Recent trends in HIV incidence in coastal South India: Implications for prioritizing HIV control strategies

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Competing interests: None declared.

Funding source: Department of Health and Family Welfare (Mangalore District), Government of Karnataka, India.

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Since the first report of human immunodeficiency virus (HIV) infection in South India in 1986, HIV prevalence in India has steadily increased. The current estimates of the National AIDS Control Organisation (NACO) of the Government of India suggest that adult HIV prevalence in India is approximately 0.36%, amounting to between 2 and 3.1 million people. If an average figure is taken, this comes to 2.5 million people living with HIV and AIDS, almost 50% of the previous estimate of 5.2 million. Although prevalence estimates for India have been controversial, control of HIV infection in India indisputably remains an important goal.

In 2002, the Government of India outlined a goal of zero growth in HIV incidence by 2007, echoing the UN’s Millennium Development Goals, which included halting and beginning to reverse the spread of HIV/AIDS infection by 2015. Many strategies are being undertaken to support this, including blood safety and condom promotion programs, sexually transmitted disease (STD) control, prevention of parent-to-child transmission (PPTCT), and voluntary counselling and testing (VCT). However, there has been little analysis to determine if these strategies are appropriate in India (as a whole or regionally) and, if so, whether they should be reprioritized according to local need.

We undertook an analysis of recent trends in the incidence of HIV infection in the coastal district of Mangalore in the state of Karnataka to determine if current programs are targeted effectively. This district is one of the NACO sentinel surveillance sites for monitoring HIV transmission in India and has a population of almost 1.9 million, two-thirds of whom (62%) live in rural areas. The district has a literacy rate of 83.4%.

We conducted a retrospective record-based study in which data were collected from all VCT centres, STD clinics, PPTCT centres, and blood banks in both rural and urban areas in the district for the period January 2001 to December 2007. Consent for data collection was obtained from the Medical Superintendent of the District Government Hospital, District Health Officer and Family Welfare Officer of the Department of Health and Family Welfare, Mangalore, and from the Nodal Officer for HIV/AIDS in Mangalore. (The Nodal Office, which reports to the District Health Officer, is in charge of implementing the program in the district.)

We collected annual data on new cases of HIV from each centre. The data from each centre were aggregated with data from all similar centres in the district. For instance, all of the data from blood banks in the entire district were pooled for each year to yield a single, integrated data set. As each new case had a unique num-
ber tagged to a patient card (which was used irrespective of where the patient was followed up or referred), double counting of cases was unlikely. Because NACO’s surveillance program was streamlined between 2001 and 2003, some records were not available for our analysis.

We used NACO’s operational definitions to define high- and low-risk populations. Our high-risk population included those attendees at STD clinics or VCT centres with a history of high-risk behaviour, including sexual intercourse with multiple partners and/or sharing inadequately sterilized needles, syringes, or any other skin-piercing instruments. Pregnant women attending PPTCT centres, people attending blood banks, and those attending VCT centres and STD clinics without a history of high-risk behaviours were considered low-risk populations. We identified suspected HIV cases as those positive for a single enzyme-linked immunosorbent assay / rapid / simple (ERS) test. Confirmed cases were those persons who obtained a positive result in any 2 ERS tests before 2003 or in any 3 ERS tests from 2003 to 2007.

We estimated incidence and prevalence for each centre, by risk group (high/low), location (urban/rural), and gender, using approximated stable population denominators to discount the effects of migration. We used the chi-square test for linear trend to examine the significance of changes in incidence over time. We considered a $p$ value $< 0.05$ to be significant. Data were analyzed using SPSS Version 12.0 (SPSS Inc., Chicago Ill.) and Epi Info Version 1.0 (US Centers for Disease Control and Prevention, Atlanta, Ga.).

We found that the total prevalence and incidence of HIV infection in Mangalore is increasing, primarily as a result of increased incidence among high-risk groups. The proportion of HIV-positive blood donors and expectant mothers is decreasing, but the incidence among those attending VCT centres and STD clinics is increasing. Incidence of HIV infection is currently greater among males, but there is a trend toward increasing incidence among females and decreasing incidence among males. Incidence in urban areas is greater than in rural areas, although incidence in rural areas is rising. These changes were statistically significant. Figures 1 to 4 demonstrate the trends outlined.

The increasing incidence of HIV infection measured for Mangalore could be an artificial finding for several reasons. When the national surveillance program began, there were few HIV testing centres and existing centres were mainly in urban areas. The number of testing centres that provided HIV testing rapidly expanded in 2002–2003 to include all rural areas in the district, resulting in a greater number of people being tested in the following years. Similarly, an HIV education campaign launched in 2001 increased awareness of HIV, also resulting in more people being tested in subsequent years. These two factors likely contributed to increased case identification and therefore to an apparent rise in HIV infections, while these in fact were previously undetected cases (i.e., prevalent cases) rather than new infections.

Trends observed at antenatal clinics and blood banks suggest that the overall incidence of HIV infection may be declining. HIV incidence among antenatal clinic attendees and HIV sero-reactivity among blood donors reflect the prevalence of HIV in the general population. Although the number of people tested at blood banks has increased over a period of time, the proportion of HIV-positive cases detected is consistently decreasing (Fig. 1). However, it is possible that as a result of HIV awareness campaigns, declining numbers of people with HIV infection are attending blood banks. A similar pattern of declining incidence is observed among attendees at PPTCT clinics (Fig. 1).

As all pregnant women in Mangalore attend antenatal clinics and all are referred to PPTCT clinics for HIV counselling and testing, the trends observed in HIV testing results are likely representative of the general population.

This pattern is similar to the pattern observed for Karnataka State, and South India as whole, where the proportion of HIV-infected people among those attending antenatal care has consistently declined. But in the states of Orissa and Rajasthan the rates have consistently increased. Although the rates of HIV among female sex workers in South India have declined over time, there are pockets of high prevalence. Similarly, prevalence among female sex workers in Manipur has declined in Manipur but has increased in Nagaland and West Bengal. Maharashtra, Nagaland and Manipur are classified as high prevalence areas (≥ 10%) whereas Bihar and Uttarakhand are considered medium prevalence areas (1%–5%). This heterogeneity in prevalence also suggests that the HIV epidemic in India is closely related to literacy levels, thus reflecting the importance of public awareness in HIV prevention. Overall national trends reflect fluctuating proportions among STD clinic and antenatal clinic attendees.

Heterogenous patterns of HIV infection in India necessitate different intervention priorities for different regions. In Mangalore District (as distinct from Karnataka State as a whole), improved diagnostic facilities and efforts to implement blood safety measures seem to have yielded some benefit (Fig. 1). However, interventions targeted toward high-risk populations, and perhaps women, require greater emphasis, as current trends indicate (Figs. 2–4).

Our data have some important limitations. We assumed a stable population (i.e., denominator) for our calculations, discounting possible effects of migration, given that the data sources used in this analysis do not provide this information. Most migration in the region occurs from rural to urban areas and, being a border district, from the neighbouring state of Kerala. A boom
in the industrial sector and construction industry has also given rise to an influx of high-risk groups such as construction workers, truck drivers, and female sex workers. It is difficult to ascertain the impact of these changes on our analysis. Because HIV infection is stigmatized in the community, people at risk can be reluctant to come forward for testing, resulting in an underestimation of the problem in this region. This bias is, of course, common to the entire country.

In summary, strategies such as interventions targeted toward high-risk populations and women are important for the Mangalore region if we are going to curb the spread of HIV/AIDS and meet Indian government and UN Millennium Development Goals indicators. Sustained information and education campaigns and wider availability of testing facilities are also important. Because epidemiological trends in HIV infection differ at local, state, and national levels, it is necessary to adopt area-specific approaches for overall HIV prevention in India. Sentinel site data are important to determine these trends and appropriate strategies.

Acknowledgments: We thank the District Health Officer and Family Welfare Officer of Department of Health and Family Welfare, Mangalore, for the permission to access the records of all the centres in Mangalore District. We also thank the staff of all the above centres in the entire district for having helped in collection of data.

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Contributors’ statement: HK and SJ conceived, planned and conducted the study. HK, RR, GK, and MSK took part in drafting the protocol, organizing the data collection, analyzing the findings, and writing the report. HK and MSK conducted the statistical analysis.

Citation: Kumar HN H, Jayaram S, Rao MR, Kumar S SG, Kotian MS. Recent trends in HIV incidence in coastal South India: implications for prioritizing HIV control strategies Open Med 2009;3(1):26-30

Published: 17 March 2009

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Figure 3: HIV incidence by rural and urban areas, Mangalore district, 2003-2007

chi-square = 13.315
(p = 0.0002)

Figure 4: HIV incidence by sex, Mangalore district, 2003-2007

chi-square = 16.079
(p = 0.0006)