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Men's Heavy Alcohol Use and Risk of HIV Acquisition and Transmission to Sexual Partners within Marriage in India

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Abstract

Background: Heavy episodic drinking by men in India and elsewhere is associated with their sexual risk behaviors, thereby increasing the risk for HIV. This paper assesses whether heavy episodic drinking is associated with acquisition of HIV among married men and its transmission to their spouses in India.

Methods: A case-control study was conducted from March-August 2010 among 595 cases (HIV positives) and 611 controls (HIV negatives) aged 18 years and above, recruited from HIV testing and treatment centers in seven districts of eastern and northern India. Logistic regression analyses were used to assess the associations between heavy episodic drinking (defined based on frequency and quantity) in the past 7 days and the following outcome variables: extramarital sex, men's HIV status and their spouse's HIV status.

Results: No significant difference was observed in the HIV status of men reporting heavy episodic drinking and those reporting light drinking (41% vs. 50%, adjusted odds ratio [AOR]=0.7, 95% confidence interval [CI]=0.5-1.0, p=0.083). However, men reporting heavy episodic drinking were more likely to have had sex with a paid partner (past 12 months) than light drinkers (25% vs. 12%, AOR=3.0; 95% CI=1.9-4.7, p<0.001). A higher proportion of men who were heavy episodic drinkers reported having an HIV positive wife than light drinkers (53% vs. 42%, AOR=4.1; 95% CI=1.8-9.2, p<0.001).

Conclusions: Men's heavy episodic drinking is associated with higher prevalence of HIV infection among their spouses. Prevention of heavy episodic drinking and associated men's risk behaviors may augment efforts to reduce the secondary transmission of HIV.

Key words: HIV; Alcohol; Risky sexual behavior; Marital relationship

Background

Alcohol consumption is increasingly being recognized as a global public health concern. It is regarded as the world's third largest risk factor for death and disability, particularly in middle income countries [1]. Although overall alcohol consumption is relatively low in India [2] as compared to global levels, a sizeable proportion of drinkers are considered "heavy" or "dependent" alcohol consumers [3]. Studies in India investigating alcohol dependence report that nearly 50% of those who consume alcohol are hazardous drinkers; that is, they consume more than five standard drinks on a typical occasion [3,4]. This has several implications as alcohol use by men has been identified as one of the major factors contributing to increased Sexually Transmitted Infections (STI) and sexual risk behaviors such as having multiple sexual partners and unprotected extramarital sex, both in developing and developed countries [5-14]. Further, studies in Africa report elevated rates of HIV among men and women linked to alcohol consumption before sex [6,15]. In Rakai, Uganda, in a study of over 14,000 women and men, alcohol use before sex increased HIV infection rates by 50% [15]. In rural eastern Zimbabwe, a population-based survey of nearly 10,000 women and men showed that visiting a beer hall in the last month was associated with both risky sexual behavior and HIV infection [6]. These findings have prompted increasing recognition of the pathways by which alcohol use, particularly heavy drinking and the types of alcohol consumed, may be a marker and facilitator for sexual transmission of HIV among men and women in India and elsewhere.

While the association between heavy alcohol use and a risky behavior is documented [5-14], we could not locate published literature on the association between men's heavy episodic drinking and their own and spouse's HIV sero-status in India. A study conducted in STI clinics in Mumbai, India documents an increased risk of HIV and other STI among men who reported consuming alcohol before visiting a female sex worker [5]. Investigation into the linkages between heavy episodic drinking and HIV acquisition and transmission is particularly important in the Indian context, especially in light of an increasing trend of alcohol use by the general population [3] and the presence of a number of HIV sero-discordant couples in the general population [16]. Therefore, this study examines whether married men's heavy episodic drinking is associated with their sexual risk behaviors, their HIV sero-status and their wife's HIV sero-status.

Methods

Sample

Data for this study were obtained from research conducted during March - August 2010 in seven districts across three states of northern and eastern India, Orissa, Bihar and Uttar Pradesh (UP), using a case-control study design. Cases included currently married HIV sero-positive men and controls included currently married HIV sero-negative men. All participants had been tested for HIV six months

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prior to the survey. Cases were recruited from among those men who visited government-run Integrated Counseling and Testing Centers (ICTCs) and/or Anti-Retroviral Therapy (ART) centers to collect their HIV test results and/or to register for counseling, while controls were recruited from the same ICTCs by matching for their age, marital status and recruitment location.

Study participants were contacted by trained male researchers and were asked to visit identified private rooms within the centers for a face-to-face interview where they were screened for eligibility. In all, 1500 men were contacted and screened, of whom 1230 (82%) met the eligibility criteria: 18 years or older, currently married, had tested for HIV six months prior to the survey, were carrying their HIV sero-status report, and were willing to participate in the study. HIV sero-status was confirmed by medical records or test reports brought by the participants. Of those eligible for the interview, 24 men did not complete their interview, resulting in an analytical sample of 1206 participants (HIV sero-positive: 595, HIV sero-negative: 611). The association between men's heavy alcohol use and their wife's HIV sero-status was assessed only among the sub-sample of men who reported that they knew their wife's HIV sero-status (n=724 cases).

Human subject protections

This study was conducted as a partnership between National AIDS Control Organization (NACO), Population Council and United Nations Development Fund (UNDP). Procedures for the study were reviewed and approved by the ethics committee of NACO and Population Council. Written informed consent was obtained from each study participant prior to their participation in the survey. Participants were given a compensation of Indian rupees (INR) 100 (approx.US$ 2.00, 1 US$=INR50) for their time in this study.

Main Outcome Measures

Men and their wife's HIV sero-status: Men's HIV sero-status was recorded as positive or negative. To assess wife's HIV sero-status, male participants were asked a question in the survey and responses were recorded as HIV sero-positive, HIV sero-negative, does not know HIV sero-status or partner not tested for HIV. For both men and their wife, HIV sero-positive status and HIV sero-negative status were two categories of the variables. These variables served as the primary outcomes.

Men's sexual risk behaviors: Men's sexual risk behaviors were assessed using single item questions asked in the survey regarding extramarital sex with a female (ever and in past 12 months), sex with paid female partners (ever and in past 12 months) and condom use in last sex with paid female partner. Sex with paid female partners was assessed by asking participants if they had paid money for sex with a female. These variables were considered as secondary outcomes to assess their association with alcohol use.

Alcohol use: Alcohol use was measured based on two questions that collected information on the frequency and quantity of alcohol consumption. Frequency of alcohol consumption was recorded as the number of days the respondent consumed alcohol in a typical week over the last 30 days. For quantity of alcohol consumed, the number and volume of drinks consumed on a typical day over the last 30 days was recorded. Quantity of pure alcohol consumed on a typical day was derived from this variable by converting the number, volume and type of drinks consumed to grams of pure ethanol [17]. In accordance with the World Health Organization's *Global Status Report on Alcohol and Health*, heavy episodic drinking was defined as drinking at least 60 grams or more of pure alcohol on at least one occasion in the past 7 days [1]. Men's alcohol use was used as the main independent variable.

Socio-demographics: Men's age, literacy level, family income, caste, and source of referral for HIV testing were assessed via single response questions. Although responses on family income were obtained as a continuous variable, it was dichotomized based on a median split due to a skewed distribution (> INR 2500, <=INR 2500). Literacy level was divided into two categories: no formal education and at least one year of formal education. The question on caste, which is an indirect measure of social status in the Indian context, was divided into two categories: Scheduled Caste or Scheduled Tribe (lower in social status), and Other Backward Class or General Caste (relatively higher in social status). Participants were asked a question on their source of referral for HIV testing and responses were grouped into two categories: self/friend/relative (informal referral) and Non-Governmental Organization (NGO)/hospital/health clinic (formal referral).

Statistical analyses: Descriptive statistics were assessed for all demographic covariates, dependent and independent variables. Tests for difference of proportions and t-tests were conducted to assess demographic differences between participants who knew their wife's HIV sero-status and those who did not. Bivariate and multivariate associations, adjusted for age, education, family income, caste and source of referral, between each independent variable and respondent's risky sexual behavior indicators, HIV sero-status and their wife's HIV sero-status were assessed. Further, a sub-sample of participants who were HIV sero-positive was analyzed to examine the relationship between men's heavy episodic drinking and spouse's HIV sero-status. Similar analyses were conducted for the sub-sample of participants who were HIV sero-negative. All statistical analyses were conducted using STATA version 10.0 (Stata Corp., College Station, TX, USA).

Results

Sample characteristics

HIV sero-positive participants were older than HIV sero-negative participants (mean: 35.5 vs. 33.4 years, p<0.001). A higher proportion of HIV sero-positive participants had no formal education (33.5% vs. 24.1%, p<0.001) and had less family income (65.7% vs. 38.9%, p<0.001) (Table 1). Only 60% of all participants knew their wife's HIV sero-status. The socio-demographic characteristics in terms of age, literacy and sources of referral of participants who knew and those who did not knew their wife's HIV sero-status were not significantly different.

Association between men's alcohol use, HIV sero-status and sexual risk behaviors

Results of the multivariate logistic regression analysis in Table 2 suggest that heavy episodic drinkers were more likely to report extramarital sex with a female in the past 12 months (28.3% vs.14.6%, adjusted odds ratio (AOR)=2.9, 95% Confidence Interval (CI)=1.9-4.5, p<0.001) and sex with paid female partner in past 12 months (25% vs. 12.1%, AOR=3.0, 95% CI=1.9-4.7, p<0.001) than light drinkers. There was no significant association observed between alcohol use and men's HIV sero-status, indicating that similar proportions of men from both HIV sero-positive cases and HIV sero-negative controls reported heavy episodic drinking (p=0.083) (Table 2).

Table 1: Socio-demographic characteristics of men by their HIV sero-status and knowledge of wife's HIV sero-status (N=1206).

Characteristics	Total sample			Men who:		
	HIV sero-positive N=595	HIV sero-negative N=611	p-value[1]	Knew wife's HIV sero-status N=724	Did not know wife's HIV sero-status N=482	p-value[1]
	n (%) or Mean (SD)	n (%) or Mean (SD)		n (%) or Mean (SD)	n (%) or Mean (SD)	
Site						
Ganjam, Orissa	208 (35.0)	206 (33.7)		280 (38.7)	134 (27.8)	
Northern Bihar	194 (32.6)	202 (33.1)		182 (25.1)	214 (44.4)	
Eastern UP	193 (32.4)	203 (33.2)	0.90	262 (36.2)	134 (27.8)	<0.001
Source of referral for HIV testing[2]						
Formal	449 (75.5)	462 (75.6)		551 (76.1)	360 (74.7)	
Informal	146 (24.5)	149 (24.4)	0.95	173 (23.9)	122 (25.3)	0.58
Age (years)						
Mean (SD)	35.5 (7.3)	33.4 (8.5)	<0.001	34.4 (7.50)	34.6 (8.69)	0.64
Literacy level						
No formal education	199 (33.5)	147 (24.1)		206 (28.5)	140 (29.1)	
Formal education	396 (66.5)	464 (75.9)	<0.001	518 (71.5)	342 (70.9)	0.82
Family income (INR)						
> 2500	204 (34.3)	373 (61.1)		298 (41.2)	279 (57.9)	
< 2500	391 (65.7)	238 (38.9)	<0.001	426 (58.8)	203 (42.1)	<0.001
Caste/Class						
Scheduled Caste / Scheduled Tribe	164 (27.6)	185 (30.3)		171 (23.6)	178 (36.9)	
General Class/ Other Backward Class	431 (72.4)	426 (69.7)	0.3	553 (76.4)	304 (63.1)	<0.001

1.Chi square p-value
2.Informal source of referral: referred for HIV testing by self /friend /relative
Formal source of referral: referred for HIV testing by NGO /hospital /health clinic

Table 2: Association between men's alcohol use, HIV sero-status and sexual risk behaviors (N=1206).

Sexual risk behaviors/HIV status	Alcohol use		
	Light drinking (N=1054)	Heavy episodic drinking1 (N=152)	AORHD vs. LD (95% CI)3
Extramarital sex with female (ever)	37.7	53.3	1.9 (1.4-2.8)
Extramarital sex with female (past 12 months)	14.6	28.3	2.9 (1.9-4.5)
Sex with paid female partner (ever)	25.8	38.8	1.9 (1.3-2.8)
Sex with paid female partner (past 12 months)	12.1	25.0	3.0 (1.9-4.7)
No condom use in last sex with paid female partner2	83.8	81.5	0.9 (0.3-2.7
HIV sero-positive	50.5	41.5	0.7 (0.5-1.0)

1Heavy episodic drinking: defined as drinking at least 60 gm or more of pure ethanol at least once in the past seven days
2 Subset of those who had extramarital sex with a paid partner (144 values missing)
3AOR: Adjusted Odds Ratio; CI : Confidence interval; HD: Heavy drinking; LD: Light Drinking; Reference category: light drinking; adjusted for site, source of referral, participant's age, literacy level, family income and caste

Association between men's alcohol use, men's HIV sero-status and wife's HIV sero-status

The odds of a wife being HIV sero-positive were four times higher among men who were heavy episodic drinkers than among those who were light drinkers (53.3% vs.41.6%, AOR=4.1, 95% CI=1.8-9.2, p<0.001) (Table 3). Men's HIV sero-status, an important confounder, had a very high and significant association with wife's HIV sero-status (65.9% vs.3.1%, AOR=108.2, 95% CI=47.2-247.6, p<0.001). A sub-sample analysis by male HIV sero-positivity indicated that a wife was four times more likely to be HIV sero-positive if her husband was a heavy episodic drinker than if her husband was a light drinker (88.1% vs.63.7%, AOR=4.4, 95% CI=1.6-11.8, p=0.02). However, this relationship was not statistically significant among wives of HIV sero-negative men.

Discussion

This study examines the proposition that men who are heavy episodic drinkers are at a higher risk for acquiring and transmitting HIV as compared to men who are light drinkers. The survey results suggest that men who are heavy episodic drinkers are fairly similar to light drinkers in terms of their risk of HIV infection; however, heavy episodic drinkers are more likely to have an HIV sero-positive wife than others. The relationship between men's heavy alcohol use and wife's HIV sero-status persisted even after controlling for socio-demographic and other characteristics. Results of the association between men's heavy episodic drinking and their wife's HIV sero-status provide empirical evidence for suggestions made in studies in India and South Africa that husbands are more likely to be infected with HIV than their wife in discordant couples and are more likely to transmit HIV to their spouse in the presence of vulnerability factors [16,18-20].

The finding that HIV sero-positive men who are heavy episodic drinkers are more likely to have an HIV sero-positive spouse than HIV sero-positive men who are light drinkers suggests a need for programmatic intervention to control heavy alcohol use among HIV infected population. It is particularly important as the previous studies suggest a strong physiological effect of heavy alcohol use on HIV: increasing the viral load level and decreasing the CD4 count of HIV sero-positive persons [21-24]. These studies suggest that heavy episodic drinking by HIV sero-positive individuals may contribute to the increased spread of HIV infection. These findings highlight the double jeopardy faced by married women whose husbands are heavy episodic drinkers and are infected with HIV. In addition to HIV risk among women from their husbands, one could argue that some women may also be putting their husbands at risk either due to their own extramarital sex behaviors or becoming HIV-infected prior to marriage. Further in-depth studies are needed to examine these issues.

Although men's heavy episodic drinking showed no association with their own HIV sero-positive status, they reported higher levels of sex with sex workers than men who were light drinkers. This result is consistent with earlier studies in India which document those men who consume alcohol infrequently or in small quantities are less likely to engage in risky sexual activities than men who are heavy alcohol users [5,10-14].

These findings suggest that HIV intervention programs should focus on the sub-group of HIV sero-positive men who are heavy episodic drinkers and whose wives are HIV sero-negative or have not been tested for HIV. Such men in the community or in known networks, including health care settings, could be identified for intervention using a screening tool such as AUDIT [25]. Due to high levels of self-stigma associated with the disease [26,27], men with HIV may not disclose their status to their spouse and continue to be heavy episodic drinkers. If effective interventions are to be designed for men who are heavy episodic drinkers and their partners, further research is needed on the factors that delay the diagnosis of HIV among these men, as well as on factors that create barriers to disclosure of HIV sero-status to their spouse and hinder the adoption of safe sexual practices within marital relationships.

Although these findings offer important evidence on the relationship between men's heavy episodic drinking and the HIV sero-status of individuals within marital relationships, they need to be interpreted cautiously in the light of several limitations. First, a case-control study conducted in HIV testing and treatment centers limits the generalizability of findings to the general population. Further, the study could not account for change in alcohol use among men before and after their HIV sero-positivity. It may be that some men who were heavy episodic drinkers prior to the study and were HIV sero-positive may have stopped consuming alcohol soon after counseling at the HIV testing centers. Also, some men who were not heavy episodic drinkers at the time of the survey may have started drinking heavily after they were diagnosed with HIV. In addition, the survey did not collect information on viral load and CD4 counts of HIV sero-positive individuals. It would have been interesting to see the relationship of these two factors with alcohol consumption. We recommend that future research studies should collect data on this aspect and examine the relationship with pattern of alcohol consumption. Additionally, it may not be possible to establish a strong causality due to the lack of

Table 3: Association between men's alcohol use, men's HIV sero-status and wife's HIV sero-status (N=724).

Characteristics	**Wife HIV sero-positive**			
	N	% positive	Crude OR (95% CI)	Adjusted OR[1] (95% CI)
Alcohol use				
Light drinking	649	41.6	Referent	Referent
Heavy episodic drinking	75	53.3	1.6 (1.0-2.6)	4.1 (1.8-9.2)
Men's HIV sero-status				
Positive	458	65.9	62.4 (30.1-129.5)	108.2 (47.2-247.6)
Negative	266	3.1	Referent	Referent
Sub-group analysis: HIV sero-positive men				
Alcohol use				
Light drinking	416	63.7	Referent	Referent
Heavy episodic drinking	42	88.1	4.2 (1.6-10.9)	4.4 (1.6-11.8)
Sub-group analysis: HIV sero-negative men				
Alcohol use				
Light drinking	233	2.2	Referent	Referent
Heavy episodic drinking	33	9.1	4.5 (1.0-20.0)	4.1 (0.8-19.6)

OR - Odds Ratio, CI - Confidence interval
[1]Adjusted for men's HIV sero-status, site, source of referral, participant's age, literacy level, family income and caste

information on when men and their wives were infected with HIV, and some men's self-reports of not knowing their wife's HIV status. In order to control the bias in the duration of HIV diagnosis, only men who were tested for HIV six months prior to the survey were recruited. Since this survey targeted only currently married men in three states of India, our findings cannot be generalized to all men in the country.

Conclusion

In conclusion, this study shows that men who are heavy episodic drinkers are more likely to have a HIV sero-positive wife than men who are light drinkers. HIV intervention programs in India need to target population groups such as married women as many of them are at risk of HIV due to their husband's lifestyle and sexual behaviors. Our data underscores the importance of developing prevention and treatment programs that target alcohol users and focus on spousal relationships to increase HIV awareness and treatment literacy among both partners.

Conflicts of Interest and Source of Funding

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