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Alcohol use, Mental Health, and HIV-related Risk Behaviors Among Adult Men in Karnataka

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Abstract

This study critically examined associations among past year alcohol use, self-rated mental health and HIV risk-related behaviors for men and their partners, i.e., two or more partners and/or perpetration of partner violence. Data are reported from a population sample of 1137 men aged 16 to 49 in Karnataka. Overall, 9.5% of all men reported HIV risk-related behaviors, 38.1% consumed alcohol, and about half (54.5%) of all current drinkers met criteria for hazardous alcohol use. Hazardous alcohol use and poorer mental health remained significantly associated with HIV-risk related behaviors after controlling for socio-demographics and psychosocial risk factors. More severe alcohol misuse, specifically alcohol dependence, and co-morbid hazardous alcohol use and poorer mental health, was associated with over 2 and 5 fold increases respectively in men's HIV risk-related behaviors. Implications of findings for HIV prevention and intervention programs for men and their partners and directions for future research are discussed.

Keywords

hazardous alcohol use; mental health; HIV risk-related behaviors; men; partner violence

INTRODUCTION

There has been an exponential increase in alcohol production and consumption in India in recent years(1). Abstinence remains relatively high among men and virtually the norm among women(2,3). However, a large majority of male drinkers meet criteria for hazardous alcohol use, defined as patterns of use that increase risk for harmful consequences for the user or others (4). Hazardous alcohol use represents a public health hazard despite the absence of any current disorder in the individual user(4).

Because it occurs in larger proportions of alcohol users compared to alcohol use disorders (AUDs) and impacts not only the drinker but also their families and communities, hazardous alcohol use is critical to assess for prevention and intervention efforts. Data from different Indian states indicate that 35% to 65% of all current drinkers meet criteria for hazardous alcohol use(5-10). Unfortunately despite the public health crisis it represents(11), hazardous alcohol use has received inadequate attention in India(7,9,12).

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Alcohol Misuse and HIV risk-related behaviors

HIV risk behaviors are associated with diverse alcohol misuse patterns. Studies in India document a higher prevalence of HIV and of sexual risk behaviors, including unprotected sex, among alcohol dependent men(13-15), among men at alcohol venues (wine shops) compared to men in the community(16,17), and among men using alcohol on a daily or weekly basis in low income communities in Mumbai(18). Associations between alcohol-related intoxication and condom non use with commercial sex workers are also reported for men attending clinics for sexually transmitted diseases(19). However, studies examining men's alcohol use and HIV risk behaviors have primarily focused on select samples and there is a relative lack of population based studies in India. There is also a paucity of studies that focus on hazardous alcohol use as opposed to alcohol use disorders.

Other factors in the alcohol-HIV risk association

Alcohol use does not occur in isolation but rather within the larger context of men's lives. Thus, several factors may modify the associations of hazardous alcohol use and HIV-risk related behaviors, potentiating or weakening the links. For instance, personality factors, such as sensation seeking, are documented to potentiate links between alcohol use and sexual risk behaviors in alcohol dependent men(13,14). Childhood sexual victimization is also documented to increase HIV risk behaviors, such as unprotected sex and male to male sex (20,21). In contrast, social support has been associated with reduced HIV risk behaviors (22, 23). For instance, a study of HIV positive men found that the availability of family members was predictive of decreased risky behaviors among HIV positive men(22) and partner support for HIV risk-specific behavior decreased risk behavior among gay male couples(24). However, studies in India, have not yet addressed the possible role of childhood victimization or self-reported social support as modifiers of associations between of men's alcohol use and HIV risk behaviors.

Mental health, in particular, may play a substantial role in associations between alcohol use and HIV-risk behaviors. Poor mental health often co-occurs with alcohol use disorders (25) and increases risks for poorer health and substance use treatment outcomes (26,27). Mental health has a key role in general health and wellbeing, including in middle and low-income countries(28). Research outside India suggests that depression increases HIV risk behaviors for men of diverse ethnic backgrounds(29,30,31). Psychiatric clinic data from South India demonstrated that the strongest predictor for sexual risk among both men and women with mental illness was co morbid alcohol use (Murthy, in this issue). Unfortunately, poor mental health has been largely overlooked in other Indian studies on alcohol use or sexual risk. It is unknown whether poor mental health or that co-occurring with alcohol use plays a role in HIV risk behaviors among men in the general population.

In sum, studies have not yet attempted to examine the complexity of associations between alcohol use and HIV risk by including poor mental health and other psychosocial factors mentioned above.

Partner Violence as a HIV-risk behavior

Another gap in existing research on alcohol and HIV risk in India is the relative inattention to the perpetration of partner violence as a male behavior that may increase women's risk for HIV exposure. The importance of partner violence as a male HIV-related risk behavior for their female partners is suggested by reports that women with physically violent partners have higher risks for sexually transmitted infections (STIs) and for HIV positivity compared to those not reporting partner violence(32,33). Indeed, male partner violence severity correlates with the level of men's other sexual risk behaviors (34). Studies in India document a four-fold increase

in HIV prevalence among married women who experience spousal violence compared to those who do not(35) and that wives of abusive men are at 7 times the risk for HIV infection(36).

Partner violence may be a marker for men's sexual risk behaviors. For instance, men who perpetrate violence against their wives are more likely to participate in extramarital sex and contract an STI compared to non-violent husbands(36,37). Partner violence is also a marker for gender inequity. Subordination of women is reported to help the spread of HIV(38) through impairment of open communication regarding safe sex practices(32). Because, violence against women by their partners is widespread in India (39,40), including male partner violence in studies of HIV risk-related behaviors among men in India is especially important.

The Present Study

We attempted to address several limitations of existing research in India by: a) systematically examining associations between diverse alcohol use patterns, including hazardous alcohol use with HIV risk behaviors in a population sample of adult men in Karnataka; b) including past year reporting of multiple sex partners and perpetration of physical partner violence as HIV-related risk behaviors relevant to both men and their partners; c) critically evaluating the unique contribution of alcohol use to HIV risk-related behaviors, controlling for other HIV risk factors, including demographics and psychosocial factors that might exacerbate or protect against the risk for HIV behaviors. Specifically, we included in our study putative, i.e., self-reported mental health and childhood sexual victimization, and protective, i.e., social support, risk factors in HIV risk among men; and d) examining the role of co-morbid alcohol use and poor mental health in men's sexual risk behaviors.

METHOD

Sample

We report on data gathered in 2003 in the state of Karnataka as part of a larger international study on gender and alcohol(41). The study consisted of a regional household survey conducted in 5 districts of Karnataka(2,42). In order that the sample be representative of the state, sampling units were randomly selected from districts that spanned the human development (HD) spectrum specified in the Human Development Report for Karnataka(43). Thus, the districts chosen included the higher (Bangalore Urban, ranked 2), and lower (Bidar, ranked 18) ends of the HD spectrum and three districts in between (Dakshina Kannada, Bangalore Rural and Davangere; ranked 4, 8 and 11 respectively). Four of the chosen districts each border a different neighboring state of Karnataka (Maharashtra, Kerala, Tamil Nadu, and Andhra Pradesh), the fifth is centrally located. Thus the sampling units also ensured geographical representativeness.

Random stratified sampling, proportional to population size, was used to obtain a representative sample of men age 18 to 49. Given the focus on HIV risk behaviors, we did not include men over the age of 50 so as to maximize reporting of past year sexual activity and related risk behavior. The chosen age range for respondents was also consistent with those in other recent Indian studies on HIV and alcohol use (3,6). The sample was representative of within district age and gender distributions of the 2000 Census for Karnataka (44). Household and within-household respondent refusal rates were both under 1 percent. This suggested minimal sampling and methodological biases and data are reported as such and are not weighted.

Due to issues with data integrity, analyses in the present study excluded the data from the southern district of Dakshina Kannada (roughly 3% of the potential sample, 46 men). Data from a total of 1137 men aged 16 to 49 are reported. Table 1 presents demographic information on study respondents. The majority were from urban areas (63.1%), residing primarily in Karnataka's largest city of Bangalore (56.2%) with the remainder living in Bidar (16.1%),

Davangere (14.7%) and rural Bangalore (13.0%). More than half of the study sample was under age 30 (56.8%) and had completed at least a high school education (58.9%). Just over half of all respondents were married or living in a partnered relationship (58.2%) with an additional 3.8% reporting a very close, romantic relationship with someone in the past year. The predominant religion was Hindu (78.5%) and most reported at least part-time employment (89.4%).

Measures—In addition to demographic information, information regarding HIV risk-related behaviors, alcohol use, and psychosocial measures were gathered via structured household interviews (for details, see(2,41,42)).

HIV risk-related behaviors, the main outcome of interest, was defined as the reporting of 2 or more sexual partners and/or perpetration of partner physical violence in the past year by respondents. All respondents who reported being in a married/cohabiting status or in a romantic relationship in the past year were asked about *how many sexual partners* they had in the past year. Men who reported 2 or more partners in the past years were coded as positive on HIV risk behaviors. *Perpetration of Partner Physical Violence* was assessed by asking all men in a married/cohabiting/relationship about the most physically aggressive act perpetrated toward their partner in the past year with a question used previously in prior research both on violence (45) and in international research on alcohol and violence(46,47): “Did you do any of these aggressive things to anyone in a romantic relationship with you (your spouse, partner, or someone with whom you had a close romantic relationship) in the past 12 months?”. This item was among other survey items on partner violence that were prefaced by defining aggression as follows: “People can be physically aggressive in many ways, for example, pushing, punching, or slapping or physically aggressive in some other way”. Such descriptions of aggression capture physical violence while avoiding societal or personal standards that respondents may use to label a given physical act as aggression or violence(48).

Alcohol use patterns, the key variables in the present study, were assessed to include: *Usual quantity* of alcohol via an item on consumption of any type of alcohol: “On those days when you had any kind of beverage containing alcohol, how many drinks did you usually have per day?”. *Usual frequency* of drinking alcohol was assessed by asking “In the past 12 months, how often did you have any kind of beverage containing alcohol?”. *Frequency of heavy drinking*, was defined as the consumption of five or more standard drinks (50g or more of alcohol) in a day, consistent with international standards for heavy alcohol use(49). All questions on alcohol use included detailed beverage-specific drink size information and reflected the region-specific standard drink size of 10 grams. Beverages assessed included beer, wine, spirits and relevant regional beverages of arrack and bhatti sarai.

Hazardous alcohol use and level of alcohol misuse was assessed using the Alcohol Use Disorders Identification Test (AUDIT). The AUDIT was developed by the World Health Organization that screens for hazardous alcohol use and Alcohol use disorders (AUDs), including harmful alcohol use and alcohol dependence(50,51). It has been used world-wide, including in general population surveys(52-54). In India, the AUDIT has been used in different parts of the country with select and/or venue samples of industrial workers, primary care outpatients, psychiatric inpatients, and substance use treatment and community outreach center attendees(55-57) and, more recently, with population samples(6).

The ten AUDIT items represent three conceptual dimensions: consumption, dependence, and alcohol-related consequences(51) and are each coded 0 to 4. When summed, scores of 8, 16, and 20 or more indicate the level of alcohol misuse as hazardous use, harmful use (alcohol abuse) and alcohol dependence, respectively(50). We used the AUDIT as employed in population level alcohol surveys, including in the multi-country GENACIS study(58). Thus,

information for the first 3 items on consumption are obtained from that on usual quantity and frequency, and on frequency of heavy drinking as described previously, and the 7 AUDIT problem items administered as part of screening for alcohol use problems.

Childhood sexual victimization was assessed by 2 survey items that asked if respondents had experienced anyone trying to make them “do sexual things or watch sexual things?” before they were 16 years old. These items were adapted from those previously used in alcohol epidemiology surveys in the United States(59). Respondents experiencing any of these acts, perpetrated by any familial or non-familial person, were coded as having experienced childhood sexual victimization.

Mental health

Participants were asked, “In general, how has your emotional/mental health been in the last 12 months?” Likert scale response options included ‘poor’, ‘fair’, ‘good’, ‘very good’ or ‘excellent’. Responses of “poor” or “fair” were coded as reporting poorer (not good) mental health.

Social Support

A single-item assessed the number of persons in men’s social network: “Apart from your spouse/partner/romantic partner, how many persons do you feel confident that you can talk to about an important personal problem?” Responses were categorized as none, one, two to three, four to five, and six or more persons. Such items have been used in prior epidemiological research on alcohol use and social support in Europe and North America(60,61).

Analysis—Past year prevalence of either risk behavior alone was relatively low in our sample (see Table 2). Therefore, for purposes of analyses, reporting of either behavior indicated past occurrence of HIV risk behaviors. We first used bivariate analyses to assess relationships of HIV risk-related behavior with alcohol use patterns, and other psychosocial covariates. Chi-square and logistic regressions were used for these analyses to compute associated risks for each variable. Because associations were robust between HIV risk behaviors and past year alcohol use, particularly hazardous alcohol use, we then conducted logistic regression analysis to determine whether associations between alcohol use and HIV risk would persist even when other risk factors for HIV behaviors, found to be significant in the bivariate analyses, were controlled for.

Three logistic regression models, utilizing significant ($p < .10$) covariates from bivariate analyses assessed multivariate relationships between demographic, other significant covariates and hazardous alcohol use with HIV risk-related behaviors among current drinkers only. The first model used hazardous vs non hazardous alcohol use. The second model used level of alcohol misuse (non hazardous vs hazardous vs abuse vs dependence) as the key alcohol use variable. In these two models, we explored the relationship of mental health and hazardous drinking to men’s HIV risk behaviors by including appropriate interaction terms. The third model examined co-morbidity of hazardous alcohol use and fair or poor mental health as a predictor of HIV risk-related behaviors among drinking men. Thus, via these three models we examined the presence of each health issue alone (poorer mental health and hazardous alcohol use) and their co-occurrence.

Because a large amount of co-variation might be expected for poor mental health, hazardous alcohol use, childhood sexual abuse, and social support, prior to running the final models, we assessed collinearity among all variables. Factor analyses indicated that alcohol use, childhood sexual abuse and HIV risk behaviors loaded on the same factor and social support on a separate

factor. However, a condition number of 0.28 (minimum to maximum eigenvalue ratio: .47/1.69) suggested lack of substantial collinearity.

The multivariate models used forward stepwise entry, entering conceptually related variables that were significant in bivariate analyses in blocks as follows: demographics (age, education, and marital status, step 1), social support and mental health rating (step 2), and lastly, the alcohol use pattern in question (hazardous vs non hazardous use, alcohol misuse level, co-morbid hazardous alcohol use and poorer mental health).

RESULTS

Past year prevalence of HIV risk-related behaviors, hypothesized associated covariates for HIV risk-related behaviors, and alcohol use are presented in Table 2.

HIV risk-related behaviors

Of the 1,137 men, 4.7% (n=54) reported sexual activity with at least 2 partners; 5.6% (n=64) indicated perpetration of violence against an intimate partner in the past year. Overall, less than 10% of all men (9.5%, 108 of 1137) and roughly 1 in 5 current drinkers (18.2%; 79 of 433) reported one or more HIV risk behaviors in the past year. The overlap of HIV risk-related behaviors was also low. Less than one percent of all men met criteria for both HIV risk-related behaviors; 2% of current drinkers (men reporting consuming at least a full drink in the past year) reported both risk behaviors (10 of 433). Less than 10% of those reporting any risk-related behaviors reported occurrence of both behaviors (10 of 118).

Psychosocial covariates

Less than 1 in 10 (9.3%) percent of all men reported childhood sexual victimization. Regarding social support, one in five men (19.2%) reported no one to talk to about important problems while 23.0% reported at least six persons; 31% reported 2 to 3 people whom they could discuss important personal problems. Very few men (1.2%, n=12) described their past year emotional/mental health as poor, but together 12.2% reported poorer mental health (fair or poor).

Alcohol Use Patterns

Consistent with other studies(2,6), a large proportion of the men reported not consuming alcohol in the past year (61.9%), about 1 in 10 (11.7%) reported consuming alcohol prior to the past year. One in 6 of all respondents reporting drinking 4 or more times a week and 9.5% drank at least 2-3 times a week. Among current drinkers (n=433), over half (60.8%) reported heavy consumption (5 or more drinks) in a usual occasion, and 54.5% reported heavy consumption at least monthly in the past year. Over half of all drinkers (56.4%) met criteria for hazardous alcohol use, defined by a score of 8 or greater on the AUDIT(50).

Bivariate associations with HIV risk-related behaviors are presented in Table 3. Any lifetime alcohol use increased risk for past year HIV risk-related behavior. Men reporting alcohol consumption in the past year were 6.15 times more likely to report a HIV-related risk behavior compared to men who had never consumed alcohol ($p<.001$) and a trend was found for ex-drinkers (those who drank prior to the past year) to be twice as likely to report HIV risk-related behaviors compared to lifetime abstainers ($p=.09$). Hazardous drinkers were almost 7 times ($p<.001$) and non-hazardous drinkers 3 times ($p<.001$) more likely to report HIV risky behavior than their non-drinking counterparts. Among current drinkers, the severity of alcohol misuse showed a linear association with HIV risk related behaviors. Drinkers meeting AUDIT criteria for alcohol abuse and dependence were more likely to report risk behavior compared to non hazardous drinkers (COR=2.35, $p=.05$; abuse versus non hazardous use; COR=3.55, $p<.00$; dependence versus non hazardous use). Risks associated with hazardous alcohol use, without

alcohol abuse and/or dependence, compared to non hazardous alcohol use were not statistically significant.

Past year HIV-risk related behaviors were also associated with demographics. Men between the ages of 30-39 were more likely to report risk (COR=1.89, $p<.02$) than those ages 16-29 as were those with less education (COR=1.82, $p=.04$). Married/cohabiting men were 4.16 times more likely ($p<.00$) to report HIV risk-taking than unmarried men. Poorer mental health increased risk (COR=3.54, $p<.00$) and having at least one person to talk to (social support) was associated with a trend in reduced risk for HIV risk-related behaviors (COR=0.57, $p=.06$).

Multivariate Analyses

All models indicated that the following demographic and psychosocial covariates were significantly associated with HIV risk-related behaviors among men: Age (30-39), being married, and poorer mental health functioning (see Table 4). Education and social support, ceased to be significant when other variables were accounted for.

Hazardous alcohol use in the past year (Model 1), showed a significant trend (AOR=1.70, $p=.08$) toward increased HIV risk-related behaviors after controlling for other covariates. The level of alcohol misuse (Model 2) was also significant. Odds for HIV risk-related behavior were not greater for those meeting hazardous or abuse criteria on the AUDIT, but were significant for men meeting alcohol dependence (AOR=2.63, $p=.01$) compared to non hazardous users. Models 1 and 2 indicated significant effects for both poor mental health and hazardous alcohol use but no interaction effects. Analyses for the third regression model indicated a significant increase in risk for HIV risk-related behaviors with the co-occurrence of poorer mental health and hazardous alcohol use (AOR=5.88, $p<.001$) but not for hazardous alcohol use or poorer mental health occurring alone.

Two additional models (results not shown in table) examined associations of specific risk factors found significant in Models 2 and 3 and each HIV risk-related behavior separately, i.e., two or more sexual partners and perpetration of partner violence in this past year. Due to low numbers of men reporting each individual HIV-risk-related behavior and the related lack of power, these analyses were exploratory but suggested that the findings were driven by associations with partner violence perpetration. Neither poorer mental health functioning nor hazardous alcohol use, either alone or when co-morbid predicted having two or more sexual partners in the past year. However, co-morbid poorer mental health and hazardous alcohol use predicted perpetration of partner physical violence in the past year. While lack of power precluded formal analyses of level of alcohol misuse within the subgroup of men with co-morbidity, it is possible that this association was driven by severe alcohol misuse, i.e. dependence and not hazardous use per se. Of the 17 men meeting study criteria for comorbid hazardous use and poorer mental health number, half ($n=9$; 52.9%) met AUDIT criteria for dependence, one in 10 for alcohol abuse ($n=2$; 11.8%) and a third met hazardous alcohol use criteria but not abuse or dependence.

DISCUSSION

Consistent with prior studies in India, e.g., Tamil Nadu(16) and Mumbai (Singh et al., in this volume), we found a relatively low prevalence of sexual risk behaviors of less than 5% among males in the general population. An innovative aspect of our study involved the examination of both behaviors that increase risk for men themselves (multiple partners) and for their partners (violence). When either of these behaviors was considered, at least 1 of 10 men and 1 of 4 male drinkers report HIV-related risk behaviors.

Recent research from Bangladesh and India documents that men who perpetrate violence against their wives are more likely to participate in extramarital sex and contract an STI compared to non-violent husbands (36,37). The mounting HIV epidemic among monogamous women in India highlights the importance of addressing their spouse's risk behaviors and gender inequities, such as men's violence against women (62). Gender relations that legitimize the subordination of women are critical factors in the spread and impact of the HIV epidemic (38), including through impairment of open communication regarding safe sex practices (32).

Hazardous alcohol use, identified by the AUDIT, was reported by 1 in 5 of all men and over 1 in 2 male drinkers. These findings are consistent with prior studies (10) that reported high rates of heavy alcohol use and alcohol-related problems in men and highlight alcohol misuse as a significant public health problem in Karnataka. Hazardous alcohol use was associated with men's HIV-risk related behaviors, even when controlling for other risk factors, such as demographics and other psychosocial factors, including social support and self-reported mental health. These findings are consistent with research from South Africa on hazardous alcohol use and higher rates of sexual risk behaviors, even when stressors, including interpersonal problems were accounted for (63). A unique contribution of the present study's are findings that the severity of alcohol misuse plays a role in HIV-risk related behaviors, with possible alcohol dependence in particular, but not hazardous alcohol use without dependence, increasing risk for such behaviors.

Like hazardous alcohol use, the association of poorer mental health remained even when other risk factors for HIV risk behaviors in men was controlled for. An increasing body of research outside India, such as U.S. cohort studies that document depressive symptoms as independent predictors of HIV sero-conversion in men, shows those with poor mental health are at heightened risk of HIV infection (28). Our study is the first to document the link between mental health ratings and HIV-related risk behavior in population data in India.

Fourteen percent of the global burden of disease is attributed to mental health disorders, including depression and other common mental disorders, alcohol and substance use disorders, and psychoses (64,65). Yet, the burden that mental health disorders represent is often underestimated due to the lack of appreciation of the inter-connectedness between mental illness and other health conditions (28). This is reflected in the low priority placed on mental health in most low- and middle-income countries where mental disorders are addressed with separate services and budgets and viewed as creating additional, unaffordable costs (28).

World Health Organization data from across 60 countries substantiates the role of depression in poor health outcomes (66), demonstrating that depression results in greater decrements in health compared to chronic diseases and that co-morbid depression worsens health compared to depression or chronic disease alone, or any combination of chronic diseases without depression. Our study adds to mounting evidence on the intertwining of mental health and physical health risk behaviors and urges the prioritization of poor mental health as an urgent public health issue in India. Researchers have also pointed out that even though 99% of HIV/AIDS related deaths occur in low and middle income countries, there is almost no research on mental disorders and HIV from these countries (28). Our findings suggest that men reporting both hazardous alcohol use and poorer mental health in the past year are at particularly elevated risk for HIV-related risk behaviors.

Diverse studies outside India suggest that mental health and other psychosocial problems contribute to sexual risk behavior and HIV infection. Depression may play a role in fueling sexual risk behaviors on the internet (67), high psychological distress is associated with biologically confirmed STIs and sexual risk behaviors in female adolescents (68) but high self esteem increased sexual risk behaviors among Hispanic men who had sex with men (30). These

inconsistent findings suggest that an understanding of key components and processes of poor mental health that increase HIV risk behaviors is important for prevention and intervention efforts. For instance, the severity of depression could be important. While major depression reduces sexual activity, dysthymic disorder (a milder, persistent depressive disorder) increases likelihood of unprotected sex(69). Similarly, isolation and loneliness may potentiate risky behaviors in black men who have sex with men, such as seeking sexual partners via the internet (31). Poor mental health may also increase likelihood for risky behaviors due to perceptions of having few options to cope with distress and the “learned helplessness”, characteristic of clinical anxiety and depression. Our mental health measure was limited to a single question on self-reported rating of mental health. Future studies on HIV risk behaviors in men should include more rigorous standardized assessments of mental health, including diagnostic measures and those of self-esteem, perceived loneliness, isolation, and risk-taking behaviors.

CONCLUSIONS

Because co-morbid mental health and substance use disorders are associated with poorer engagement in substance abuse treatment, it is important to address their co-occurrence (70, 71). Indeed our findings demonstrate that individuals with both hazardous alcohol use and poorer mental health were almost 6 times more likely to report HIV-risk related behaviors, an increase in risk over 2 fold compared to men with poor mental health or hazardous alcohol use alone. Relationships among hazardous alcohol use, poor mental health, partner violence and HIV risk are likely to be complex. Thus, further understanding of the mechanisms of how poor mental health and hazardous alcohol use increase HIV risk-related behaviors is vital to the development of effective HIV prevention and intervention strategies. Common factors and processes may underlie both poor mental health and alcohol use disorders. Regardless, the co-occurrence of poor mental health and hazardous alcohol use and heightened risk for sexual risk behaviors is noteworthy as it indicates the need for focused screening and targeted, tailored integrated interventions for men reporting both issues. Screening measures, such as the AUDIT, provide useful tools to assess for hazardous alcohol use and should be supplemented by more rigorous diagnostic assessment, should alcohol abuse or dependence be indicated.

Limitations of the present study must be noted. Due to the low prevalence of individual risk behaviors, we had inadequate power to examine each HIV risk behavior separately and the reported findings from our exploratory analyses need to be replicated. Men who did not report being married, in a cohabiting relationship or being in a close romantic relationship may have been sexually active, hence excluding them from being asked questions on intimate and sexual relationships, possibly excluded these men’s sexual risk behaviors. In addition, information regarding respondent’s sexual orientation was available for lifetime but not for the past year. The lack of behaviorally specific questions on anal sex precluded the identification of men having sex with men. Hence, anal sex and male sex with males were not included among the HIV risk behaviors assessed in our study. Although indicated as increasing women’s risk by prior studies, male partner violence may be a marker for men’s other HIV risk behaviors (such as multiple sexual partners) rather than a direct risk factor. Future studies should assess specific factors that increase risk for HIV transmission, such as genital injury related to sexual violence, and include serological indicators of HIV infection.

Our measure of mental health was crude and findings need to be replicated using data from rigorous screening and diagnostic measures of mental health functioning. Similar limitations apply to our measures of social support. Given that the association between social support and reduced risk-taking behavior appears to be specific to the type of relationship (e.g., family, friend, peer) within the social network(24), future research should assess several aspects of social support, including relationships, and perceived adequacy of support.

Reverse causality also cannot be ruled out for associations found in cross-sectional data. For instance, the co-morbidity of poor emotional health and hazardous alcohol use may be due to use of alcohol to self-medicate or represent the impact of excessive alcohol use on mental health functioning. Longitudinal and event-based data that critically assess the temporal order to these phenomena may help elucidate the nature of the relationships. Future studies should examine the impact of men's alcohol misuse using larger samples, longitudinal designs to assess causality in associations, and more critically evaluate psychosocial and other context and cultural factors associated with health risk behaviors in men, such as neighborhood, peer networks, and gender perceptions. Future studies could also examine hazardous alcohol use and mental disorders as predictors of HIV transmission and assess the impact for both mental health and alcohol use in HIV prevention and intervention programs.

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Table 1
Sample Demographics (N=1137)

| Variable | | Percentage (n) |
|----------------------------|-------------------------------------|----------------|
| Area | Rural (includes small town or city) | 36.6% (416) |
| | Urban (medium to large city) | 63.1% (718) |
| | Missing | 0.3% (3) |
| District | Bangalore Rural | 13.0% (148) |
| | Bangalore Urban | 56.2% (639) |
| | Bidar | 16.1% (183) |
| | Davangere | 54.8% (74) |
| Age | 16-29 | 56.8% (646) |
| | 30-39 | 28.6% (325) |
| | 40-49 | 14.6% (166) |
| Education | Did not complete high school | 40.4% (459) |
| | Completed high school and more | 58.9% (670) |
| | Missing | 0.7% (8) |
| Marital Status * | Married/living with a partner | 58.2% (662) |
| | Widowed, divorced separated | 0.9% (10) |
| | Never married | 40.9% (462) |
| | Missing | 0.3% (3) |
| Relationship status | Married or living with partner | 58.2% (662) |
| | Close, romantic relationship | 3.8% (43) |
| | No close, romantic relationship | 30.4% (346) |
| | Missing | 7.5% (86) |
| Religion | Hindu | 78.5% (892) |
| | Muslim | 10.8% (123) |
| | Christian | 3.2% (36) |
| | Sikh or other | 6.0% (68) |
| Unemployed | | 10.6% (121) |

* Excludes 46 respondents from Dakshina Kannada and 6 missing on district from total sample 1347; Further excludes respondents age 50 and older (n=157) and 1 missing on age from resultant sample of 1295 men.

Table 2
Prevalence of risk behaviors and hypothesized factors in risk (N=1137)

| Variable | Percentage (n) |
|---|-------------------------------|
| <u>HIV Risk behaviors</u> | |
| 2 or more sexual partners in the past year | 4.7% (54), missing 2 (0.2%) |
| Perpetrated physical violence against partner | 5.6% (64), missing 3 (0.3%) |
| Both risk behaviors * | 0.9% (10) |
| Either risk behavior | 9.5% (108) |
| <u>Hypothesized covariates</u> | |
| Childhood sexual victimization | 9.3% (101), missing 49 (4.3%) |
| Social support (number of people can talk to about problems, excluding partner) | |
| None | 19.2% (218) |
| One | 8.9% (101) |
| 2 to 3 | 31.0% (352) |
| 4 to 5 | 17.6% (200) |
| 6 or more | 23.0% (261), missing 5 (0.4%) |
| Past year poor mental health | |
| Poor | 1.2% (14) |
| Fair | 11.0% (125) |
| Good | 56.6% (643) |
| Very Good | 24.8% (282) |
| Excellent | 5.9% (67), missing 6 (0.5%) |
| <u>Alcohol use</u> | |
| Frequency of Use | |
| Never | 61.9% (704) |
| Less than monthly | 5.9% (67) |
| At least monthly | 7.7% (88) |
| 2-3 times a week | 9.5% (108) |
| 4 or more times a week | 15.0% (170) |
| <u>Alcohol Use Patterns Among drinkers (N=433)</u> | |
| Usual Quantity | |
| 5 (60g) or more drinks | 60.8% (262) |
| Frequency of heavy (5 or more) drinking | |
| Monthly or more | 54.5% (232) |
| Hazardous alcohol use | 56.4% (244) |

* OR for 2 or more partners for perpetration of physical violence= 4.31 (2.06 – 9.02), p=.00. (15.6% of those perpetrating violence versus 4.1% who did not perpetrate violence reported 2 or more partners in the past year).

Table 3
Bivariate associations of past year HIV risk behaviors with alcohol use among all men and with selected demographics, and psychosocial factors among male current drinkers

| | Total sample (n) | At least one HIV risk behavior (N=108) % (n) | OR (95% CI), p |
|--|------------------|--|--|
| ALL MEN | 1137 | | |
| Alcohol use | | | |
| Lifetime Use | | | |
| Lifetime Abstainer | (569) | 3.5% (20) | 2.00 (0.89- 4.50), .09 6.15 (3.70-10.22), .00 |
| Prior (to the past year) drinker | (133) | 6.8% (9) | |
| Current (past year) drinker | (433) | 18.2% (79) | |
| Past year Use | | | |
| Non current drinker | (702) | 4.1% (29) | 3.20 (1.79- 5.72), .00 6.73 (4.20-10.92), .00 |
| Non hazardous drinker | (182) | 12.1% (22) | |
| Hazardous drinker | (244) | 22.5% (55) | |
| CURRENT DRINKERS ONLY | | | |
| Alcohol Misuse level | | | |
| None | (182) | 12.1% (22) | 1.55 (0.84-2.88), ns 2.35 (1.01-5.44), .05 3.55 (1.77-7.12), .00 |
| Hazardous | (142) | 17.6% (25) | |
| Abuse | (41) | 24.4% (10) | |
| Dependence | (61) | 32.8% (20) | |
| Demographics | | | |
| Area | | | |
| Rural | (119) | 15.1% (18) | ns |
| Urban | (304) | 18.8% (57) | |
| Age | | | |
| 16-29 | (201) | 14.4% (29) | 1.89 (1.10-3.25), .02 0.94 (0.43-2.04), ns |
| 30-39 | (149) | 24.2% (36) | |
| 40-49 | (73) | 13.7% (10) | |
| Education | | | |
| High school or more | (138) | 12.3% (17) | 1.82 (1.01-3.26), .04 |
| Less than high school | (285) | 20.4% (58) | |
| Marital Status | | | |
| Never Married/Divorced/separated/Widowed)* | (135) | 6.7% (9) | 4.16 (2.01-8.69), .00 |
| Married or living with partner | (288) | 22.9% (66) | |
| Religion | | | |
| Non Muslim | (392) | 17.9% (70) | Ns |
| Muslim | (25) | 20.0% (5) | |
| Psychosocial Factors | | | |
| Childhood Sexual victimization | | | |
| No | (335) | 17.8% (65) | Ns |
| Yes | (75) | 22.7% (10) | |
| Social Support | | | |
| None | (75) | 25.3% (19) | 0.57 (0.31-1.02), .06 |
| At least one person | (348) | 16.1% (56) | |
| Mental Health | | | |
| Good or better | (355) | 14.1% (50) | 3.54 (1.99- 6.31), .00 |
| Poor or fair | (68) | 36.8% (25) | |

Note: Due to missing data among current drinkers (e.g. 7 missing cases for past year alcohol use patterns, numbers for some variables do not add up to 433); ns= p > .10.

Table 4
Associations between hazardous alcohol use and HIV risk behaviors among current drinkers (N=426)

| <i>R² for final model</i> | | Model 1 Adjusted OR (95% CI, p) .175 | Model 2 Adjusted OR (95% CI, p) .184 | Model 3 Adjusted OR (95% CI, p) .175 |
|---|---|---|---|---|
| Age* | 16-29 (ref) | | | |
| | 30-39 | 2.43 (1.02-5.75, .04) | 2.48 (1.04-5.88, .04) | 2.47 (1.04-5.87, .04) |
| | 40-49 | 2.08 (0.94-4.61, .07) | 2.03 (0.91-4.52, .08) | 2.13 (0.95-4.75, .07) |
| Education | No high school (ref) | | | |
| | High school or more | 0.71 (0.38-1.34, .29) | 0.72 (0.38-1.36, .31) | 0.71 (0.37-1.33, .28) |
| Marital status* | Not married (ref) | | | |
| | Married/with partner | 4.79 (2.05-11.18, .00) | 4.97 (2.12-11.62, .00) | 4.82 (2.06-11.24, .00) |
| Social Support | None (ref) | | | |
| | At least one person | 0.70 (.37- 1.34, .29) | 0.66 (0.34-1.27, .21) | 0.71 (0.37-1.35, .29) |
| Mental health | Good or better (ref) | | | |
| | Poor or Fair | 3.40 (1.85-6.34, .00) | 3.04 (1.61-5.73, .00) | |
| Hazardous alcohol use (Model 1 only) | | | | |
| | No hazardous use (ref) | | | |
| | Hazardous use | 1.70 (.94, 3.06, .08) | | |
| Alcohol Misuse Level (AUDIT score) (Model 2 only) | | | | |
| | Non hazardous (< 7) (ref) | | | |
| | Hazardous (8- 15) | | 1.39 (0.72-2.69, .33) | |
| | Abuse (16 -19) | | 1.68 (0.66-4.30, .27) | |
| | Dependence (< =20) | | 2.63 (1.20-5.76, .01) | |
| Alcohol use and mental health (Model 3 only) | | | | |
| | Neither (ref) | | | |
| | Poor mental health only | | | 2.59 (.71, 9.42, .15) |
| | Hazardous alcohol use only | | | 1.57 (.82, 3.03, .18) |
| | Poor mental health & hazardous alcohol use | | | 5.88 (2.66, 13.02, .00) |

Note: 1) Religion, area, unemployment, and childhood sexual victimization are not included in models due to lack of bivariate associations with HIV risk behaviors. 2) Significant covariates in final models are indicated by *. 3) Interactions between hazardous alcohol use and poor mental health were not significant.