

Understanding HIV epidemic in India: analyses of the HIV program data

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Abstract. We describe the current status of the human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) epidemic among adults in India. Analyses of data relating to HIV positive persons aged 15 to 49 years as reported to the national HIV/AIDS Reporting System from the major states provide trends in HIV prevalence based on sentinel surveillance from 2004 through 2008. Analyses reveal that the number of HIV positive pregnant women had increased from 8991 in 2005 to 20027 in 2008. Five states (Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka and Gujarat) contributed 17097 (85%) of 20027 positive pregnant women identified in the same year. Seropositivity among general clients and pregnant women has declined from 11.55% to 5.33% and 0.77% to 0.43% from year 2005 to 2008, respectively. Five states of the southern and western region account for more than three-fourths of the volume of HIV infected persons. Government of India's policy of categorizing districts and states based on prevalence and other program data appears justified. Study reveals success of NACP III in combating the HIV epidemic which is reflection of comprehensive evidence based planning which gives judicious focus on prevention but at the same time does not ignore care and treatment.

Key words: HIV/AIDS, epidemiology, sero-positivity, prevalence, India

1. Introduction

The human immunodeficiency virus (HIV) epidemic in India has been described as 'highly heterogeneous' as there is wide variation between states and sub-population within the states. The HIV epidemic is more severe in the southern parts and the far north-east of the country. As per the recent estimates using the internationally comparable Workbook method¹ and using multiple data sources, namely the expanded sentinel surveillance system, National Family Health Survey-III and the Integrated Biological Behavioral Assessment and Behavioral Surveillance Survey, there are estimated 2.31 million (1.8 – 2.9 million) people living with HIV/AIDS (PLHIV) at the end of 2007(1). The estimated adult prevalence in the country is 0.34% (0.25%-0.43%) and it is greater among males (0.44%) than among females (0.23%).

Though prevalence rate of HIV is low, India being a populous country ranks third in terms of number of HIV positive persons behind South Africa and Nigeria (1,2). More than 90 percent of these infections in India, as in other countries of Asia, have acquired the virus through one of the following three routes: heterosexual contacts, transmission in MSM groups and intravenous drug use (3). Over the past decade, there has been a shift in the number of infections between men and women with infection rates increasing among women in most parts of the country (2). The National Family Health Survey, conducted between 2005-06 found the rate among men (0.36%) to be considerably higher than that among women (0.22%) (4). Evidence suggests that in addition to addressing high prevalence groups, more attention is needed for people perceived to be at low risk, such as married women, as HIV infection spreads amongst the general population (5).

As the HIV epidemic in India is still concentrated among the high risk populations, response under the National AIDS Control Program during Phase-III (2007-2012) (6) has

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Table 1. Distribution of ICTCs by State in India, 2008-09

S.No.	State	Projected population, 2009	Number of districts	Number of districts with ICTCs	Number of ICTCs*	Number of ICTCs per million population
1	Andhra Pradesh	83178000	23	23	968	12
2	Assam	29814000	27	23	84	3
3	Bihar	95026000	37	37	210	2
4	Chandigarh	1297000	1	1	10	8
5	Chhatisgarh	23600000	16	16	81	3
6	Delhi	17437000	9	9	98	6
7	Goa	1655000	2	2	14	8
8	Gujarat	57434000	26	26	424	7
9	Haryana	24597000	20	19	83	3
10	Himachal Pradesh	6662000	12	12	45	7
11	Jammu & Kashmir	11414000	22	15	22	2
12	Jharkhand	30611000	22	22	56	2
13	Karnataka	58181000	27	27	1047	18
14	Kerala	34063000	14	14	138	4
15	Madhya Pradesh	69897000	50	45	133	2
16	Maharashtra	109553000	36	35	1162	11
17	Manipur	2393000	9	9	53	22
18	Meghalaya	2560000	7	7	12	5
19	Mizoram	981000	8	8	34	35
20	Nagaland	2197000	11	11	67	30
21	Orissa	40025000	30	30	181	5
22	Pondicherry	1267000	4	4	7	6
23	Punjab	27048000	20	20	91	3
24	Rajasthan	65650000	33	30	182	3
25	Tamil Nadu	66566000	31	31	847	13
26	Tripura	3532000	4	4	14	4
27	Uttar Pradesh	193763000	70	70	256	1
28	Uttaranchal	9656000	13	13	47	5
29	West Bengal	87839000	19	19	142	2
All states		1157896000	603	582	6508	6

*65 ICTCs in Union Territories and Low Population states not included

focused on controlling HIV in these populations. However, emphasis on one or more high risk populations may leave other populations under-protected or unprepared for the risk and the consequences of HIV infection. In particular, attention to women's risks of exposure to HIV and needs for care may not receive sufficient attention as long as the perception persists that the epidemic is predominantly among young males. Without more knowledge of the epidemic

among women, policy makers and planners cannot ensure that programs will also serve women's needs. Except for a few local or regional studies, the patterns, distribution and determinants of HIV throughout the country remain largely undocumented (7-9). Therefore an attempt has been made to describe the current status of the human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) epidemic in India and trace the

Table 2. Number of ICTC attendees tested and detected for HIV in India, 2005-2008

Indicator	2005	2006	2007	2008
General Clients tested for HIV	1142770	1835604	3252794	4936796
Pregnant women tested for HIV	1143321	1941639	2986417	4616138
Total No. of persons tested for HIV	2286091	3777243	6239211	9552934
HIV Positive General Clients	131966	183867	250334	263257
HIV Positive Pregnant women	8991	16960	20244	20027
Total No. of HIV Positive persons	140957	200827	270578	283284

Table 3. State-wise distribution of HIV positive persons detected among ICTC general attendees in India, 2005-08

State	2005		2006		2007		2008	
	Tested	HIV+ve	Tested	HIV+ve	Tested	HIV+ve	Tested	HIV+ve
Maharashtra	170567	24393	259360	34145	294117	38119	756105	63830
Andhra Pradesh	275446	46118	465108	62949	910933	92738	547702	62341
Tamil Nadu	58712	11523	315448	24452	789049	37506	1690180	34210
Karnataka	70422	15108	71072	10987	83288	16296	326567	32762
Gujarat	74881	7185	108334	12043	86162	12162	232674	14571
Uttar Pradesh	29877	3007	35987	4252	97086	8225	169736	6690
Rajasthan	19639	2330	30399	3572	65611	5005	95820	6519
Delhi	78005	3239	122172	4751	125898	6152	159349	6283
Bihar	191024	2386	102354	3673	142736	5122	132689	5695
West Bengal	22029	2608	38796	3631	58597	3900	110464	5088
Punjab	8128	844	19326	1540	49041	4051	89739	4535
Madhya Pradesh	12904	1728	22930	1960	50812	2191	52193	2846
Kerala	9287	1748	27843	2447	55393	2248	81629	2592
Haryana	14508	963	25493	1697	63192	2508	91834	2524
Orissa	15779	1185	37853	2038	111856	2850	58934	1768
Jharkhand	2378	287	4413	594	11195	1042	32676	1673
Chandigarh	10174	1007	8366	970	9402	822	17366	1239
Manipur	10889	2510	30220	2740	28224	3097	10193	1157
Nagaland	11042	757	20876	1038	29168	810	35948	1081
Goa	7783	688	11023	940	11751	967	15291	953
Mizoram	6103	367	7621	393	12441	483	17597	721
Assam	6049	303	12448	489	33365	472	47728	695
Other states	37144	1682	58162	2566	133477	3568	164382	3484
Total	1142770	131966	1835604	183867	3252794	250334	4936796	263257

epidemic over time and geography. This analysis will identify the lacunae in the existing knowledge and suggest directions for potential

research priorities in the adult population, particularly among women in India.

Table 4. State-wise distribution of HIV positive pregnant women detected among ICTC attendees in India, 2005-08

State	2005		2006		2007		2008	
	Tested	HIV+	Tested	HIV+	Tested	HIV+	Tested	HIV+
Andhra Pradesh	99757	2075	392030	5535	625886	7243	568005	5274
Maharashtra	194305	2938	402908	4756	427971	3275	873291	4417
Tamil Nadu	660800	2964	610838	2413	913072	2575	1020573	3534
Karnataka	NA	NA	110416	2185	218254	4452	417875	3124
Gujarat	28092	200	60088	333	84526	499	245507	748
West Bengal	71846	147	108722	184	123130	229	243061	278
Delhi	32330	68	49812	103	68382	152	130831	272
Manipur	8468	173	22865	303	35257	473	23534	256
Kerala	17579	62	49535	106	50564	89	98438	232
Rajasthan	2583	25	11911	36	62431	136	153997	221
Uttar Pradesh	832	9	3186	60	81573	178	189459	204
Bihar	13962	81	45512	382	57825	171	101367	198
Nagaland	6380	106	8225	161	11676	104	14163	168
Orissa	478	8	16025	47	54389	95	67179	166
Punjab	4538	5	7295	14	11487	34	61477	165
Mizoram	682	6	3934	45	6982	50	13184	131
Madhya Pradesh	2373	24	3050	28	10647	43	68017	96
Goa	3300	39	7422	70	12940	77	10939	80
Haryana	1212	9	16829	50	37234	120	67772	79
Jharkhand	NA	NA	125	1	1531	4	23474	77
Assam	1826	8	3970	18	24935	28	82201	62
Chandigarh	20358	30	20088	59	18114	57	21906	62
Other states	3224	14	25863	71	47611	160	119888	183
Total	1174925	8991	1980649	16960	2986417	20244	4616138	20027

NA=Data not available

2. Material and methods

In a country with a generalized epidemic, the national estimate of HIV prevalence is mainly based on surveys of pregnant women attending antenatal clinics. In countries or regions where antenatal clinics are well-attended, HIV related

data provide a good basis for comparisons and are also reliable indicators of trends of HIV prevalence. In the present study, data from Integrated Counseling and Testing Centers (ICTC) were extracted from the Computerized Management Information System (CMIS) (10) at National AIDS Control Organization for the period of 2005-2008. From 2006 onwards,

voluntary counseling and testing for general clients and pregnant women were integrated under one roof and facilities were called Integrated Counseling and Testing Centers (ICTC). The number of such facilities has increased from 1476 in 2005 to 4817 in 2008. Data was analyzed separately for general clients and pregnant women. General clients included both voluntary clients and provider initiative referrals. For trend analyses of sero-positivity, data from consistent ICTC sites has been included. In addition, we also examined data from HIV Sentinel Surveillance (HSS) 1, National Family Health Survey (2005-06) and other population based surveys (11).

Analysis was done using SPSS 15.0 (SPSS, Inc., Chicago, IL, USA). A p-value <0.05 was considered significant.

3. Results

3.1. Distribution of ICTCs by states

The distribution of ICTCs and ICTCs per million populations is given in the Table 1. There are 6 ICTCs per million populations in the country; however the range between states varies from 1 to 35 ICTCs per million populations. It is observed that more number of ICTCs were set-up per million population in high prevalence states like Andhra Pradesh (12), Karnataka (18), Maharashtra (11), Tamil Nadu (13). The number of ICTCs per million populations was even higher in 3 states of northeastern regions (Manipur-22, Nagaland-30, Mizoram-35) which are hilly in terrain and moderate to high in HIV prevalence.

In the remaining low-prevalence states, the number was in single digits (1 to 8).

3.2. HIV positives detected at Counseling and Testing Centers

Table 2 provides the number of individuals who attended ICTC centers and those detected HIV positive in India. It is clear that the number of clients counseled and tested for HIV and those detected HIV positive have steadily increased. The number of general clients tested for HIV has increased from 1.14 million in 2005 to 4.93 million in 2008. Similarly, the number of pregnant women tested rose from 1.14 million in 2005 to 4.61 million in 2008. In terms of yield, the number of general clients detected positive for HIV increased from 131966 in 2005 to 263257 in 2008. Likewise, the number of pregnant women detected HIV positive increased from 8991 in 2005 to 20027 in 2008.

Tables 3 & 4 depict state-wise distributions of persons attending ICTCs and those detected HIV positive. The majority of the states have shown scale-up in numbers of persons tested and numbers detected HIV positive. Five states, namely Maharashtra, Andhra Pradesh, Tamil Nadu, Karnataka and Gujarat, contributed 207714 (79%) out of 263257 HIV positive persons detected during 2008. Similarly these states accounted for 17097 (85%) of 20027 positive pregnant women identified in the same year. These observations show the heterogeneity distribution of HIV in India.

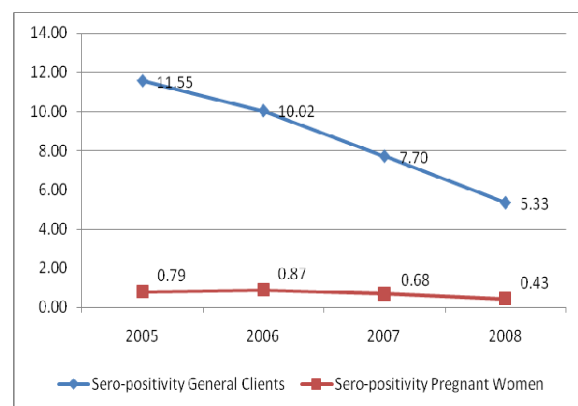


Fig. 1. HIV Sero-positivity amongst General Clients and Pregnant Women attending ICTCs in India, 2005-2008.

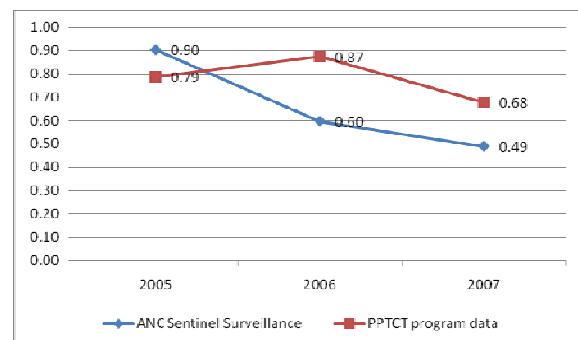


Fig. 2. HIV seropositivity among pregnant women based on Sentinel Surveillance and PPTCT program data, 2005-08.

3.3. Estimated HIV prevalence

Fig 1 portrays the HIV sero-positivity amongst the ICTCs attendees in India. It illustrates that sero-positivity among general clients has declined from 11.55% in year 2005 to 5.33% in the year 2008, which is a statistically significant trend ($0 < 0.05$). Sero-positivity among pregnant women

has also declined from 0.79% in the year 2005 to 0.43% in the year 2008.

As the number of antenatal attendees opting for HIV testing was very large, an attempt was made to compare sero-prevalence among antenatal attendees as a marker for prevalence of HIV as estimated using Sentinel Surveillance data. Fig 2 depicts the comparison of HIV seropositivity among antenatal women based on ANC Sentinel

Surveillance and PPTCT program data. While both data sets show gradual reduction in sero-prevalence over the years (2005-2007), the difference in prevalence based on two data sets is not statistically significant ($p>0.05$). Reduction in prevalence from 2005 to 2007 is statistically significant using both the data sets and therefore consistent ($p<0.05$).

Table 5. HIV Sero-prevalence among pregnant women of selected states based on Sentinel Surveillance and PPTCT data, 2005-2008

State	Source of Data	2005	2006	2007	2008 [#]
Andhra Pradesh	ANC-Surveillance	1.75	1.26	1.00	
	PPTCT data	2.08	1.41	1.16	0.93
Maharashtra	ANC-Surveillance	1.00	0.75	0.50	
	PPTCT data	1.51	1.18	0.77	0.51
Tamil Nadu	ANC-Surveillance	0.50	0.25	0.25	
	PPTCT data	0.45	0.40	0.28	0.35
Karnataka*	ANC-Surveillance	1.00	1.00	0.50	
	PPTCT data	NA	1.98	2.04	0.75
Gujarat*	ANC-Surveillance	0.25	0.50	0.25	
	PPTCT data	0.71	0.55	0.59	0.30
Goa*	ANC-Surveillance	0.00	0.50	0.13	
	PPTCT data	1.18	0.94	0.60	0.73
Haryana*	ANC-Surveillance	0.13	0.13	0.00	
	PPTCT data	0.74	0.30	0.32	0.12
Kerala*	ANC-Surveillance	0.25	0.13	0.38	
	PPTCT data	0.35	0.21	0.18	0.24
Madhya Pradesh*	ANC-Surveillance	0.25	0.00	0.00	
	PPTCT data	1.01	0.92	0.40	0.14
Manipur	ANC-Surveillance	1.00	1.25	0.75	
	PPTCT data	2.04	1.33	1.34	1.09
Nagaland*	ANC-Surveillance	1.50	0.93	0.60	
	PPTCT data	1.66	1.96	0.89	1.19
Mizoram*	ANC-Surveillance	0.88	1.00	0.75	
	PPTCT data	0.88	1.14	0.72	0.99

NA: Data not available

* $p<0.05$

[#] Sentinel Surveillance data for 2008 is not available.

Table 5 depicts HIV seropositivity among pregnant women of selected states based on ANC surveillance and Prevention of Parent to Child Transmission (PPTCT) data since 2005. It was observed that seroprevalence from two sources of data was not statistically significant for Andhra Pradesh, Maharashtra, Tamil Nadu and Mizoram

whereas in remaining states the differences were significant.

4. Discussion

There has been improvement in management and use of data under National AIDS Control Program Phase-III (NACP-III)⁶ in India that was launched in 2007 for a period of five years.

NACP-III plan envisaged developing a computerized Strategic Information Management System (SIMS). Standard monitoring indicators, reporting formats and output reports were developed systematically. As surveys and sentinel surveillance are expensive means to collect and compile information and yet have limitations, it was planned that on a long term basis, SIMS will be useful to provide information that will help in evidence based planning, monitoring and evaluation of various interventions and track the epidemic.

Based on information from SIMS, the number of general clients and pregnant women attending ICTC centers has increased over the years. During 2008, nearly 10 million persons had undergone an HIV test. Such a large data base, as compared to Sentinel Surveillance data, can provide information on sero-prevalence, geographical distribution of HIV positive persons and over time, provide information on trends. An increase in diagnoses might not mean that more people are becoming infected with HIV than in previous years - it might mean, instead, that HIV testing has become easily available in recent years. Stigma linked to HIV/AIDS has gradually declined and more people are more willing to be tested (12). In this study, analysis of program data has been attempted to assess geographical spread, magnitude and trends of HIV infection in India. Program data give clear picture in terms of persons detected HIV positive. However, it does not give community based prevalence as many people living with HIV, knowingly or otherwise, have never taken an HIV test. As evident from this study, HIV infection is not uniformly prevalent in the country. Five states of the southern and western region account for more than three-fourths of the volume of HIV infected persons. Government of India's policy of categorizing districts and states based on prevalence and other program data is therefore justified. Resources and program inputs should therefore be allocated based on prevalence and volume of HIV infected persons.

Consistency of trends in prevalence based on program data and sentinel surveillance data is an indication that utility of program data cannot be under-estimated. As the program data reflect "actual volume" rather than "estimates" and gives information about details of information about the persons infected, it gives confidence to program managers to efficiently and effectively invest limited resources.

There is evidence that HIV epidemic is stabilizing in India and in fact declining in some

states like Tamil Nadu (5). This may be due to comprehensive evidence based planning which gives judicious focus on prevention but at the same time does not ignore care and treatment. Although the Government of India's response to the country's HIV epidemic reflects an intensive, and long-term commitment to effective HIV prevention and care, prevention efforts which ignore some evidence of a "generalized" epidemic of HIV, or ignore other types of "high risk" groups, may prove inadequate, at best, for national AIDS control policy in India (13). This information is very important not only to understand the actual distribution of HIV infected persons in the country but also help in upscaling of prevention of mother to child program and upscaling of antiretroviral treatment.

Although the rate of HIV infection in India is low and differs from Africa's HIV trajectory, it has been documented that the epidemic continues to demand a serious and sustained national commitment (14).

Program data will be reflecting better estimates of HIV when acceptance of antenatal services and HIV testing is high. However, there are some limitations to this study which are obvious while using program data. There may be some degree of duplication as currently program data do not give unique ID number to individuals. Secondly, the analysis is based on the HIV positive individuals accessing health care services and thus may not be fully representative of the community. Therefore, representativeness of the population may be questionable particularly when the proportion of pregnant women who seek antenatal care and those accepting HIV testing is low. However, when carefully analyzed within limitations, the information can be of immense use. It is also not evident from program data about time when the persons became infected as the test may have been conducted many years after the infection occurred. But that is true even for sentinel surveillance data. It would be ideal to compare program data with Surveillance data from consistent sites for robust results. However, as both Sentinel sites as well as ICTCs were rapidly scaled-up, comparison of both sets of data from consistent sites could not be undertaken in the present study.

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