Published in final edited form as:
Arch Sex Behav. 2003 August ; 32(4): 339–349.

Predictors of HIV Risk among Men Seeking Treatment for Substance Abuse in India

Michael P. Carey, Ph.D.[1,3], **Prabha S. Chandra, M.D.**[2], **Kate B. Carey, Ph.D.**[1], and **Dan J. Neal, M.S.**[1]

1*Center for Health and Behavior, Syracuse University, Syracuse, New York.*

2*Department of Psychiatry, National Institute of Mental Health and Neurosciences, Bangalore, India.*

Abstract

The purpose of this study was to investigate the prevalence and correlates of HIV risk among men receiving treatment for substance abuse in India. Consecutive inpatients from the major substance abuse hospital in Southern India were screened using a structured interview and standardized measures to obtain demographic, psychiatric, sexual behavior, and substance use data at the time of admission. Seventy-seven percent of the 352 men who were screened reported that they were sexually active during the past year, and 13% reported that they had engaged in sexual practices associated with greater risk. The most common risk practices in the past year included having multiple sexual partners (7%), paying for sex (5%), and having unprotected anal sex (4%). Engaging in risky sexual practices was associated with the presence of a co-occurring psychiatric disorder and higher scores on a drug abuse screening measure. Assessing HIV risk in substance abuse settings can help to identify patients who may benefit from HIV-risk reduction programs.

Keywords

HIV; India; risk behavior; substance use; men

INTRODUCTION

In India, HIV disease is expanding at an alarming rate. Seroprevalence rates have risen from 0.56% in 1993 to 8.7% in 1999 at a sexually transmitted disease clinic in northern India (Kumar & Gupta, 2000), and India may already have the largest number of HIV infected people in the world (Eberstadt, 2002; UNAIDS/WHO Group on Global HIV/AIDS and STD Surveillance, 1997). With a population of more than one billion, India is a country where further spread of HIV could lead to millions of premature deaths. Thus far, most HIV research in India has

[3]To whom correspondence should be addressed at Michael P. Carey, Ph.D., Center for Health and Behavior, 430 Huntington Hall, Syracuse University, Syracuse, New York 13244-2340; (315) 443-2755, Fax: (315) 443-4123, e-mail: mpcarey@syr.edu.

[1]The Indian *beedi* consists of shredded, sun-dried tobacco in small quantities that is hand rolled into a piece of leaf called *tendu*. *Beedi* smoking is popular in India, and starts at an early age.

[2]Betel nuts (also called areca nuts) are the dried seeds of the *areca catechu* palm found in India and other South Asian countries. They are chewed for their psychostimulant, digestive, and cardiotonic properties.

[3]The HIV risk scores were reduced to a dichotomous score, with 0 indicating no risk and 1 indicating one or more risk behaviors. Several statistical models that would have allowed for the use of the HIV-risk variables as a continuous variable, including ordinary least squares (OLS) regression, weighted least squares (WLS) regression, and negative binomial regression were explored; however, regression diagnostics for these techniques indicated that the data did not meet the necessary assumptions for hypothesis testing. In particular, non-normal, heteroskedastic residuals for OLS and WLS regression, and non-normal deviance residuals for negative binomial regression precluded use of these techniques. Therefore, expressing the data as a dichotomous score and using logistic regression provided a better statistical model and maintained consistency in the analytic technique across the three dependent variables.

focused on groups feared to be at the greatest risk of infection, the so-called "core transmitter" groups such as commercial sex workers, intravenous drug users, and truck drivers (Agarwal et al., 1999; Bharadwaj, Biswas, & Shetty, 2001; Biswas, Hazarika, Hazarika, & Mahanta, 1999; Bryan, Fisher, & Benziger, 2001; Eicher, Crofts, Benjamin, Deutschmann, & Rodger, 2000). However, other "at risk" groups, such as persons who abuse alcohol and other drugs, have not received as much research attention.

Increased information regarding substance abuse populations in India is needed because, in many countries, substance abusers engage disproportionately in sexual behaviors associated with increased risk for HIV. For example, data from the U.S. general population indicate that participants classified as "heavy drinkers" were more likely to report multiple sex partners and sex trading (i.e., exchanging sex for money, drugs, or lodging) when they were compared to "nonheavy drinkers" (Shillington, Cottler, Compton, & Spitznagel, 1995). Other data from the U.S. indicate that problem drinking is associated with greater likelihood of being infected with a sexually transmitted disease (STD) (Cook, Pollock, Rao, & Clark, 2002; Ericksen & Trocki, 1994), and that alcoholics in treatment are more likely to engage in risky sexual behaviors than the general population (Scheidt & Windle, 1996). Research in Europe also reveals an increased risk for HIV among substance users and abusers. For example, data from a representative sample of the Spanish population indicated that sexual risk behavior (i.e., multiple partners and failure to use a condom regularly) was more frequent in the previous year among persons who had been drunk (Castilla, Barrio, Belza, & de la Fuente, 1999). Use of drugs such as marijuana, cocaine, and crack have also been associated with increased risk behavior and a greater risk of sexual HIV transmission (Castilla et al., 1999; Larrat, Zierler, & Mayer, 1994; McCusker et al., 1990).

Investigation of the prevalence, patterns, and correlates of HIV-related risk behaviors in the Indian context is needed to guide the development of behavioral risk reduction and prevention programs. Therefore, the purpose of the current study was to provide information regarding the prevalence and correlates of HIV-risk behavior among patients seeking treatment for an alcohol or drug abuse problem in India. The methods of this study emulate those used in recent large-scale screening studies in the U.S. (Carey et al., 1999; Carey, Carey, Maisto, Gordon, & Vanable, 2001). Specifically, in order to obtain a representative sample, all new admissions to the De-Addictions Unit of the National Institute of Mental Health and Neurosciences (NIMHANS) in Bangalore, India were invited to be screened. The NIMHANS is the largest psychiatric and substance abuse hospital in southern India, a region where HIV prevalence rates are high; for example, among patients at STD clinics infection rates range from 15% to 33% (Thappa, Singh, & Singh, 1999). This exploratory study sought to determine the nature and prevalence of behaviors associated with increased risk of HIV transmission, and to identify demographic, psychiatric, and substance use correlates of these behaviors.

METHOD

Participants

Participants were drawn from all new admissions to the 60-bed inpatient De-Addiction Unit of the NIMHANS from April to October 2001. Patients come to this publicly-funded psychiatric teaching hospital from urban, semi-urban, and rural areas, or through referrals from all states of southern India. Newly admitted patients were eligible if they were: (a) at least 18 years of age, (b) diagnosed with a substance use disorder, (c) judged to be able to complete the assessment by clinical and research staff, (d) not acutely psychotic or otherwise unable to participate meaningfully in the screening assessment, and (e) able to provide informed consent. Patients who were less than 18 years of age, who had a primary psychiatric diagnosis, who stayed in the hospital for less than one week (e.g., those discharged early or those who left the

hospital against medical advice), or those who were too psychiatrically ill to give consent for the study were excluded.

The de-addiction unit received 493 admissions during the study period. From this total, 132 could not be interviewed because they left the hospital against medical advice ($n = 22$); did not reach the inpatient facility despite admission or absconded before formal admission ($n = 18$); were discharged early ($n = 50$); were unable to comprehend and respond to the interview because of an acute psychiatric problem ($n = 38$); were not eligible for reasons such as readmission, age older than 65 years, language problems, or need for immediate transfer to another medical units ($n = 4$). Thus, 361 patients with problems primarily related to substance use were available, psychiatrically stable, and consented to participate in the study. Of these patients, only 9 were women; because this subsample was considered to be too small to permit reliable analyses, they were not included in further analyses, resulting in a final sample of 352 men.

The final sample of 352 men had a mean age of 36.8 years ($SD = 9.2$). Seventy percent were married. The preferred language was Kannada for 38%, Tamil for 23%, Telugu for 18%, Hindi for 3%, English for 2%, and 17% other. Religious affiliation was 82% Hindu, 10% Christian, 7% Moslem, and 1% other. Approximately 65% of the sample lived in an urban area, 19% in a rural area, and 16% in a semi-urban area. Most lived either in their own home (46%); the remainder (54%) lived with others. The vast majority had some formal education, with 45% completing primary level education, 31% high school, and 24% receiving some post-high school education; 83% were employed outside their home (72% in non-professional work, 11% in a professional or governmental position).

Most patients (89%) were admitted with alcohol abuse, 7% had a single drug abuse/dependence disorder, and 4% were diagnosed with multiple substance use disorders. Five percent of the sample had an additional psychiatric disorder, with a mean duration of 7.9 years. Twenty-nine percent had been admitted to the hospital previously for their substance use disorder, whereas for 71% the current admission was their first.

Measures

Chart information—A systematic review of the medical records provided the following information: *International Classification of Diseases (ICD)-10* diagnoses (made by two qualified psychiatrists), age at first hospitalization, total duration of the substance use disorder, and number of previous hospitalizations.

Brief semi-structured interview—A brief screening interview was conducted by one of six interviewers. Four of the interviewers were physicians and two were psychologists; three were male and three were female. All six interviewers had prior training in substance abuse treatment, psychiatry, and HIV/AIDS; in addition, the interviewers received additional training from the investigators prior to working with patients, and ongoing supervision throughout the course of the study.

The interviewer first established rapport with the patient, and then elicited sociodemographic information including age, gender, living arrangement, marital status, education, and employment status. Patients were asked if they smoked commercially-prepared cigarettes and/or beedis[1], and if they chewed tobacco and/or betel nut[2].

***Alcohol Use Disorders Identification Test* (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993)—**The AUDIT, a 10 item screening measure yields scores that range from 0-40, was designed to identify drinkers at risk for alcohol abuse and dependence. Development of the AUDIT was commissioned by the World Health Organization for use in

both developing and developed countries; it was designed and tested by an international group of investigators using data from six countries (Australia, Bulgaria, Kenya, Mexico, United States, and Norway; Saunders et al., 1993). The AUDIT has been found to be reliable and valid in numerous evaluation studies in primary health care, psychiatric, and other health settings throughout the world (Allen, Litten, Fertig, & Babor, 1997; Bohn, Babor, & Kranzler, 1995; Hays, Merz, & Nicholas, 1995; Maisto, Carey, Carey, Gordon, & Gleason, 2000), including India (Carey, Carey, & Chandra, in press).

Drug Abuse Screening Test **(Skinner, 1982a,1982b)—**The DAST-10 is a short version of the DAST, designed to identify drug-use related problems in the previous year. The DAST uses items derived from the Michigan Alcohol Screening Test, which has been demonstrated to be reliable and valid in both clinical and non-clinical settings (Skinner, 1979). DAST scores range from 0-10. The DAST-10 is internally consistent (alpha = .86), temporally stable (ICC = .71), and able to discriminate between patients with and without current drug abuse/dependence diagnoses (Cocco & Carey, 1998; Maisto et al., 2000). Research conducted with Indian participants corroborates the unidimensional structure, internal consistency, and validity of the DAST (Carey et al., 2002).

HIV-Risk Screening Instrument **(HRSI) (Gerbert, Bronstone, McPhee, Pantilat, & Allerton, 1998)—**The HRSI is a brief questionnaire designed to screen primary care patients for HIV-related risk behavior. Ten items assess sexual risk behaviors that have been demonstrated in epidemiologic investigations to discriminate between low- and high-risk groups for contracting HIV among the general population (Gerbert et al., 1998). These risk factors include type of sexual activity (e.g., “Have you had anal sex - a man puts his penis into the anus of another person - with any of your sexual partners”), drug use risk behavior (e.g., “Have you ever injected street drugs, steroids, or vitamins with a needle”), number of sexual partners (e.g., “Have you had two or more sexual partners”), and other risk behaviors (e.g., “Have you ever had sex with someone so that they [sic] would give you money or drugs?”).

The HRSI is internally consistent (Kuder-Richardson-20 coefficient = .73), and able to discriminate between clinical population known to vary regarding their risk for HIV infection (e.g., primary care, methadone clinics, STD clinics). For the current study, minor modifications (e.g., providing definitions of some words, such as *anal* sex and steroids) were made to the HRSI to make it more appropriate to the Indian context. A score of zero reflects low risk, whereas a score of one or more reflects higher risk for HIV infection. Given the purposes of this study (and to allow us to compare our findings with previous research conducted before the HRSI was available), we expanded the time frame assessed to include the past year as well as 10-year risk behavior.

STD symptoms—The screen included four items regarding specific STD-related symptoms (i.e., genital discharge, pain while urinating, genital sores, genital swelling) in the past year.

Procedure

Prior to beginning the study, all procedures and materials were reviewed for ethical appropriateness by the Institutional Review Boards of the NIMHANS and Syracuse University, and by the Indian Council of Medical Research.

All new admissions were reviewed with the clinical team to determine their eligibility, and to be certain that each person was able to participate meaningfully in the research. The research staff then approached patients to explain the study, answer questions that the patient might have, and invite the patient to participate. No financial incentive was provided to induce patients to participate. Participation was completely voluntary.

The research staff included four physicians and two psychologists, all with an interest in substance abuse treatment, psychiatry, and HIV/AIDS. Confidentiality was emphasized with assurances that information would be shared with the treating team only with consent from the patient. Patients who were interested were asked to provide informed consent, and were assessed individually within 72 hours of their consent in a private room in the DeAddictions Unit of the hospital. Because of traditional cultural taboos against explicit discussion of sexual material in India, assessors spent considerable time establishing rapport and ensuring that patients understood confidentiality before actually conducting the interview. All assessment materials were available in English, Hindi, Tamil, and Kannada; the original version was English, and it was translated (and back-translated to assure consistency) into the three other languages. An interview format and the language most comfortable for the patient was used in order to ease the cognitive burden on the patients, to afford greater sensitivity regarding cultural taboos, to avoid potential problems associated with patient endurance, and to avoid misunderstandings associated with language or literacy concerns and, ultimately, to enhance reliable reporting.

Data Management and Analyses

All data were double-entered into Epidata, and compared for accuracy. Discrepancies were compared against the raw data to correct any clerical errors. Initial descriptive analyses were completed to provide estimates of the prevalence of sexual activity and of HIV-related risk behaviors. Next, to identify correlates of elevated HIV-risk status, logistic regression modeling (Hosmer & Lemeshow, 2000) was used to examine the relationships between three classes of predictor variables (i.e., demographic, psychiatric, and substance use variables) and each of the three measures of HIV-risk behavior (i.e., 10-year risk for HIV, last year risk for HIV, endorsement of an STD symptom).

The *predictor* variables included demographic variables (age, education, marital status, living situation, and occupation), psychiatric variables (substance use diagnosis, presence of a co-occurring psychiatric disorder, duration of the substance use disorder, age at first hospitalization, and number of previous admissions), and substance use variables (cigarette use, beedi use, chewing tobacco use, betel nut use, and AUDIT and DAST scores). Three *criterion* variables were modeled: 10-year HIV risk behavior (coded as 0 = low risk, 1 = higher risk),[3] past year HIV risk behavior (coded 0 = low risk, 1 = higher risk), and experience of a STD symptom during the past year (coded 0 = not reported, 1 = reported).

Logistic regression analyses were conducted in two stages (Hosmer & Lemeshow, 2000). First, for each dependent variable, an initial full model was computed using all predictor variables. The overall model fit was evaluated using the likelihood ratio χ^2 statistic (a test of overall significance) and area under the Receiver Operating Characteristic (ROC) curve (a measure of how well the model classifies observations). Significance tests and confidence intervals for individual regression coefficients (adjusted odds ratios) in each model were computed using the Wald *z*-statistic, which is based on the estimated variance-covariance matrix of the parameter estimates. Second, a modified backward elimination stepwise procedure was used to reduce the number of predictors in each regression model. This procedure was conducted in three steps: (a) individually non-significant demographic variables were dropped as a group, and their joint significance was evaluated; (b) individually non-significant psychiatric variables were dropped as a group, and their joint significance was evaluated; (c) individually non-significant substance use variables were dropped as a group, and their joint significance was evaluated. At each step, Wald χ^2 tests were used to test for significant reductions in model fit. Finally, a likelihood ratio χ^2 comparison between the final reduced model and the original model was computed, in order to demonstrate that the reduced models showed as much

predictive validity as the full models. In this case, a non-significant χ^2 value indicates that the models are statistically equivalent.

RESULTS

Prevalence of Risky Sexual Behavior

Approximately 91% (n = 321) of all patients reported that they had been sexually active in their lifetime, and 77% (n = 272) of all patients reported that they had been sexually active in the past year. Forty percent (n = 140) reported HIV-related risk behavior in the past 10 years, and 13% (n = 45) of all patients reported risk behavior in the past year. Table I presents the prevalence of the risk behavior items on the HRSI for both the past 10 years and for the past year. As can be seen there, the most common risk behaviors during the past year included having multiple sexual partners (7%), paying money to someone to have sex (5%), and anal sex without a condom (4%). When asked if they had a STD in the past year, 1% said that they had; however, when asked if they had one or more of the symptoms characteristic of an STD, 3% reported one or more such symptoms.

Logistic Regression Analyses: Full Models

HIV Risk (10-year)—HIV risk behavior scores were collapsed to binary data (lower risk vs. higher risk) and analyzed using logistic regression. The results of the model are presented in Table II. Overall, the full model with all independent variables was significant, likelihood ratio χ^2 *(19)* = 51.53, $p < .0001$, area under ROC curve = .73. Three predictor variables significantly predicted HIV risk, namely, having a co-occurring psychiatric disorder (*AOR* = 3.73, $z = 2.3$, $p < .05$), scoring higher on the AUDIT (*AOR* = 1.07, $z = 3.81$, $p < .001$), and scoring higher on the DAST (*AOR* = 1.19, $z = 2.29$, $p < .05$).

HIV Risk (past year)—HRBI scores for the past year were collapsed to binary data (lower risk vs. higher risk) and analyzed using logistic regression. The results of the model are presented in Table III. Overall, the full model was significant, likelihood ratio χ^2 *(19)* = 49.84, $p < .0001$, area under ROC curve = .77. Two variables significantly predicted HIV risk, namely, having a co-occurring psychiatric disorder (*AOR* = 4.99, $z = 2.43$, $p < .05$) and higher scores on the DAST (*AOR* = 1.40, $z = 4.07$, $p < .001$).

Endorsement of an STD Symptom—For this model, the indicator variables for occupation were excluded because one category (professional/government) predicted perfectly the lack of reported STD symptoms. To determine whether occupation predicted endorsement of an STD symptom without controlling for other variables, occupation was cross-tabulated with STD symptoms. Fisher's Exact Test indicated that STD symptomology was not related to occupation, further justifying the exclusion of occupation from the logistic regression analyses.

The results of the model are presented in Table IV. Overall, the full model with all other variables was significant, likelihood ratio χ^2 *(17)* = 29.42, $p < .05$, area under ROC curve = .87. Significant predictors were having a co-occurring psychiatric disorder (*AOR* = 18.62, $z = 2.99$, $p < .01$) and higher DAST scores (*AOR* = 1.62, $z = 3.36$, $p < .001$).

Logistic Regression Analyses: Reduced Models

The three full models just described were reduced using a modified stepwise regression procedure, such that only significant predictors remained in the regression models. Sequential elimination of non-significant variable sets (i.e., demographic, psychiatric, and substance use) did not reveal significant reductions in fit for any of the models.

HIV Risk (10-year)—The reduced model for 10-year HIV-risk behavior was significant overall, (likelihood ratio χ^2 *(3)* = 40.00, $p < .0001$, area under ROC curve = .69), and included three significant predictors: presence of a co-occurring psychiatric disorder (*AOR* = 3.50, $z = 2.31$, $p < .05$), AUDIT scores (*AOR* = 1.06, $z = 4.14$, $p < .001$), and DAST scores (*AOR* = 1.31, $z = 5.05$, $p < .001$). All three predictors were associated with increased sexual risk behavior. Overall, the reduced three-carrier model showed the same predictive ability as the full model (likelihood ratio χ^2 *(16)* = 11.53, ns).

HIV Risk (past year)—The reduced model for past year HIV Risk was significant overall (likelihood ratio χ^2 *(3)* = 41.64, $p < .0001$, area under ROC curve = .73) and included three significant predictors: presence of a co-occurring psychiatric disorder (*AOR* = 4.07, $z = 2.34$, $p < .05$), DAST scores (*AOR* = 1.41, $z = 6.02$, $p < .001$), and AUDIT scores (*AOR* = 1.03, $z = 1.97$, $p < .05$) were all associated with increased risk. Overall, the reduced three-carrier model showed the same predictive ability as the full model (likelihood ratio χ^2 *(16)* = 8.20, ns).

Endorsement of an STD Symptom—Overall, the reduced model was significant (likelihood ratio χ^2 *(2)* = 13.63, $p < .01$, area under ROC curve = .71) and contained two significant predictors. Identical to the full model, the presence of a co-occurring psychiatric disorder was associated with higher risk of STD symptomology (*AOR* = 9.47, $z = 2.97$, $p < .01$) as was elevated DAST scores (*AOR* = 1.28, $z = 2.93$, $p < .01$). This two-carrier model showed the same predictive ability as the full model (likelihood ratio χ^2 *(15)* = 15.79, ns).

DISCUSSION

This report provides the first, large-scale investigation of sexual activity levels and HIV-related risk behavior among men seeking treatment for substance abuse in India. A hospital-wide screening process indicated that 91% of patients had been sexually active in the past 10 years and 77% had been active in the past year. It would be informative to compare these findings with results from a random sample from the general population of Indian men, but we were unable to locate such data. However, we can compare them to data from the general population of men, and to men in substance abuse treatment, from other countries.

The most recent U. S. representative survey of adult sexual behavior found that 92% of the general population of men had partnered sex in the prior year (Laumann, Gagnon, Michael, & Michaels, 1994). Data from five public alcohol treatment centers in San Francisco indicated that 84% of the 888 heterosexual patients studied had engaged in at least one episode of vaginal or anal intercourse in the preceding 12 months (Avins et al., 1994). Thus, rates of sexual activity for Indian men seeking substance abuse treatment may be slightly lower than proxy comparison samples from other countries. These differences might simply be an artifact of the use of different sampling or measurement strategies. It is also possible that the lower rates in the Indian context reflect cultural differences such as the observation that, in India, it is more common than it is in the West for adult men to continue to live with their families; such living arrangements may restrict opportunities for sexual activity, especially among unmarried men. The design of the current study did not allow strong conclusions regarding these subtle differences but it does support the conclusion that men seeking substance abuse treatment in India are sexually active and that they require sexual health services to help them to avoid STDs, including HIV.

Most important are the findings regarding the prevalence of risky sexual behavior. In the current study, we found that 13% of the patients reported HIV-related risk behavior in the past year. The most common risk practices reported were having multiple partners, paying for sex, and having unprotected anal sex. Intravenous drug use was reported by only 2% of patients, reflecting the fact that injection use occurs more commonly in northeastern India and is less

frequently a problem in southern India (Channabasavanna, Ray, & Kaliaperumal, 1990; Sureh Kumar & Ray, 2002) where this study was conducted. The prevalence of same sex behavior was relatively low. The 13% rate of risky sexual behavior (past year) found in the current sample is lower than rates found in studies from the West. For example, Avins et al. (1994) reported that 54% of patients reported multiple sexual partners in the past year. Woods et al. (2000) sampled heterosexuals in alcoholism treatment in San Francisco and reported that more than half of their patients had multiple sexual partners in the past 6 months and reported a history of a STD.

This cross-cultural difference may reflect lower risk taking among inpatients relative to outpatients, differences in actual sexual risk taking between India and the West, underreporting of risk, or a combination of these (or other) explanations. In any event, however, vulnerability to HIV remains high, with 40% of the current sample reporting risk behavior during the past 10 years.

Using multivariate logistic regression analyses that controlled for the effects of other predictors, we found that both risky behavior indices (past year and past 10 years) were associated with the same set of predictors, namely, risk for alcohol or drug use problems and diagnosis with a co-occurring psychiatric disorder. Self-reported STD symptoms were also associated in multivariate analyses with drug use problems and diagnosis with a co-occurring psychiatric disorder.

The association between risky sexual behavior and substance use remains a consistent finding, regardless of setting (Weinhardt & Carey, 2000). However, the interpretation of this global level association remains complex because sophisticated event-level analyses fail to reveal a causal association between, for example, alcohol use and risky sex (Leigh, 2002; Weinhardt, Carey, Carey, Maisto, & Gordon, 2001). Evidence points to the likely role of personality factors (Kalichman, Heckman, & Kelly, 1996), situational influences (Carey, Carey, Weinhardt, & Gordon, 1997), or their transaction. Nevertheless, evidence from several sources indicates that reducing substance use may also reduce risky sexual behavior (e.g., Avins et al., 1997).

The link between risk behavior and psychiatric illness was quite strong, with very large odds ratios (ranging as high as 126.99 for STD symptom reporting) for all three criteria. It is important to keep in mind that this association was based on a small sub-sample of patients. Nevertheless, the link between psychiatric illness and HIV risk is a consistent finding in the mental health literature. Considerable evidence confirms that risk behaviors, such as having multiple or high risk partners, sex trading, and unprotected penetrative sex, occur commonly in psychiatric patients (Carey et al., 1999; Cournos et al., 1994; Kalichman, Carey, & Carey, 1996; Kalichman, Kelly, Johnson, & Bulto, 1994; Kelly et al., 1995). In addition, seroprevalence studies completed with psychiatric patients in the last decade (Carey, Weinhardt, & Carey, 1995) reveal infection rates that range from 3.1% (Rosenberg et al., 2001) to 22.9% (Susser, Valencia, & Conover, 1993), rates that are 8 to 70 times higher than the rate (0.3% to 0.4%) estimated for the general population.

Mental illnesses may increase HIV-related risk for many reasons. For example, psychiatric illnesses and medication side effects often result in patients being confused or misinformed about HIV disease (Kalichman et al., 1994) and poorly motivated to adopt risk reduction strategies (Carey et al., 1997). Psychiatric patients often lack the interpersonal and social skills needed to negotiate for safer sexual relationships (Mueser et al., 1996). The social networks of psychiatric patients tend to support risk taking rather than self-protection (Kelly et al., 1997). Patients with persistent impairment are typically unable to work and often experience periods of homelessness (Drake et al., 1991). These disease characteristics and their social sequalae tend to emerge in early adulthood when sexual activity also peaks (Centers for Disease

Control and Prevention, 1998), increasing patients vulnerability to sexual coercion (Wenzel, Koegel, & Gelberg, 2000) and sexual risk behavior (Ramrakha, Caspi, Dickson, Moffitt, & Paul, 2000). Overall, the associations between risk behavior, alcohol and drug use, and mental illness are not surprising, and provide cross-cultural replication of findings obtained in the U.S.

These results should be interpreted mindful of the study's strengths and limitations. Strengths of the study include the use of hospital-wide screening, direct patient assessment using standardized measures, sensitivity to language and cultural assessments of assessment, and a large diverse sample; these strengths enhance confidence in the validity and representativeness of the findings. The primary limitation of the study involves the possibility of a self-selection bias resulting from the voluntary nature of the recruitment. No study can include patients who leave the treatment facility prematurely before they have been evaluated. We were able to recruit approximately 73% of all male patients evaluated at the De-Addictions Unit; this response rate compares favorably to even the 68% rate reported by Avins et al. (1994). A second limitation involves the use of a brief screening measure rather than a detailed sexual behavior assessment. The advantage of screening measures is that they allow the recruitment of large and diverse samples, increasing the generalizability of the results; however, the use of screening measures limits the amount of detailed risk information that can be gathered. A third limitation of this research is the possibility that some patients underreported their sexual behavior in response to cultural norms against engaging in, or talking about, sexual behavior. To minimize underreporting, we used well-trained and carefully-supervised medical professionals who took the time to establish rapport with patients and provided considerable reassurances regarding confidentiality; however, as with all sexuality research, it is likely that the current findings underestimate the true magnitude of risk behavior in this population.

Useful directions for future research include sampling substance-abusing women to assess sexual risk and gathering data on the prevalence of HIV infection among men and women seeking treatment for substance abuse. Research is needed to clarify the nature of the relation between risky taking behavior and substance use and to develop and evaluate strategies for risk reduction and HIV prevention in this population. The latter will be especially challenging in India for at least two reasons: (a) limited health care and research resources, and (b) because cultural norms still discourage the direct discussion of sexual behavior and, hence, the acceptability of group-based intervention approaches that have been found to be useful in the West. Continued research is essential, however, to limit the spread of HIV and other STDs, and curtail the pandemic's devastating impact on the sub-continent.

ACKNOWLEDGMENTS

This research was supported by grant R01-MH54929 from the National Institute of Mental Health to Michael P. Carey, and by Independent Scientist Awards from the National Institute of Mental Health to Michael P. Carey (K02-MH01582) and from the National Institute of Drug Abuse to Kate B. Carey (K02-DA00426). We gratefully acknowledge the patients for their participation; the therapists and administrators at the National Institute of Mental Health and Neurosciences for their support; Drs. Willo Pequegnat, Juan Ramos, and Ellen Stover for their encouragement; and the Health Improvement Project team for their contributions to this work.

REFERENCES

Agarwal AK, Singh GB, Khundom KC, Singh ND, Singh T, Jana S. The prevalence of HIV in female sex workers in Manipur, India. Journal of Communicable Diseases 1999;31:23–28. [PubMed: 10810582]

Allen JP, Litten RZ, Fertig JB, Babor T. A review of research on the Alcohol Use Disorders Identification Test (AUDIT). Alcoholism: Clinical and Experimental Research 1997;21:613–619.

Avins AL, Lindan CP, Woods WJ, Hudes ES, Boscarino JA, Kay J, et al. Changes in HIV-related behaviors among heterosexual alcoholics following addiction treatment. Drug and Alcohol Dependence 1997;44:47–55. [PubMed: 9031820]

Avins AL, Woods WJ, Lindan CP, Hudes ES, Clark W, Hulley SB. HIV infection and risk behaviors among heterosexuals in alcohol treatment programs. Journal of the American Medical Association 1994;271:515–518. [PubMed: 8301765]

Bharadwaj A, Biswas R, Shetty KJ. HIV in Nepal: Is it rare or the tip of an iceberg? Tropical Doctor 2001;31:211–213. [PubMed: 11676055]

Biswas D, Hazarika NC, Hazarika D, Mahanta J. Prevalence of communicable disease among restaurant workers along a highway in Assam, India. Southeast Asian Journal of Tropical Medicine and Public Health 1999;30:539–541. [PubMed: 10774665]

Bohn MJ, Babor TF, Kranzler HR. The Alcohol Use Disorders Identification Test (AUDIT): Validation of a screening instrument for use in medical settings. Journal of Studies on Alcohol 1995;56:423–432. [PubMed: 7674678]

Bryan AD, Fisher JD, Benziger TJ. Determinants of HIV risk among Indian truck drivers. Social Science and Medicine 2001;53:1413–1426. [PubMed: 11710417]

Carey KB, Carey MP, Chandra PS. Psychometric evaluation of the AUDIT and DAST with psychiatric patients in India. Journal of Clinical Psychiatry. in press

Carey MP, Carey KB, Maisto SA, Gleason JR, Gordon CM, Brewer KK. HIV-risk behavior among outpatients at a state psychiatric hospital: Prevalence and risk modeling. Behavior Therapy 1999;30:389–406.

Carey MP, Carey KB, Maisto SA, Gordon CM, Vanable PA. Prevalence and correlates of sexual activity and HIV-related risk behavior among psychiatric outpatients. Journal of Consulting and Clinical Psychology 2001;69:500–505.

Carey MP, Carey KB, Weinhardt LS, Gordon CM. Behavioral risk for HIV infection among adults with a severe and persistent mental illness: Patterns and psychological antecedents. Community Mental Health Journal 1997;33:133–142. [PubMed: 9145255]

Carey MP, Weinhardt LS, Carey KB. Prevalence of infection with HIV among the seriously mentally ill: Review of research and implications for practice. Professional Psychology: Research and Practice 1995;26:262–268.

Castilla J, Barrio G, Belza MJ, de la Fuente L. Drug and alcohol consumption and sexual risk behaviour among young adults: results from a national survey. Drug and Alcohol Dependence 1999;56:47–53. [PubMed: 10462092]

Centers for Disease Control and Prevention. Trends in sexual risk behaviors among high school students--United States, 1991-1997. Morbidity and Mortality Weekly Report 1998;47:749–752. [PubMed: 9756456]

Channabasavanna, SM.; Ray, R.; Kaliaperumal, V. Patterns and problems of non-alcoholic drug dependence in Karnataka. Department of Health and Family Welfare, Government of Karnataka; Bangalore, India: 1990.

Cocco KM, Carey KB. Psychometric properties of the Drug Abuse Screening Test in psychiatric outpatients. Psychological Assessment 1998;10:408–414.

Cook RL, Pollock NK, Rao AK, Clark DB. Increased prevalence of herpes simplex virus type 2 among adolescent women with alcohol use disorders. Journal of Adolescent Health 2002;30:169–174. [PubMed: 11869923]

Cournos F, Guido JR, Coomaraswamy S, Meyer-Bahlburg H, Sugden R, Horwath E. Sexual activity and risk of HIV infection among patients with schizophrenia. American Journal of Psychiatry 1994;151:228–232. [PubMed: 8296894]

Drake RE, Wallach MA, Teague GB, Freeman DH, Paskus TS, Clark TA. Housing instability and homelessness among rural schizophrenic patients. American Journal of Psychiatry 1991;148:330–336. [PubMed: 1992835]

Eberstadt N. The future of AIDS. Foreign Affairs 2002;81(6):22–45.

Eicher AD, Crofts N, Benjamin S, Deutschmann P, Rodger AJ. A certain fate: spread of HIV among young injecting drug users in Manipur, north-east India. AIDS Care 2000;12:497–504. [PubMed: 11091782]

Ericksen KP, Trocki KF. Sex, alcohol and sexually transmitted diseases: a national survey. Family Planning Perspectives 1994;26:257–263. [PubMed: 7867773]

Gerbert B, Bronstone A, McPhee S, Pantilat S, Allerton M. Development and testing of an HIV-risk screening instrument for use in health care settings. American Journal of Preventive Medicine 1998;15:103–113. [PubMed: 9713665]

Hays RD, Merz JF, Nicholas R. Response burden, reliability, and validity of the CAGE, Short MAST, and AUDIT alcohol screening measures. Behavior Research Methods, Instruments, and Computers 1995;27:277–280.

Hosmer, DW.; Lemeshow, S. Applied logistic regression. Wiley; New York: 2000.

Kalichman SC, Carey MP, Carey KB. Human immunodeficiency virus (HIV) risk among the seriously mentally ill. Clinical Psychology: Science and Practice 1996;3:130–143.

Kalichman SC, Heckman T, Kelly JA. Sensation seeking as an explanation for the association between substance use and HIV-related risky sexual behavior. Archives of Sexual Behavior 1996;25:141–154. [PubMed: 8740520]

Kalichman SC, Kelly JA, Johnson JR, Bulto M. Factors associated with risk for HIV infection among chronic mentally ill adults. American Journal of Psychiatry 1994;151:221–227. [PubMed: 8296893]

Kelly JA, McAuliffe TL, Sikkema KJ, Murphy DA, Somlai AM, Mulry G, et al. Reduction in risk behavior among adults with severe mental illness who learned to advocate for HIV prevention. Psychiatric Services 1997;48:1283–1288. [PubMed: 9323747]

Kelly JA, Murphy DA, Sikkema KJ, Mulry GW, Fernandez MI, Miller JG, et al. Predictors of high and low levels of HIV risk behavior among adults with chronic mental illness. Psychiatric Services 1995;46:813–818. [PubMed: 7583483]

Kumar B, Gupta S. Rising HIV prevalence in STD clinic attenders at Chandigarh (north India)—a relatively low prevalence area. Sexually Transmitted Infections 2000;76:59. [PubMed: 10817077]

Larrat EP, Zierler S, Mayer K. Cocaine use and heterosexual exposure to human immunodeficiency virus. Epidemiology 1994;5:398–403. [PubMed: 7918808]

Laumann, EO.; Gagnon, JH.; Michael, RT.; Michaels, S. The social organization of sexuality: Sexual practices in the United States. University of Chicago Press; Chicago, IL: 1994.

Leigh BC. Alcohol and condom use: a meta-analysis of event-level studies. Sexually Transmitted Diseases 2002;29:476–482. [PubMed: 12172533]

Maisto SA, Carey MP, Carey KB, Gordon CM, Gleason JR. Use of the AUDIT and the DAST-10 to identify alcohol and drug use disorders among adults with a severe and persistent mental illness. Psychological Assessment 2000;12:186–192. [PubMed: 10887764]

McCusker JJ, Westenhouse J, Stoddard AM, Zapka JG, Zorn MW, Mayer KH. Use of drugs and alcohol by homosexually active men in relation to sexual practices. Journal of Acquired Immune Deficiency Syndromes 1990;7:729–736. [PubMed: 2352125]

Mueser KT, Doonan R, Penn DL, Blanchard JJ, Bellack AS, Nishith P, et al. Emotion recognition and social competence in chronic schizophrenia. Journal of Abnormal Psychology 1996;105:271–275. [PubMed: 8723008]

Ramrakha S, Caspi A, Dickson N, Moffitt TE, Paul C. Psychiatric disorders and risky sexual behaviour in young adulthood: cross sectional study in birth cohort. British Medical Journal 2000;321:263–266. [PubMed: 10915126]

Rosenberg SD, Goodman LA, Osher FC, Swartz MS, Essock SM, Butterfield MI, et al. Prevalence of HIV, Hepatitis B, and Hepatitis C in people with severe mental illness. American Journal of Public Health 2001;91:31–37. [PubMed: 11189820]

Saunders JB, Aasland OG, Babor TF, De La Fuente JR, Grant M. Development of the Alcohol Use Disorders Screening Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption--II. Addiction 1993;88:791–804. [PubMed: 8329970]

Scheidt DM, Windle M. Individual and situational markers of condom use and sex with nonprimary partners among alcoholic inpatients: Findings from the ATRISK study. Health Psychology 1996;15:185–192. [PubMed: 8698032]

Shillington AM, Cottler LB, Compton WM, Spitznagel EL. Is there a relationship between “heavy drinking” and HIV high risk sexual behaviors among general population subjects? International Journal of the Addictions 1995;30:1453–1478.

Skinner HA. A multivariate assessment of the MAST. Journal of Studies on Alcohol 1979;40:831–844. [PubMed: 513775]

Skinner HA. The Drug Abuse Screening Test. Addictive Behaviors 1982a;7:363–371. [PubMed: 7183189]

Skinner, HA. The Drug Abuse Screening Test (DAST): Guidelines for administration and scoring. Addiction Research Foundation; Toronto: 1982b.

Suresh Kumar, M.; Ray, R. Rapid assessment survey of drug abuse in India. Ministry of Social Justice and Empowerment and United Nations International Drug Control Programme; New Delhi, India: 2002.

Susser E, Valencia E, Conover S. Prevalence of HIV infection among psychiatric patients in a New York City men's shelter. American Journal of Public Health 1993;83:568–570. [PubMed: 8460736]

Thappa DM, Singh S, Singh A. HIV infection and sexually transmitted diseases in a referral STD centre in south India. Sexually Transmitted Infections 1999;75:191. [PubMed: 10448401]

UNAIDS/WHO Group on Global HIV/AIDS and STD Surveillance. Report on the global HIV/AIDS epidemic. WHO; Geneva: 1997.

Weinhardt LS, Carey MP. Does alcohol lead to sexual risk behavior? Findings from event-level research. Annual Review of Sex Research 2000;11:125–157.

Weinhardt LS, Carey MP, Carey KB, Maisto SA, Gordon CM. The relation of alcohol use to HIV-risk sexual behavior among adults with a severe and persistent mental illness. Journal of Consulting and Clinical Psychology 2001;69:77–84. [PubMed: 11302280]

Wenzel SL, Koegel P, Gelberg L. Antecedents of physical and sexual victimization among homeless women: a comparison to homeless men. American Journal of Community Psychology 2000;28:367–390. [PubMed: 10945122]

Woods WJ, Lindan CP, Hudes ES, Boscarino JA, Clark WW, Avins AL. HIV infection and risk behaviors in two cross-sectional surveys of heterosexuals in alcoholism treatment. Journal of Studies on Alcohol 2000;61:262–266. [PubMed: 10757137]

Table I

Individual Risk Items from the HIV-Risk Screening Instrument (HRSI) for the Past Year and Past Ten Years (N = 352)

Item	Past Year *n* (%)	Past Ten Years *n* (%)
Had two or more sexual partners	25 (7%)	111 (32%)
Had anal sex	13 (4%)	25 (7%)
Did not use condom when having anal sex	13 (4%)	23 (7%)
Had STD or symptoms of STD	5 (1%)	35 (10%)
Gave money or drugs in exchange for sex	17 (5%)	66 (19%)
Had sex with someone so they would give you money or drugs	2 (0.6%)	20 (6%)
Injected street drugs	7 (2%)	11 (3%)
Had partner who injected street drugs	1 (0.3%)	1 (0.3%)
Had sex with men who had sex with men	3 (1%)	6 (2%)
Had partner with STD	3 (1%)	12 (3%)
Any risk indicator	45 (13%)	141 (40%)

Table II

Logistic Regression Analyses Predicting HIV Risk (past 10 years)

Predictor Variables	*Wald-z*	*p*	*AOR*	*95% CI*
Psychiatric Variables				
Substance Use Disorder				
AUD	Reference		1.00	
DUD	1.16	ns	2.42	0.54 - 10.79
MUD	0.81	ns	2.00	0.38 - 10.64
Other Psychiatric Diagnosis				
No	Reference		1.00	
Yes	2.30	.05	3.73	1.22 - 11.45
Duration of Substance Use Disorder	0.37	ns	1.00	0.99 - 1.01
Age At First Hospitalization	-0.20	ns	0.99	0.86 - 1.13
Number of Previous Admissions	-0.36	ns	0.95	0.74 - 1.23
Demographic Variables				
Age	0.05	ns	1.00	0.87 - 1.15
Educational Level				
Pre-High School	Reference		1.00	
High School	0.29	ns	1.09	0.60 - 1.98
Post-High School	0.81	ns	1.33	0.67 - 2.66
Marital Status				
Married	Reference		1.00	
Single	-0.90	ns	0.74	0.38 - 1.42
Living Situation				
Own Home	Reference		1.00	
Others' Home	0.83	ns	1.25	0.74 - 2.11
Occupation Status				
Unemployed	Reference		1.00	
Non-professional	0.36	ns	1.13	0.60 - 2.12
Professional/Government	-1.57	ns	0.44	0.15 - 1.23
Substance Use Variables				
Cigarette Use				
No	Reference		1.00	
Yes	1.59	ns	1.54	0.90 - 2.61
Beedi Use				
No	Reference		1.00	
Yes	-0.19	ns	0.95	0.56 - 1.62
Chewing Tobacco Use				
No	Reference		1.00	
Yes	0.45	ns	1.15	0.63 - 2.08
Betel nut Use				
No	Reference		1.00	
Yes	-1.20	ns	0.70	0.40 - 1.25
AUDIT	3.81	.001	1.07	1.03 - 1.10
DAST	2.29	.05	1.19	1.03 - 1.38

Note. Wald-*z* statistics for the regression coefficients are based on the estimated variance-covariance matrix of parameter estimates in the logistic regression model; AOR = Adjusted Odds Ratio; CI = Confidence Interval; ns = non-significant; Adjusted Odds Ratios for categorical variables (diagnosis, dual-diagnosis, school, marital status, living situation, occupation, cigarette use, beedi use, chewing tobacco use, and betel nut use) are relative to the reference categories for each variable; Adjusted Odds Ratios for continuous variables reflect the increase in risk associated with an increase of 1 in the predictor variable; AUD = alcohol use disorder; DUD = drug use disorder; MUD = multiple substance use disorder.

Table III

Logistic Regression Analyses Predicting HIV Risk (past year)

Predictor Variables	*Wald-z*	*p*	*AOR*	*95% CI*
Psychiatric Variables				
Substance Use Disorder				
AUD	Reference		1.00	
DUD	-0.27	ns	0.79	0.15 - 4.33
MUD	0.38	ns	1.39	0.26 - 7.54
Other Psychiatric Diagnosis				
No	Reference		1.00	
Yes	2.43	.05	4.99	1.36 - 18.23
Duration of Substance Use Disorder	-0.48	ns	1.00	0.99 - 1.01
Age At First Hospitalization	-1.46	ns	0.88	0.74 - 1.05
Number of Previous Admissions	-0.32	ns	0.94	0.65 - 1.36
Demographic Variables				
Age	1.49	ns	1.15	0.96 - 1.37
Educational Level				
Pre-High School	Reference		1.00	
High School	-0.02	ns	0.99	0.38 - 2.56
Post-High School	0.80	ns	1.52	0.55 - 4.21
Marital Status				
Married	Reference		1.00	
Single	-0.63	ns	0.71	0.25 - 2.04
Living Situation				
Own Home	Reference		1.00	
Others' Home	0.13	ns	1.05	0.46 - 2.42
Occupation Status				
Unemployed	Reference		1.00	
Non-professional	0.37	ns	1.20	0.46 - 3.11
Professional/Government	-0.95	ns	0.42	0.07 - 2.49
Substance Use Variables				
Cigarette Use				
No	Reference		1.00	
Yes	-0.03	ns	0.99	0.42 - 2.32
Beedi Use				
No	Reference		1.00	
Yes	-0.01	ns	1.00	0.43 - 2.29
Chewing Tobacco Use				
No	Reference		1.00	
Yes	1.57	ns	1.94	0.85 - 4.44
Betel nut Use				
No	Reference		1.00	
Yes	-0.08	ns	0.96	0.39 - 2.39
AUDIT	1.18	ns	1.03	0.98 - 1.08
DAST	4.07	.001	1.40	1.19 - 1.65

Note. Wald-*z* statistics for the regression coefficients are based on the estimated variance-covariance matrix of parameter estimates in the logistic regression model; AOR = Adjusted Odds Ratio; CI = Confidence Interval; ns = non-significant; Adjusted Odds Ratios for categorical variables (diagnosis, dual-diagnosis, school, marital status, living situation, occupation, cigarette use, beedi use, chewing tobacco use, and betel nutuse) are relative to the reference categories for each variable; Adjusted Odds Ratios for continuous variables reflect the increase in risk associated with an increase of 1 in the predictor variable; AUD = alcohol use disorder; DUD = drug use disorder; MUD = multiple substance use disorder.

Table IV

Logistic Regression Analyses Predicting Endorsement of STD Symptoms (past year)

Predictor Variables	*Wald-z*	*p*	*AOR*	*95% CI*
Psychiatric Variables				
Substance Use Disorder				
AUD	Reference		1.00	
DUD	-1.07	ns	0.19	0.01 - 3.97
MUD	-0.05	ns	0.94	0.06 - 15.58
Other Psychiatric Diagnosis				
No	Reference		1.00	
Yes	2.99	.005	18.62	2.73 - 126.99
Duration of Substance Use Disorder	0.84	ns	1.00	0.99 - 1.01
Age At First Hospitalization	1.50	ns	2.20	0.78 - 6.16
Number of Previous Admissions	0.51	ns	1.32	0.45 - 3.78
Demographic Variables				
Age	-1.54	ns	0.45	0.16 - 1.24
Educational Level				
Pre-High School	Reference		1.00	
High School	-1.29	ns	0.29	0.04 - 1.89
Post-High School	-0.91	ns	0.40	0.05 - 2.90
Marital Status				
Married	Reference		1.00	
Single	0.05	ns	1.05	0.14 - 7.99
Living Situation				
Own Home	Reference		1.00	
Others' Home	-0.29	ns	0.79	0.16 - 3.84
Occupation Status				
Unemployed	N/A			
Non-professional	N/A			
Professional/Government	N/A			
Substance Use Variables				
Cigarette Use				
No	Reference		1.00	
Yes	-0.83	ns	0.50	0.10 - 2.54
Beedi Use				
No	Reference		1.00	
Yes	-1.72	ns	0.21	0.04 - 1.24
Chewing Tobacco Use				
No	Reference		1.00	
Yes	-0.35	ns	0.75	0.16 - 3.61
Betel nut Use				
No	Reference		1.00	
Yes	0.62	ns	1.70	0.32 - 9.11
AUDIT	1.27	ns	1.06	0.97 - 1.15
DAST	3.36	.001	1.62	1.22 - 2.14

Note. Wald-*z* statistics for the regression coefficients are based on the estimated variance-covariance matrix of parameter estimates in the logistic regression model; AOR = Adjusted Odds Ratio; CI = Confidence Interval; ns = non-significant; Adjusted Odds Ratios for categorical variables (diagnosis, dual-diagnosis, school, marital status, living situation, occupation, cigarette use, beedi use, chewing tobacco use, and betel nut use) are relative to the reference categories for each variable; Adjusted Odds Ratios for continuous variables reflect the increase in risk associated with an increase of 1 in the predictor variable; AUD = alcohol use disorder; DUD = drug use disorder; MUD = multiple substance use disorder.