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HIV rates and risk behaviors are low in the general population of males in South India, but high in alcohol venues: results from 2 probability surveys

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Abstract

Background—As the HIV epidemic continues to expand in India, empirical data are needed to determine the course of the epidemic for high-risk and the general population.

Methods—Two probability surveys were conducted in Chennai slums among a household sample of males and alcohol venue patrons ("wine shops") to compare HIV and other sexually transmitted disease (STD) prevalence and to identify STD behavioral risk factors.

Results—The wine shop sample (n=654) had higher rates of HIV and prevalent STDs (HIV, HSV-II, syphilis, gonorrhea or chlamydia) compared to the household sample (n = 685) (3.4% versus 1.2%: p-value = 0.007 and 21.6% versus 11.8%: p-value = <0.0001, respectively). High-risk behaviors in the household sample was rare (<4%), but 69.6% of wine shop patrons had >2 partners, 58.4% had unprotected sex with a casual partner and 54.1% had exchanged sex for money in the past 3 months. A multivariate model found that older age, ever-married, ever tested for HIV, and having unprotected sex in the past 3 months was associated with STD prevalence in wine shop patrons.

Conclusions—Prevalent HIV and STDs, and sexual risk behaviors are relatively low among the general population of men. We found that men who frequent alcohol venues practice high risk behaviors and have high rates of STDs, including HIV, and may play an important role in expanding the Indian epidemic.

Keywords

HIV; sexually transmitted diseases; men; alcohol; India; risk factors

Introduction

India has the third highest number of HIV-infected people in the world. Since the first AIDS case was reported in 1986¹, by November 2005, the cumulative number of reported AIDS cases has risen to almost 117,000². An estimated 2.5 million Indians are living with HIV/AIDS,³ representing more than 80% of South Asia's infected population.

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While the HIV epidemic continues to expand in India, there have been conflicting reports on the extent of HIV in the country, particularly in southern India. Although the number of surveillance sites is expanding, the data may still be skewed and inadequate^{4–6}. UNAIDS/WHO defines countries to have a generalized HIV epidemic if the national HIV prevalence in pregnant women extends beyond 1%⁷. Most studies conducted in India among both general and high-risk populations support the inference that India may be on the edge of a generalized HIV epidemic^{8–12}. While the reported prevalence of HIV in the country is 0.7%¹³, national surveillance and other studies reported that in 2001, the HIV prevalence rate increased to above 1% in antenatal clinics in four southern states of Maharashtra, Karnataka, Andhra Pradesh, and Tamil Nadu^{13;14}. However, recent studies suggest that national surveillance may overestimate the burden of HIV in South India⁵ up to two to three fold. Given India's population of over 1 billion, the health and cost implications of a generalized HIV epidemic are enormous; understanding the stage of the epidemic is critical to healthcare planning and HIV prevention strategies.

The continued transformation of the HIV epidemic in India is supported by the presence and inter-connection of at least two elements in both male and female populations: high HIV prevalence concentrated in high-risk populations^{13, 15;16} and reports of elevated high-risk sexual behaviors among the female and male general populations¹⁷. The linkage of these elements creates the epidemiological condition to support widening HIV transmission in the general population. These two elements have been explored more fully in female rather than male populations. The HIV prevalence among certain high-risk populations such as sex workers and sexually transmitted disease (STD) clinic patients in Maharashtra State and injecting drug users (IDUs) in Manipur State, reached over 5% in 1990¹³. Heterosexual sex accounts for 86% of all new HIV-1 infections in India^{18;19} and it is estimated that 50–75% of new infections are acquired through male use of female sex workers^{8;10;12}. In the mid 1990's, studies reported that 21% of men attending STD clinics in Pune¹⁰, and over 30% of female sex workers in Mumbai and Pune^{15;16} were HIV-positive. Research has shown that a significant proportion of Indian men report both premarital and extra marital sexual activity in India; a recent study of 2,901 men aged 18–40 years old living in rural districts of five states found that 15% to 47% of men reported extramarital sex¹⁷. Despite active surveillance in antenatal clinics^{20;21} and several studies that have focused on high risk groups such as STD clinics^{22;23}, sex workers^{24;25}, and IDUs²⁶, few studies have assessed HIV prevalence in the general male population using community based random probability samples in India. More HIV data are needed for both male high-risk and male general populations to gauge the stage of the epidemic.

To better understand the burden of HIV in southern India, we aimed to characterize the HIV epidemic among men using two cross-sectional surveys: we first conducted a probability household survey in low income areas of Chennai, India to provide an indicator of the HIV epidemic in the general population. These data indicated low rates of HIV/STDs and sexual risk behaviors in the general population but HIV prevalence and risk behaviors were associated with alcohol use. We then conducted a probability survey among men recruited in wine shops to examine if HIV/STD risk was concentrated in these venues.

In India, wine shops are community-based, licensed commercial establishments that sell alcohol for consumption on premises or on a take-out basis. A more detailed explanation of wine shops are described elsewhere²⁷. In brief, wine shops primarily sell distilled spirits and beer. On average, a wine shop in Chennai serves about 200 regular (at least 3 times a week) customers. The vast majority of wine shop patrons are men and previous ethnographic research has suggested that after going to wine shops, men frequently engage in unprotected sex with sex workers²⁸.

We compare results from each survey and discuss implications for the stage of the epidemic in southern India and useful HIV prevention strategies for each population segment.

Methods

This study was conducted in the southern city of Chennai, in Tamil Nadu State, India, between March 2001 and June 2002. Findings from our study were used to inform an HIV prevention intervention trial (National Institute of Mental Health [NIMH] Collaborative HIV/STD Prevention Trial). The research team identified approximately 900 self-contained, urban residential areas (“slums”) in Chennai, designated by the Tamil Nadu Slum Clearance Board as sites for future permanent housing. To maximize intervention effectiveness and minimize contamination between experimental and control arms in the trial, thirty slums that housed 100–300 families, had stable populations and had discrete boundaries were purposively selected as study sites. In twenty-four of the thirty slums, we conducted both a household survey and a wine shop survey.

Sample selection for general population survey

Local study staff first conducted a household enumeration in the project slums. Using a systematic random sampling scheme, 65 households from each slum with at least one individual aged 18–40 were selected to be approached for the study. From each selected household, one eligible participant was randomly selected to participate in the study, bringing the total sample to 1,950 slum residents. Study staff visited households of selected individuals and gave them a color-coded invitation to participate in the study.

All residents of the selected slums, regardless of study status, were invited to attend health camps offering free physical exams and prescriptions by local physicians. In the health camps, sampled participants holding color-coded invitation cards from each slum were informed of the risks and benefits of participation and given a copy of the informed consent to read and sign.

Sample selection of wine shop patrons

Of the 700 licensed wine shops in Chennai city in 2001, we purposively selected 100 wine shops in 24 clusters of 4–5 wine shops based on the presence of sex work services in the wine shop vicinity and high risk sexual behavior among wine shop patrons indicated by previously collected ethnographic data²⁸. We invited every third person who entered a project wine shop bar to participate, for a total of 55 men per cluster.

The research protocol, questionnaire and consent forms were reviewed and approved by several ethical review committees: Indian Council on Medical Research, YRG CARE’s IRB, the Johns Hopkins Bloomberg School of Public Health’s Committee on Human Research and the National Institutes of Health’s Office for Protection from Research Risks.

To be eligible for the study, participants had to be lucid and capable of providing voluntary, informed consent at the time of the interview. Each participant was informed of the risks and benefits of participation and advised of his or her rights as a study participant. At the end of the consent procedure, participants were asked if they had any questions. If he/she agreed to participate, a copy of the informed consent form was given to read and sign (or mark an “X”). Consenting participants were administered a 30-minute interview by one of four interviewers, using the computer-aided personal interview (CAPI) method. In the household survey, interviews were conducted in a separate area of the health camp, in private, sound-proofed booths. In the wine-shop survey, participants were offered free transportation and interviewed at an assessment site with private, sound-proofed rooms. After participants were given HIV

pre-test counseling, laboratory personnel drew 10 ml of blood and clinicians collected urine samples and vaginal swabs (as appropriate) for HIV and selected sexually transmitted diseases testing.

Trained laboratory personnel tested all biological specimens in the study laboratory in Chennai. Twenty percent of specimens, selected randomly, were sent to the central laboratory at the Johns Hopkins University School of Medicine and retested for quality control. HIV testing was performed on serum using HIV ELISA 1.2.0 (Abbott Murex Biotech Limited, Kent, England), repeated using Genscreen HIV ½ Version 2 ELISA (BioRad, Marnes LA Coquette) and confirmed using Western blot (BioRad, Marnes LA Coquette). Serum was tested for HSV-2 antibodies using Herpesselect 2 EIA (MRL, Focus Technologies, Los Angeles, CA, USA), and for syphilis using the Treponema pallidum Hemagglutination Assay (TPHA, Scordia-Fujirebio Inc., Japan). Urine was tested for chlamydia and gonorrhea DNA using Amplicor CT/NG PCR (Roche, Totowa, NJ, USA).

Test results were made available to participants two weeks after the interview. Those who had antibodies to HIV were confidentially contacted and provided retesting, post-test counseling and referrals. Those who were diagnosed with an STD were provided treatment on site and/or referrals to local services.

Given the small number of females interviewed in the wine shop survey ($n = 91$) and key differences between females in the wine shop survey (females were all sex workers in the wine shop survey) and the household survey, we excluded females in these analyses. To further maximize comparability across surveys, we limited our analysis to the twenty-four slums where both household and wine shop surveys were conducted.

Simple logistic regression analysis was used to conduct exploratory analysis of the associations between independent variables and the dependent variable of interest. We were unable to conduct multivariate analysis with HIV as an outcome due to the small number of individuals with HIV. Because STDs and HIV may be transmitted through the same sexual behaviors, we developed models to assess factors associated with any STD, including HSV, HIV, chlamydia, gonorrhea and syphilis among men from the general population and men from wine shops in Chennai slums.

Risk factors significantly associated with the outcome (p -value < 0.10) in either the household or wine shop sample, or hypothesized to be associated with STDs, were entered into a multiple logistic regression model among men sampled from the household survey. To adjust for potential confounders, we used forward stepwise logistic regression analysis ($p < 0.10$ to enter, $p < 0.05$ to retain). Using a parallel analysis, we then identified factors associated with having any STD among men sampled from wine shops. We used chi-square analysis (Fisher's Exact two-sided p -value was used when one or more cells had expected count less than 5) to assess differences across demographic and behavioral characteristics and across STD outcomes between the general population and the wine shop population. Generalized Estimating Equations²⁹ were used in all analyses to control for intra-slum correlations and all analyses were conducted using STATA software version 9³⁰.

Results

From April–June 2001, 1631 of 1950 sampled adults were interviewed (84% response rate) through the household survey. Approximately 47% ($n = 774$) of the sampled population were male, of whom 685 were residents of the twenty-four slums where the wine shop survey was also completed.

In the household sample ($n = 685$), the mean age was 28.5 ($SD = 6.76$) and the majority was married (63%). The vast majority (96.1%) had one or no sex partners in the past 3 months and most (60%) drank alcohol less than once a week. HIV prevalence in this population was 1.2% and 11.8% had any STD (HIV, HSV-II, syphilis, gonorrhea or chlamydia).

Table 3 shows the odds ratios for risk factors associated with any STD in univariate and multivariate analyses among men from the general population survey. Men 34 years of age or older and men who had ever been married were significantly more likely to have an STD than those who had not. Men who had a higher number of sexual partners or who had exchanged money or other goods in the past 3 months were also more likely to have an STD. Increased alcohol consumption was associated with a six-fold increased risk of a prevalent STD. Mobility was protective of any lab-diagnosed STDs.

Variables that remained statistically significant after multivariate adjustment (Table 3) were having been married, greater number of sexual partners, exchange of money for sex in past 3 months, and binge drinking. No interactions were found to be statistically significant.

Wine shop men in slums

From March-June 2002, 1,196 male participants (91% response rate) were interviewed in the wine shop survey, and of those, 654 were sampled from wine shops in one of the twenty-six slums included in these analyses.

Men in the wine shop sample were less likely to have a higher education (12+) and more likely to be mobile (Table 1) than men in the general population. They also had a higher HIV risk profile, with 70% having two or more sexual partners and 58% having unprotected sex with a casual partner in the past 3 months compared to 4% and 2%, respectively, in the general population. As expected, men from the wine shop drank alcoholic beverages more frequently and in higher quantity than their counterparts in the general population. Men from the wine shop sample also had significantly higher rates of HIV (3.4%) and STDs (21.6%) compared to men from the household survey (1.2%: p -value = 0.007 and 11.8%: p -value = <0.0001, respectively) (Table 2).

Table 4 shows the odds ratios for risk factors associated with any STD in univariate and multivariate analysis among wine shop men. As was seen in the general population, the oldest men, those 34 years of age or older, those who had ever been married or tested for HIV in past were more likely to have an STD. Having unprotected sex with a casual partner in the past 3 months was also associated with increased STD. Again, mobility was protective of STD prevalence. Variables that remained statistically significant after multivariate adjustment were older age, ever married, ever tested for HIV, and unprotected sex in the past 3 months.

Since chlamydia, gonorrhea and syphilis are bacterial and only infectious for a few months, we removed these infections from the outcome in both the household and wine shop analyses and found the multivariate models were unchanged (data not shown).

Discussion

The prospect of an HIV epidemic in India poses enormous challenges to the Indian health infrastructure and – because of the large underlying population -- will dramatically contribute to the size of the global epidemic. Indian officials recognize the potential enormity of the health problem and starting in April, a new phase of the National AIDS Control Program (NACP) aims to reduce the number of new HIV infections, improve clinical management, and provide anti-retroviral therapy to more people³¹. However, the current paucity of reliable data on the

stage of the epidemic in India remains a barrier to planning cost-effective prevention and treatment strategies.

The rate of HIV in the general population of men is 1.2% in Chennai – just above the level of a generalized epidemic. However, we found that high risk behaviors in the general population are limited to a relatively small group of men. Approximately 4% of men had sex with more than two partners over the past 3 months, 4% had exchanged sex for money or goods in the past 3 months and 4% had 5 or more drinks on the days they consumed alcohol (Table 1). Men who engaged in these behaviors were more likely to be diagnosed with an STD, including HIV.

The survey among wine shop patrons revealed that HIV/STDs may be concentrated in alcohol venues. Studies have shown that alcohol consumption is associated with increased HIV sexual risk behaviors^{32–36}. In contrast to men from the general population, the majority of men in wine shops had more than two partners in the past 3 months (69.6%), had unprotected sex with a casual partner (not including paid partners) in the past 3 months (58.4%) and had exchanged sex for money or goods in the past 3 months (54.1%). Given the pervasiveness of high risk behaviors in this population, less traditional risk factors were associated with an STD. In addition to men who had unprotected sex with a casual partner in past 3 months, men who had previously tested for HIV were also more likely to have an STD, indicating that individuals with STDs in this sub-population were aware of their high risk behaviors.

Age and marital status were associated with STD prevalence in both populations, reflecting the cumulative nature of viral STDs, which accounts for a substantial proportion of STD burden.

It is interesting to note that the odds ratios are much higher in the low prevalence population. This may be due, in part, to the fact that those at high risk have been in a high risk environment for a long period, hence the behaviors in the past three months among wine shop patrons is not as predictive as among the household survey.

This study has several limitations that should be considered when interpreting results. First, because all behavioral data relied on self-report, associations of high-risk behavior and disease may be underestimated across risk behaviors. When answering questions about sensitive behaviors, participants may have given what they perceived to be socially desirable responses. While differential misclassification of the exposure (HIV risk behaviors) may have occurred, it is expected that this bias would dilute the estimates of association between risk behaviors and STD prevalence and thereby result in conservative estimates. In addition, because women rarely go to wine shops in India, we were unable to include women in this analysis. Our data were collected in 2001 and 2002 and may not reflect the current situation. However, data collected between 2003–2004 among male wine shop patrons (n = 2914) found STD prevalence rates similar to our wine shop sample, suggesting that rates continue to be high among this population. The results of this study may have limited generalizability to other cities in India. However, because the participants of this study were randomly selected from the general population living in slums, conclusions and recommendations may be applicable to other slum dwelling communities in Chennai and to Southern India.

With several reports of increases in HIV in antenatal clinics^{13;14}, there has been widespread speculation that the HIV epidemic has spread to the general Indian population. Our study found that HIV, STDs, and sexual risk behaviors are relatively uncommon among most men in the slums of Chennai, India. However, within these slums, there are pockets of men who frequent wine shops, who are practicing high risk behaviors, and have high rates of STDs, including HIV. These men may be immersed in a high risk environment over a longer period of time and given the widespread practice of high risk behaviors, interventions that include all male patrons from wine shops would be effective. In contrast, interventions set in slum communities where

high risk behaviors are more uncommon, should focus on high risk sub-groups in the community, perhaps using a screening tool to identify men who frequent wine-shops and are high risk for HIV/STDs.

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Table 1

Sociodemographic and behavioral characteristics among the men in general population (n= 685) and men in wine shops (n = 654) in Chennai, India

Characteristic	Total N	Household Survey N (column %)	Wine shop Survey N (column %)	P-value
Total number	1339	685	654	
Age (quartiles)				
18–22 years	301	167 (24.4)	134 (20.5)	0.05
23–27 years	332	163 (23.8)	169 (25.8)	
28–33 years	354	163 (23.8)	191 (29.2)	
34+	351	191 (27.9)	160 (24.5)	
Marital Status				
Never married	494	252 (36.8)	242 (37.0)	0.93
Ever married	845	433 (63.2)	412 (63.0)	
Education				
None	174	97 (14.2)	77 (11.8)	<0.0001
1–5 years	336	160 (23.4)	176 (26.9)	
6–11 years	525	154 (22.5)	371 (56.7)	
12 + years	304	272 (40.0)	30 (4.6)	
Months per year away from site				
0–1 month	857	612 (89.7)	255 (36.0)	<0.0001
2+ months	482	70 (10.3)	418 (64.0)	
# of sex partners past 3 months				
0	363	322 (47.0)	41 (6.3)	<0.0001
1	494	336 (49.1)	158 (24.2)	
2+	482	27 (3.9)	455 (69.6)	
Unprotected sex with casual partner* in past 3 months				
No	944	672 (98.1)	272 (41.6)	<0.0001
Yes	395	13 (1.9)	382 (58.4)	
Exchange sex for money or goods in past 3 months				
No	960	660 (96.4)	300 (45.9)	<0.0001
Yes	379	25 (3.6)	354 (54.1)	
Ever had sex with a man				
No	1268	641 (93.6)	627 (95.9)	0.06
Yes	71	44 (6.4)	27 (4.1)	
Frequency of drinking alcohol				
Less than once a week	456	413 (60.5)	43 (6.6)	<0.0001
Weekly, but not daily	652	166 (24.3)	486 (74.3)	
Daily	229	104 (15.2)	125 (19.1)	
On drinking days, # alcoholic drinks on average				
0 (do not drink)	232	207 (30.2)	25 (3.8)	<0.0001
1–4 drinks	731	448 (65.4)	283 (43.3)	
5 + drinks	376	30. (4.4)	346 (52.9)	

* A casual partner was defined as “Someone you just met that you had spontaneous sex with (with or without the exchange of money or goods)”

Table 2

STD prevalence among the men in general population (n= 685) and men in wine shops (n = 654) in Chennai, India

STD	Total N	Household Survey N (column %)	Wine shop Survey N (column %)	P-value
Total number	1339	685	654	
HIV	30	8 (1.2)	22 (3.4)	0.007
HSV	180	68 (9.9)	112 (17.1)	0.0001
Chlamydia	4	4 (0.6)	0	0.12
Gonorrhea	5	3 (0.44)	0	0.25
Syphilis	29	5 (0.7)	24 (3.7)	0.0002
Any viral STD (HIV, HSV)	200	73 (10.7)	127 (19.4)	<0.0001
Any non-viral STD (CT, GC, Syph)	35	11 (1.6)	24 (3.7)	0.02
Any STD	222	81 (11.8)	141 (21.6)	<0.0001

Table 3

Factors associated with any STD in univariate and multivariate analysis among men in general population in Chennai, India (n = 685).

Characteristic	Total N	Any STD n (row%)	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (quartiles)				
18–22 years	167	7 (4.2)	1.0	1.0
23–27 years	163	14 (8.6)	2.15 (0.79–5.80)	1.19 (0.40–3.50)
28–33 years	163	17 (10.4)	2.66 (0.83–8.52)	1.21 (0.30–4.85)
34+	191	42 (22.0)	5.52 (2.41–17.23)	2.46 (0.70–8.61)
Marital Status				
Never married	252	11 (4.4)	1.0	1.0
Ever married	433	70 (16.2)	4.22 (2.09–8.54)	3.08 (1.15–8.21)
Months per year away from site				
0–1month	612	78 (12.8)	1.0	1.0
2+ months	70	3 (4.3)	0.31 (0.10–0.90)	0.23 (0.07–0.76)
Ever had HIV test				
No	632	71 (11.2)	1.0	-- *
Yes	53	10 (18.9)	1.84 (0.85–3.96)	
# of sex partners past 3 months				
0	322	25 (7.8)	1.0	1.0
1	336	47 (14.0)	1.93 (1.27–2.93)	0.92 (0.64–1.32)
2+	27	9 (33.3)	5.94 (2.80–12.62)	2.04 (0.90–4.62)
Unprotected sex with casual partner** in past 3 months				
No	672	79 (11.8)	1.0	--
Yes	13	2 (15.4)	1.36 (0.33–5.68)	
Exchange sex for money or goods in past 3 months				
No	660	72 (11.1)	1.0	1.0
Yes	25	8 (32.0)	3.78 (1.47–9.73)	4.42 (1.66–11.81)
On drinking days, # alcoholic drinks on average				
0 (do not drink)	207	17 (8.2)	1.0	1.0
1–4 drinks	448	53 (11.8)	1.50 (0.68–3.32)	1.27 (0.60–2.70)
5 + drinks	30	11 (36.7)	6.47 (1.84–22.80)	4.26 (1.19–15.29)

* Not significant in multivariate analyses

** A casual partner was defined as “Someone you just met that you had spontaneous sex with (with or without the exchange of money or goods)”

Table 4

Factors associated with any STD in univariate and multivariate analysis among men in wine shops in Chennai, India (n = 654).

Characteristic	Total N	Any STD Test Positive n (row %)	Univariate OR (95% CI)	Multivariate OR (95% CI)
Age (quartiles)				
18–22 years	134	22 (16.4)	1.0	1.0
23–27 years	169	25 (14.8)	0.88 (0.56–1.39)	0.87 (0.54–1.41)
28–33 years	191	41 (21.5)	1.39 (0.86–2.25)	1.38 (0.58–2.25)
34+	160	53 (33.1)	2.52 (1.71–3.73)	2.45 (1.10–3.59)
Marital Status				
Never married	242	37 (15.3)	1.0	--*
Ever married	412	104 (25.2)	1.87 (1.42–2.47)	
Months per year away from site				
0–2month	235	60 (25.5)	1.0	--*
2+ months	418	81 (19.4)	0.70 (0.50–0.98)	
Ever had HIV test				
No	572	117 (20.5)	1.0	1.0
Yes	82	24 (29.3)	1.61 (1.10–2.34)	1.64 (1.04–2.57)
# of sex partners past 3 months				
0	41	9 (22.0)	1.0	--*
1	158	35 (22.2)	1.01 (0.47–2.19)	
2+	455	97 (21.3)	0.96 (0.42–2.20)	
Unprotected sex with casual partner** in past 3 months				
No	272	49 (18.0)	1.0	1.0
Yes	382	92 (24.1)	1.44 (1.00–2.09)	1.47 (1.01–2.15)
Exchange sex for money or goods in past 3 months				
No	300	59 (19.7)	1.0	--*
Yes	354	82 (23.2)	1.23 (0.78–1.94)	
On drinking days, # alcoholic drinks on average				
0 (do not drink)	25	5 (20.0)	1.0	--*
1–4 drinks	283	56 (19.8)	0.99 (0.48–2.03)	
5 + drinks	346	80 (23.1)	1.20 (0.56–2.59)	

* Not significant in multivariate analyses

** A casual partner was defined as “Someone you just met that you had spontaneous sex with (with or without the exchange of money or goods)”