

## Community prevalence of antibodies to human immunodeficiency virus in rural and urban Vellore, Tamil Nadu

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### ABSTRACT

**Background.** Human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS) are becoming increasingly common in India. Currently, antenatal prevalence is a surrogate marker for HIV prevalence in the community. The association between antenatal and community prevalence of HIV needs to be validated so that estimates can be verified or adjusted appropriately.

**Methods.** A probability proportional to size cluster survey was conducted in the Kaniyambadi block of Vellore district and in the urban wards of Vellore town to estimate the prevalence of

antibodies to rubella from August 1999 to February 2000. All personal identifier data from the serum samples were removed to yield a collection for which only the age and sex were known. Estimation of antibodies to HIV in sera from individuals between 15 and 40 years of age, was carried out by one screening ELISA and the reactive sera were further subjected to a supplementary test.

**Results.** We tested 1512 serum samples from subjects residing in rural areas and 1358 samples from those residing in urban areas. The seropositivity among rural samples was 0.66% and among urban samples 1.4%. The prevalence was almost equal among men and women and the youngest infected individual was 15 years old.

**Conclusion.** The prevalence of HIV during the period of study was similar to the national surveillance data for Tamil Nadu based on antenatal women. HIV prevalence differs in urban and rural Tamil Nadu, with urban areas having a higher burden of the disease.

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### INTRODUCTION

The number of human immunodeficiency virus (HIV)-infected individuals in India is estimated to be 5.1 million. This estimate is based on the surveillance carried out by the National AIDS Control Organization (NACO) through its sentinel centres across the country which submit data from sexually transmitted disease (STD) and antenatal clinics. In 2002, in Tamil Nadu, the estimated prevalence of antibodies to HIV based on antenatal clinic data was 0.88%, while it had previously been 1% or higher.<sup>1</sup> Antenatal HIV prevalence is a surrogate marker which needs validation by community studies. Such validation is not available because previous studies to estimate HIV prevalence have been carried out in communities that are at high risk for HIV infection, or have been biased by recruitment of individuals attending health camps or STD screening camps.<sup>2-4</sup> Community prevalence of HIV infection ranged from 1.8% to 7.4% in studies carried out in Tamil Nadu,<sup>2,3</sup>

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which is significantly higher than that reported for antenatal screening. We did a seroprevalence survey using unlinked samples that were collected for a different infectious disease (rubella).

## METHODS

The serum samples used in this study were collected from August 1999 to February 2000 during a survey for rubella. The sampling methods are briefly described below.

### *Rural community survey*

The Kaniyambadi block of Vellore district consists of 88 villages. A database updated by the 1994 and 1999 censuses of the block was used as the sampling frame for the survey. Demographic summaries obtained from this database were used for planning the various stages of the sample selection procedure. Villages were divided into two strata based on the population size ( $\leq 2000$  and  $>2000$  population). As approximately 50% of the population was in each strata, half the survey population was selected from each stratum. Twenty clusters were selected in each stratum using probability proportional to size (PPS), based on the cumulative population size of those up to 40 years of age in each village, with serum samples being collected from those in the age group of 3–40 years. Thirty households within each cluster were selected by simple random sampling (SRS). The sample size for each cluster was based on the total sample size divided by the number of clusters, with an adjustment to allow for ineligible households and non-response. Compliance with sample collection was 94.8%.

### *Urban community survey*

The Vellore municipality is divided into 49 wards with 5 urban health centres. The database used for the sampling framework was the 1999 census conducted by the health centres. The age group 5–44 years was used for estimation of the sample size, although serum samples were collected again only in the age group of 3–40 years. Eighty clusters (streets) were selected by PPS based on the total population, with 12 households (families) selected by SRS from each street. Forty clusters were selected from streets with a population size  $\leq 556$ , and 40 clusters from streets with a population size  $>556$ . Compliance with sample collection was 87.7%.

### *Laboratory testing*

The serum samples were delinked from all personal identifiers except age and sex and tested in batches. Sera from individuals  $>15$  years of age were selected for testing. The first screening ELISA was Genedia HIV-1 and -2, in which all positive samples were tested twice, followed by the Detect HIV ELISA for confirmation as recommended by the WHO for developing countries. The use of unlinked, anonymized sera was approved by the institutional research committee.

### *Statistical analysis*

SPSS version 6 and STATA software were used for data analysis. The probability of selection for age and sex distribution was obtained from the 1994 and 1999 censuses for rural and urban populations, respectively. The prevalence and confidence intervals were estimated, incorporating adjustment for design effect.

## RESULTS

The age distribution and positivity rates for each age group are given in Table I. Of the 2870 samples tested, 29 were positive, giving a prevalence of 1.01%. A total of 1512 samples from individuals in rural areas were tested, of which 10 (5 men and 5

women) were confirmed to be positive (0.66%; 95% CI: 0.5–0.8). The age of the youngest infected individual was 15 years, the starting age of the sampling. In the rural samples, there were two samples from a single cluster, one from a 37-year-old man and the other a 31-year-old woman. Of the 1358 samples from urban individuals, 19 (9 women and 10 men) were positive (1.4%; 95% CI: 1.2–1.6). The youngest infected individual was 15 years of age. There were four clusters with more than 1 positive individual, three clusters had 2 positive individuals each (2 women, 2 men, and 1 man and 1 woman) and one cluster had 3 positive individuals (2 men and a woman).

In both rural and urban populations, all infected individuals below the age of 25 years were women. In both rural and urban populations, the highest prevalence of HIV infection was in the age group of 30–34 years, with 4% and 1.53% in the urban and rural populations, respectively. The difference in prevalence between the rural and urban population was statistically significant ( $p < 0.001$ , chi-square test).

## DISCUSSION

Previous studies on the prevalence of antibodies to HIV carried out in Tamil Nadu have focused on high risk groups such as patients attending STD clinics and those with tuberculosis. The NACO STD clinic surveillance data from Tamil Nadu for the past 5 years shows an HIV prevalence of over 10%.<sup>1</sup> For 1999 and 2000, the period during which the samples analysed in this study were collected, the prevalence in STD clinics of Tamil Nadu was 16.3% and 10.4%, respectively, with an antenatal prevalence of 1%.

A study carried out to estimate HIV seroprevalence among patients with tuberculosis in Tamil Nadu during 1997–98 showed that in Vellore, the District Tuberculosis Centre and the Sanatorium had a seroprevalence of 4.3% and 9.4%, respectively.<sup>4</sup> In another study on patients with tuberculosis from Chennai, the HIV seroprevalence was 16.9%.<sup>5</sup> Other populations in whom HIV seroprevalence has been estimated in Tamil Nadu include patients with leprosy and mental disorders.<sup>6,7</sup> Unlike patients attending STD clinics and those presenting with tuberculosis, patients with leprosy and mental disorders did not appear to be high risk populations based on seroprevalence data. Studies from other parts of India have also reported an increasing incidence of HIV infection in STD clinic attendees and patients with tuberculosis.<sup>8–12</sup>

Different approaches have been used in various studies to establish community prevalence in Tamil Nadu. In a study carried out in 1994 and 1995 in 5 urban and 5 rural centres, where every third adult was recruited, HIV-1 antibodies were found in 7.4% (95% CI: 5.8%–9.2%) of urban and 7% (95% CI: 5.6%–8.7%) of the rural population, which is significantly higher than that reported by the national surveillance data.<sup>3</sup> In a more recently published study that utilized a cluster sampling model in 3

TABLE I. Seroprevalence of antibodies to human immunodeficiency virus (HIV) infection in the urban and rural areas of Vellore

Age group (in years)	Urban		Rural	
	<i>n</i>	Positive (%)	<i>n</i>	Positive (%)
15–19	336	1 (0.3)	403	1 (0.25)
20–24	291	2 (0.69)	299	1 (0.33)
25–29	280	5 (1.79)	282	1 (0.35)
30–34	225	9 (4)	262	4 (1.53)
35–40	226	2 (0.88)	266	3 (1.13)
Total	1358	19 (1.4)	1512	10 (0.66)

districts of Tamil Nadu where individuals were recruited for STD screening, an HIV prevalence of 1.8% (95% CI: 1.7–1.9) was found.<sup>2</sup> The use of study designs which involve purposeful, non-random selections introduces a bias because persons likely to have the disease will attend such camps, making it difficult to generalize these data to the community.

In our study, sera were collected for an infectious disease survey which has no associated stigma, and compliance with sample collection was high. Therefore, the results obtained can be generalized to the population under consideration. The combined HIV prevalence for the rural and urban populations in this study was 1%, which is the same as the NACO antenatal surveillance data for 1999 and 2000.

The major lacunae in our study are the inability to assess risk factors because of the unlinked, anonymized testing and the lack of availability of samples from persons over 40 years of age. However, the data reported here validate the approach of utilizing antenatal surveillance to estimate HIV antibody prevalence, and highlight the differences in rural and urban HIV prevalence. Based on this and previous reports,<sup>2,3,13,14</sup> as well as data submitted annually to NACO from the surveillance centre in the Department of Clinical Virology at Christian Medical College, it is seen that the estimated doubling time in patients at Vellore is approximately 3.5 years. We conclude that while there is no dramatic increase from year to year, the HIV epidemic is continuing to spread in the general population.

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### *An AIDS Helpline*

The Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi through its AIDS Education and Training Cell has started an interactive AIDS helpline called *Shubhchintak*. This helpline aims to create awareness about AIDS and answer queries from the general public about AIDS and HIV infection.

This service works between 10 a.m. and 5 p.m. on all working days from Monday to Friday. Telephonic service is available on 011-26588333.