prevalence and probable elimination and hopefully eradication (In an oral presentation at the ASICON Conference on HIV Pathogenesis, Treatment and Prevention in Hyderabad)

Keeping in view of ABC policy (Abstinence, behavioural change, condoms) and all the updates on TasP, PrEP, PEP and Test and Treat policy, and the scenario of implementation of zero transmission of HIV, probably we will find answer with more intense research (RCTs) in near future.

Conclusion

HIV epidemic in India is less generalized than had been thought and that there are greater opportunities to control it. HIV prevention efforts in India should concentrate on high risk groups such as commercial sex workers and their clients, men who have sex with men, mobile populations such as migrant laborers and truckers, people with other sexually transmitted infections, and injection-drug users. The transmission of HIV can be prevented by awareness and education of even illiterate communities about ABC policy and with additional maximum and quick implementation of TasP, PrEP and PEP as and when required in the all ART Centres in our country.

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Table – 1: Distribution of genders in various groups.

Gender	HIV+VE/RTI+VE (T)		HIV+VE/RTI-VE (C2)		Total (T+C2)	
	(n)	%	(n)	%	(n)	%
Male	577	60.05	167	55.67	744	59.00
Female	383	39.85	133	44.33	516	40.91
TS*/TG*	01	00.10	0	0	01	0.07
Total	**961**	**100**	**300**	**100**	**1261**	100

*TS/TG= Trans sexual/Trans gender

Table - 2: Distribution of patients according to their residential area.

Resident area	HIV+VE/RTI+ve (T)		HIV+VE/RTI-ve (C2)		Total (T+C2)	
	(n)	%	(n)	%	(n)	%
Rural	823	85.64	203	67.67	**1026**	**81.36**
Urban	138	14.36	97	32.33	**235**	**18.64**
Total	**961**	**100**	**300**	**100**	**1261**	**100**

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Table - 3: Socio-economic distribution in various groups.

Economic Classes	HIV+VE/RTI+VE (T)		HIV+VE/RTI-VE (C2)		Total (TC2)	
	(n)	%	(n)	%	(n)	%
Very Low	397	41.31	89	29.67	486	38.54
Low	324	33.82	102	34.00	426	33.78
Middle Class	240	24.97	109	36.33	349	27.67
Total	**961**		**300**		**1261**	

Table - 4: Mode of transmission of HIV in test and control groups C2.

Mode of transmission	HIV+VE/RTI+VE (T)		HIV=VE/RTI-VE (C2)		Total (TC2)	
	(n)	%	(n)	%	(n)	%
Heterosexual	773	80.43	257	85.67	1030	81.68
Blood transfusion	46	04.79	10	03.33	56	04.44
Injection drug user (IDU)	05	0.52	00	00.00	05	0.40
Mother to Child	101	10.51	29	09.67	130	10.31
Men who have sex with men (MSM)	20	02.08	03	01.0	23	01.82
Probable Unsafe Injection	10	1.04	01	00.33	11	0.87
Unknown	04	00.42	00	00.00	04	0.31
Total	**961**		**300**		**1261**	

Table - 5: Literacy distribution in various groups.

Education category	HIV+VE/RTI+VE (T)		HIV+VE/RTI-VE (C2)		Total (TC2)	
	(n)	%	(n)	%	(n)	%
Illiterate	64 7	67.32	199	66.33	846	67.08
Primary School	186	19.35	62	20.67	248	19.67
Secondary School	87	9.05	25	8.33	112	8.88
College	41	4.27	14	4.66	55	4.36
Total	**961**	**100**	**300**	**100**	**1261**	**100**

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Table - 6: Age group distribution in HIV+ve/ RTI+ve (T) group patients.

Mean age (Years)	Male (T)		Female (T)		Total (T)	
	34.64±9.68 years		32.83±15.70 years		33.94±9.54 years	
Age groups	(n)	%	(n)	%	(n)	%
0-14	52	9.01	33	8.61	85	8.8
15-24	50	8.67	47	12.27	97	10.1
25-34	159	27.56	128	33.42	287	29.87
35-44	185	32.06	110	28.72	295	30.70
45-54	87	15.08	45	11.75	132	13.74
55-64	35	06.07	13	03.39	48	04.99
65-74	8	01.38	6	01.57	14	01.46
75-84	1	00.17	1	00.26	2	00.20
Total	**577**		**383**		**960***	

***=1 TG/TS in T Group**

Table - 7: Age group distribution in HIV+ve/ RTI-ve (C2) group patients.

Mean age	Male (C2)		Female (C2)		Total (C2)	
	34.95±7.86 years		32.49±16.44 years		33.86±3.1 years	
Age groups	(n)	%	(n)	%	(n)	%
0-14 years	12	07.19	9	06.77	21	07.00
15-24 years	18	10.78	15	11.28	33	11.00
25-34 years	49	29.34	41	30.83	90	30.00
35-44 years	54	32.33	37	27.81	91	30.33
45-54 years	28	16.77	21	15.79	49	16.33
55-64 years	4	02.39	8	06.02	12	04.00
65-74 years	2	1.19	1	0.75	3	01.00
75-84 years	0	0	1	0.75	1	0.33
Total	**167**		**133**		**300**	

Table - 8: Marital status distribution in various groups.

Marital status	HIV+VE/RTI+VE (T)		HIV=VE/RTI-VE (C2)		HIV +VE (TC2)	
	(n)	%	(n)	%	(n)	%
Singles	180	18.73	60	20	240	19.03
Married	574	59.73	179	59.67	753	59.72
2nd marriage	10	1.04	3	1	13	1.03
Divorcee	13	1.35	3	1	14	1.11
Widowed	184	19.15	55	18.33	239	18.95
Total	**961**	**100**	**300**	**100**	**1261**	**100**