Introduction

Globally, 36.9 (31.1–43.9) million people were estimated to be living with HIV in 2017. This is an increase from previous years and is thought to be because more people are currently receiving the life-saving antiretroviral therapy (ART). There were 1.8 (1.4–2.4) million new cases of HIV infection globally each year, showing a 47% decline from the 3.4 (3.1–3.7) million in 1996.\(^1\) India has been categorized as a nation with a low prevalence of HIV with seroprevalence rates of less than 1%,\(^2\) and the adult HIV incidence has decreased by more than 50% from 2001 to 2013. The current prevalence of HIV among antenatal women in the country is 0.35%, which also shows a declining trend.\(^2\)

The first case of immunodeficiency virus in India was reported in Chennai in 1986.\(^3\) In 1987, the National AIDS Control Programme (NACP) was launched under the Ministry of Health and Family Welfare, Government of India, to coordinate national responses to the spread of infection. Its activities included surveillance, blood screening, and health education for HIV. To prevent mother-to-child transmission (MTCT) of HIV, the most important source of HIV in children less than 15 years of age, the Prevention of Parent-To-Child Transmission (PPTCT) program was launched under the NACP in 2002. PPTCT is the largest national antenatal screening program in the world.\(^4\)

The NACO Technical Estimate Report (2015) estimated that 35,255 of 29 million annual pregnancies in India occur in HIV-positive women. In the absence of any intervention, an estimated (2015) 10,361 infected babies will be born annually. The PPTCT program aims to prevent the perinatal transmission of HIV from the HIV-infected mother to her newborn baby. The program entails counseling, testing, and treatment of pregnant women.

In India, the diagnosis and treatment of HIV is largely concentrated in areas with high HIV prevalence; Tamil Nadu is one of these states. However, the seroprevalence rate in Tamil Nadu, which was 1.6% among antenatal women in 2001, has come down to 0.5% in 2005.\(^5\)

Background: India, with its large number of migrant workers, had a large number of people affected by HIV. This included antenatal women who are a vulnerable population. The Government of India along with nongovernmental organizations worked on a large number of programs to screen and decrease mother-to-child transmission. This in turn has brought down the prevalence of HIV.

Materials and Methods: Retrospective analysis of data from the block being provided with healthcare was carried out over a period of 14 years from January 2002 to December 2016. Results: The observed HIV prevalence was 5.9 per 1000 in 2002 and showed a declining trend to 1.2 per 1000 in 2016. Conclusion: Consistent work at health education and preventive methods has helped bring down the prevalence of HIV over the years.

Keywords: Community, HIV, South India

Abstract

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Prevention of HIV in India has been based on the assumption that the principal drivers of the epidemic are individuals in high-risk groups, such as commercial sex workers and men who have sex with men. \[^{6}\] Though targeting these high-risk groups has remarkably lowered the prevalence of HIV, it is uncertain whether these methods can be used in rural populations where these high-risk groups form a minority. Therefore, other strategies to lower HIV prevalence in rural populations are necessary.

Direct measurement of HIV incidence involves following up a seronegative population with repeated HIV tests, which is tedious. Therefore, an indirect estimation of the prevalence can be made from a population of people who may have recently been exposed, such as antenatal mothers. The aim of this study was to measure the prevalence of HIV among antenatal mothers and its change over a period of 14 years.

**Materials and Methods**

This study is a retrospective, cross-sectional study. It was approved by the Institutional Review Board of Christian Medical College. The data included and analyzed in this study were collected from the PPTCT program as conducted in the Kaniyambadi block (population, 108,000) between January 2002 and December 2016 by the Department of Community Health, Christian Medical College.

Pregnant women identified by the health workers were registered and encouraged to visit the mobile clinics for antenatal care. Once they are registered, blood was collected for routine investigations including HIV and HBsAg and antenatal care was given by our mobile health teams, led by a doctor, which visited each village at least once a month. A few antenatal women did not register with us.

All women were offered screening for HIV under the PPTCT program, and an opt-out procedure was followed. HIV testing was performed according to World Health Organization (WHO) recommendations. \[^{7}\] First, a rapid test was performed. If it was positive, the sample was retested. If both the tests were positive, both the patient and her husband were called to the base hospital. Detailed pretest counseling was done and blood was drawn for repeat rapid test and Western blot. If the rapid test was positive, the sample was sent to the Department of Virology, Christian Medical College, Vellore, for confirmation with Western blot.

**Results**

During the study period, 32,088 pregnancies were registered for antenatal care in the peripheral clinics. A total of 29,985 antenatal women were tested for HIV, whereas 2103 women received antenatal care from other healthcare providers. Of all the samples tested, 55 (0.18%) tested positive for HIV. The observed HIV prevalence which was 5.9 per 1000 in 2002 had declined to 1.2 per 1000 in 2016. No women tested positive for HIV between 2012 and 2015 [Table 1]. The data analyzed are presented in 5-year blocks in Table 2 to remove the fluctuation in annual rates caused by the small numbers of HIV-positive women detected each year [Figure 1].

A declining trend in HIV prevalence was also seen in the hospital setting where a total of 37,244 pregnant women were tested. The prevalence of HIV which was 3.7 per 1000 women in 2004 had declined to 0.31 per 1000 women in 2016 [Table 3].

**Table 1: HIV prevalence in Kaniyambadi block**

| Year | No. positive | No. screened | Prevalence | 95% CI Lower | 95% CI Upper |
|------|--------------|--------------|------------|--------------|--------------|
| 2002 | 9            | 1514         | 0.594      | 0.207        | 0.9817       |
| 2003 | 7            | 2089         | 0.335      | 0.087        | 0.5829       |
| 2004 | 7            | 2510         | 0.303      | 0.079        | 0.5272       |
| 2005 | 2            | 2068         | 0.097      | 0            | 0.2307       |
| 2006 | 5*           | 2127         | 0.235      | 0.029        | 0.4409       |
| 2007 | 8*           | 2196         | 0.364      | 0.112        | 0.6163       |
| 2008 | 4*           | 2038         | 0.196      | 0.004        | 0.3884       |
| 2009 | 4            | 2152         | 0.186      | 0.004        | 0.3679       |
| 2010 | 3*           | 2012         | 0.149      | 0            | 0.3177       |
| 2011 | 4*           | 2210         | 0.181      | 0.004        | 0.3582       |
| 2012 | 0            | 2035         | 0          | 0            | 0.147        |
| 2013 | 0            | 2007         | 0          | 0            | 0.147        |
| 2014 | 0            | 1766         | 0          | 0            | 0.17         |
| 2015 | 0            | 1840         | 0          | 0            | 0.163        |
| 2016 | 2            | 1621         | 0.123      | 0            | 0.2944       |

*Includes patients who have been tested more than one time in subsequent pregnancies. CI: Confidence interval

**Table 2: HIV prevalence in 5-year blocks in Kaniyambadi**

| Year          | No. positive | No. screened | Prevalence | 95% CI Lower | 95% CI Upper |
|---------------|--------------|--------------|------------|--------------|--------------|
| 2002-2006     | 30           | 10108        | 0.3        | 0.191        | 0.403        |
| 2007-2011     | 23           | 10608        | 0.22       | 0.128        | 0.305        |
| 2012-2016     | 2            | 9269         | 0.02       | 0            | 0.051        |

CI: Confidence interval

**Table 3: Prevalence of HIV in pregnant women attending the hospital**

| Year          | Positive | Tested | Prevalence | 95% CI Lower | 95% CI Upper |
|---------------|----------|--------|------------|--------------|--------------|
| 2004          | 6        | 1623   | 0.37       | 0.0744       | 0.665        |
| 2005          | 5        | 2186   | 0.229      | 0.028        | 0.429        |
| 2006          | 7        | 2271   | 0.308      | 0.08         | 0.536        |
| 2007          | 3        | 2752   | 0.109      | 0            | 0.232        |
| 2008          | 5        | 2982   | 0.168      | 0.021        | 0.315        |
| 2009          | 3        | 3207   | 0.094      | 0            | 0.199        |
| 2010          | 3        | 3056   | 0.098      | 0            | 0.209        |
| 2011          | 3        | 3293   | 0.091      | 0            | 0.194        |
| 2012          | 7        | 3140   | 0.223      | 0.058        | 0.388        |
| 2013          | 1        | 3063   | 0.033      | 0            | 0.097        |
| 2014          | 2        | 3259   | 0.061      | 0            | 0.146        |
| 2015          | 2        | 3134   | 0.064      | 0            | 0.152        |
| 2016          | 1        | 3278   | 0.031      | 0            | 0.09         |

CI: Confidence interval
A declining trend was seen in both primi- and multigravid women [Table 4].

**Discussion**

India, being a country with poor socioeconomic development and a large number of migrant workers, seems to have a rise in HIV epidemic.[8] A large number of programs have been used by the Government of India to screen for HIV and to prevent MTCT of HIV.

The prevalence of HIV in Tamil Nadu and other southern states of India seems to be declining. This is in contrast to earlier studies where the prevalence was found to be higher in Tamil Nadu than expected, involving even populations that were not at high risk.[9] The prevalence of HIV in the community was found to range from 1.8% to 7.4% in earlier studies.[9,10] Various studies have reported a decline in HIV prevalence across the country,[11,12] whereas other studies have reported an increasing trend, such as the study by Gupta et al. that reports an increase from 0.7% in 2003–2004 to 0.9% in 2005–2006.[13] Our study showed a declining trend in HIV prevalence among pregnant women.

The decline in HIV prevalence could be attributed to the various interventions done by the Department of Community Health of CMC, Vellore, which might have decreased the rates of transmission in the community. A few such interventions are as follows: barbers were educated on the need to use disposable blades in their practice and were given certificates of their compliance for displaying to their clientele; traditional dais were introduced to sterile techniques of conducting deliveries and to the use of disposable needles and syringes; newly married couples were counseled about safe sex practices and the use of condoms; school children were educated about HIV, modes of its spread, and safe sex practices; and health education was conducted among the masses about HIV and the prevention of its spread. In addition, programs to screen for sexually transmitted diseases were conducted among women in the reproductive age group.

What primary care physicians need to know is that the Government of India has a well-structured approach to controlling HIV in India. Screening of antenatal women is essential in preventing the MTCT which can occur. Health teaching to both the woman and her husband on safe sex practices is also essential in keeping the prevalence of HIV low. Primary care physicians, being the first contact point of the patient with the health system, play an important role in the education of women and their families.

The Government of India is committed to eliminating new HIV among children. Based on the new WHO guidelines, NACO will provide lifelong ART to all pregnant and breastfeeding women regardless of their CD4 count and the clinical stage of their disease.

![Graph showing the decline in HIV prevalence over the years](image)

**Table 4: Prevalence of HIV among primi- and multigravid women**

| Year | Positive | Total   | Prevalence (95% CI)  |
|------|----------|---------|----------------------|
|      |          |         |                      |
| Primi|          |         |                      |
| 2003 | 2        | 852     | 0.235 (0.000, 0.560) |
| 2004 | 5        | 1008    | 0.496 (0.000, 0.930) |
| 2005 | 2        | 926     | 0.216 (0.000, 0.515) |
| 2006 | 2        | 958     | 0.209 (0.000, 0.498) |
| 2007 | 5        | 1018    | 0.491 (0.062, 0.921) |
| 2008 | 1        | 1014    | 0.099 (0.000, 0.292) |
| 2009 | 3        | 1064    | 0.282 (0.000, 0.601) |
| 2010 | 1        | 986     | 0.101 (0.000, 0.300) |
| 2011 | 3        | 1059    | 0.283 (0.000, 0.630) |
| 2012 | 0        | 959     | 0.000 (0.000, 0.313) |
| 2013 | 0        | 917     | 0.000 (0.000, 0.327) |
| 2014 | 0        | 817     | 0.000 (0.000, 0.367) |
| 2015 | 0        | 821     | 0.000 (0.000, 0.365) |
| 2016 | 0        | 748     | 0.000 (0.000, 0.401) |

| Year | Positive | Total   | Prevalence (95% CI)  |
|------|----------|---------|----------------------|
|      |          |         |                      |
| Multigravid| | | |
| 2003 | 5        | 1237    | 0.404 (0.051, 0.758) |
| 2004 | 2        | 1302    | 0.154 (0.000, 0.366) |
| 2005 | 0        | 1142    | 0.000 (0.000, 0.263) |
| 2006 | 1        | 1169    | 0.086 (0.000, 0.253) |
| 2007 | 1        | 1178    | 0.085 (0.000, 0.251) |
| 2008 | 0        | 1024    | 0.000 (0.000, 0.293) |
| 2009 | 1        | 1088    | 0.092 (0.000, 0.272) |
| 2010 | 1        | 1026    | 0.097 (0.000, 0.288) |
| 2011 | 0        | 1151    | 0.000 (0.000, 0.261) |
| 2012 | 0        | 1076    | 0.000 (0.000, 0.279) |
| 2013 | 0        | 1090    | 0.000 (0.000, 0.275) |
| 2014 | 0        | 949     | 0.000 (0.000, 0.316) |
| 2015 | 0        | 1019    | 0.000 (0.000, 0.294) |
| 2016 | 2        | 873     | 0.229 (0.000, 0.401) |

CI: Confidence interval
Conclusion

There is a decrease in new cases of HIV among antenatal women over the years. However, it is difficult to give one single intervention credit for it. A multipronged approach that improved awareness among different groups of people and involved various organizations such as the WHO, government bodies, and various nongovernmental organizations including our community health department has helped in decreasing the prevalence of HIV in Kaniyambadi block. This approach could be a model which other developing countries with high prevalence rates of HIV could follow.

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Conflicts of interest
There are no conflicts of interest.

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