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Condom use, multiple rounds of sex, and alcohol use among South African women who use alcohol and other drugs: An event-level analysis

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Abstract

Background—High rates of alcohol and other drug use contribute to the ongoing generalized HIV epidemic in South Africa. Despite the general link between alcohol use and condomless sex, findings from event-level studies of the relationship between alcohol use and condomless sex during the same encounter have been inconsistent.

Methods—We conducted event-level analyses of the most recent sexual encounter reported by 636 women who use substances in Pretoria. Data were collected via a questionnaire that included questions about the number of rounds of vaginal and anal sex and condom use during each round. We used multiple logistic regression analyses to model the associations between alcohol use by both partners and having multiple rounds of sex, and alcohol use and condom use during all rounds of sex.

Results—Over 50% of encounters involved multiple rounds of vaginal or anal sex. Encounters that involved multiple rounds of sex were associated with inconsistent condom use. Encounters in which both partners drank alcohol were more likely to involve condomless sex, as compared with encounters in which one or neither partner drank alcohol.

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Conclusions—These findings raise the possibility that prior event-level studies, which do not ask about multiple rounds of sex, may underestimate the prevalence of condomless sex. The association between alcohol use by both partners and condomless sex may partially explain inconsistent associations between alcohol use and condom use in event-level studies that did not assess the number of partners drinking.

Keywords

Alcohol; rounds of sex; sexual encounter; condomless sex; HIV; South Africa

Introduction

High rates of alcohol and other drug use contribute to the generalized HIV epidemic in South Africa.¹ Multiple studies, including a recent systematic review, link alcohol and other drug use to HIV risk behaviors.² Most of these studies measured associations between the frequency of alcohol and other drug use—either generally or before or during sex—and the frequency of condomless sex during a specified period.³ However, these global associations cannot determine whether alcohol and other drug use and condomless sex occurred during the same encounter. In contrast, event-level studies ask about specific encounters—such as the last time a person had sex—whether the person used a condom, and whether the person used alcohol or other drugs during the encounter.³ These studies can determine if condomless sex occurred during the same encounter in which someone used alcohol or other drugs, which is an essential first step in establishing a causal relationship. A recent review of experimental studies concluded that alcohol use increased intentions to have condomless sex,⁴ but event-level studies continue to provide mixed results.^{5,6}

Event-level studies that ask about the multiple types of sex (i.e., oral, vaginal, or anal) a person may engage in during the same sexual encounter may shed light on the inconsistent association between alcohol and other drug use and condomless sex. Participants in these studies often report using a condom during some activities but not others, and the association varied depending on the activity.^{7,8} Additionally, some encounters may include multiple rounds of each type of sex.⁹ For example, an encounter may begin with oral sex, proceed to vaginal sex, and be followed by anal sex and then vaginal sex. Simply asking people if they used a condom the last time they had sex may provide misleading information if they used a condom during one round or act of sex but not others.

This article assesses the prevalence of sexual encounters that involve multiple rounds of vaginal or anal sex, and the association between event-level alcohol use and experience of multiple rounds of sex. It also examines the association between multiple rounds of sex and event-level alcohol use and condomless sex at any or all rounds.

Materials and Methods

Procedure Overview

The article presents analyses of cross-sectional baseline data collected from women who were recruited by outreach workers in Pretoria, South Africa, between May 2012 and

September 2014. The baseline data analyzed in this article were collected at enrollment in an intervention study to increase HIV testing, linkage to antiretroviral therapy (ART) and ART retention and adherence among women who used alcohol or other drugs and were at high risk of HIV. The study used a cluster-randomized approach in which the city of Pretoria was divided into 14 geographic areas that were randomized using a matched-pair design. The study protocol was published in an open-access journal.¹⁰

Sample and Eligibility

The study sample comprised 641 women. Eligibility criteria included (1) self-identify as female, (2) be Black African, (3) be aged 15 or older, (4) report using alcohol or other drugs at least weekly during the past 90 days, (5) report unprotected vaginal sex with a male partner in the past 6 months, (6) speak English, Sesotho, Tswana, or Zulu, (7) consent to HIV rapid testing (blood), drug testing (urine), and alcohol breathalyzer, (8) provide written and verbal assent/consent to participate, and (9) provide verifiable locator information for the Pretoria area and plan to stay in the area for the next 12 months.

Recruitment and Data Collection

Prior to beginning recruitment, outreach workers received training on techniques for approaching women in public places and discreetly screening them for eligibility. Throughout the study, outreach workers conducted eligibility screening in the field and scheduled intake appointments for women who were eligible and interested. The appointments, conducted at the study's field site, included the following activities: rescreening to confirm eligibility, obtaining informed consent or assent, data collection using a computer-assisted personal interview, blood collection via a finger stick for rapid HIV testing, urine specimen collection for pregnancy testing and drug screening, and a breathalyzer test for recent alcohol use. Participants received toiletries worth R100 (at the time of the study, 1 USD equaled approximately 10 ZAR) for their time and reimbursement for travel.

Measures

Global Measures

Background characteristics: We assessed sociodemographic characteristics, including age, education, marital status, and employment status. Other background characteristics included traded sex for money or drugs in the past 6 months, ever received treatment for a substance use disorder, and any incarceration during the past year. We also measured traumatic experiences—physically abused before age 18, physically abused in the past year, sexually abused before age 18, and raped or forced to have sex in the past year.

Harmful or hazardous drinking: We used the Alcohol Use Disorders Identification Test (AUDIT) to assess hazardous and harmful drinking.¹¹ We used categories of less than 8, 8 to 13, 14 to 19, and 20 or greater.¹² AUDIT scores from 8 to 13 are considered hazardous drinking, scores from 14 to 19 are considered harmful drinking, and scores of 20 or greater indicate likely alcohol dependence.

Living in an informal settlement: Many South African cities are surrounded by a mix of formal settlements that are sanctioned by the government and informal settlements that are not sanctioned. Most dwellings in informal settlements are shacks constructed of available materials, including cardboard, corrugated sheet metal, and scraps of wood. Very few dwellings have running water or indoor toilets; however, most dwellings have electricity, which is often obtained illegally. Although people are rarely prosecuted for stealing electricity, the makeshift wires and grid pose a serious fire hazard. Many of the people living in the informal settlements moved to the city from rural areas but are unable to afford housing in the city or the formal settlements.

Perceived HIV status: All participants were asked if they had ever been tested for HIV, and those who reported being tested for HIV were asked if they had ever had a positive test result. Participants who reported a positive test result were coded as self-reporting being HIV positive. Participants who reported never being tested for HIV or never having a positive test result were coded as not reporting being HIV-positive. We used self-reported HIV status instead of actual HIV status in our models because we hypothesized that perceived HIV status may influence behavior, whereas being HIV-positive without knowing it would not influence behavior.

Event-Level Measures

Partner type: Partners were classified as primary partners or nonprimary partners. Primary partners were defined as husband, boyfriend, or someone with whom the participant was in a relationship. All other partners were classified as nonprimary partners.

Multiple rounds of sex and condom use by round: Each participant was asked if she had vaginal sex and if she had anal sex the last time she had sex. A participant who answered “yes” was asked how many rounds she had of each type of sex she reported. For each round reported (i.e., Round 1, Round 2, etc.), each participant was asked whether she used a condom during that round. These analyses exclude events in which both partners were female.

Event-level alcohol and other drug use: Each participant was asked whether she used alcohol, marijuana, and several other drugs during the last sexual encounter. She was also asked which substances her partner used at the last sexual encounter.

Analysis

Event-level analysis of sexual encounters provides a mechanism for testing whether activities such as alcohol or drug use and condomless sex occurred during the same encounter. Although event-level analyses are insufficient to establish a causal relationship, co-occurrence of behaviors (e.g. condomless sex, alcohol use) in an encounter is an essential element in assessing causality. If alcohol use and condomless sex do not occur in the same event it becomes difficult to argue that there is a causal relationship between them.

We conducted bivariate analyses using unadjusted logistic regression to assess associations between sociodemographic characteristics, historical variables (e.g., histories of abuse,

substance abuse treatment, and incarceration), behavioral variables (e.g., recent sex work, recent drug use, etc.), event-level variables (e.g., relationship to sex partner and drug use), and each outcome. Variables that were significant at the $p = 0.10$ level in bivariate analyses were entered in a multiple logistic regression model. Non-significant variables were manually removed one at a time based on their significance levels and scientific relevance to the dependent variable.

Ethics

The Institutional Review Boards (IRBs) of the South African Medical Association Research Ethics Committee, the Tshwane Research Committee, and RTI International all approved this study. Additionally, a Data and Safety Monitoring Board reviewed the protocol and met biannually with the investigators to ensure participant safety.

Results

The study sample included 641 women; however, 5 women with missing data were excluded from the analyses. The mean age was 30.4 years (SD 7.8 years). Most women (84%) met the criteria for hazardous or harmful drinking based on their AUDIT scores; 37% reported trading sex for money or drugs in the past 6 months. Overall, 55% tested positive for HIV; however, only 36% reported they were HIV-positive.

Multiple Rounds of Vaginal or Anal Sex

Anal sex was relatively uncommon, with only 4% of participants reporting engaging in it during their last sexual encounter, and only 3% of participants reported engaging in both anal and vaginal sex during their last sexual encounter. However, 338 participants reported engaging in more than one round of vaginal sex during their last encounter and 8 participants reported engaging in multiple rounds of anal sex, with 340 (54%) participants reporting engaging in multiple rounds of vaginal or anal sex. In bivariate analyses (Table 1), participants who reported engaging in multiple rounds of vaginal or anal sex were significantly younger. Also, they were less likely to self-report being HIV-positive and less likely to report trading sex for money or drugs in the past 6 months. Sexual encounters that involved multiple rounds of sex were more likely to be with a primary partner, and both partners were more likely to use alcohol during the encounter (Table 1).

In multivariable analyses, trading sex and self-reporting being HIV-positive were associated with reduced odds of engaging in multiple rounds of sex, whereas having sex with a primary partner and alcohol use by both partners was associated with increased odds of engaging in multiple rounds of sex (Table 2a).

Condom Use at All Rounds of Last Sex

In bivariate analyses conducted using the full sample, self-reporting being HIV-positive and trading sex in the past 6 months were associated with increased odds of using a condom for all rounds of vaginal and anal sex (Table 2b). Having sex with a primary partner, living in an informal settlement, alcohol use by both partners, marijuana use by the male partner and

engaging in multiple rounds of sex were all associated with decreased odds of consistent condom use throughout the encounter.

In multivariable analyses, self-reporting being HIV-positive and trading sex in the past 6 months were independently associated with increased odds of consistent condom use throughout the encounter. Having sex with a primary partner, living in an informal settlement, alcohol use by both partners, and marijuana use by the male partner were independently associated with reduced odds of using condoms consistently throughout the encounter.

Discussion

Over half of participants (54%) in this study reported multiple rounds of sex during their last sexual encounter. Similar studies should be conducted with other samples to determine if sexual encounters involving multiple rounds of sex are common among other populations. If the practice is widespread, it could be important to determine how people report condom use for multiple rounds of sex if a condom is used during some but not all rounds. If a study asks about condom use at last sex, and a person who used a condom during some but not all rounds reports using a condom, this could underestimate the occurrence of condomless sex.

Alcohol use by both partners during an encounter was associated with increased odds of engaging in multiple rounds of sex and with inconsistent condom use during the encounter. The observed association between alcohol use by both partners and engaging in multiple rounds of sex and with inconsistent condom use is similar to the findings from other event-level studies of alcohol use,^{13,14} methamphetamine use⁸ and prescription opioid use.¹⁵ Given the diverse pharmacological effects of methamphetamine, prescription opioids, and alcohol, it seems unlikely that these risk behaviors are driven by the effects of the drugs themselves. One plausible explanation is that when two people who are potential sex partners use the same drug together, there is a shared expectation and intention to have sex that is conducive to condomless sex as well as multiple rounds of sex. When only one partner uses alcohol or other drugs or each partner uses different drugs, the effects on sexual behavior may be more limited. This may help explain the inconsistent associations between alcohol use and condomless sex that have been reported in other event-level studies.^{5,6}

Histories of childhood or recent sexual or physical abuse were not associated with engaging in multiple rounds of sex or condom use in bivariate analyses. Numerous studies have reported associations between histories of physical and sexual abuse and HIV risk behaviors, drug and alcohol use and psychological distress. However, gender-based violence is ubiquitous in South Africa and possibly difficult to disentangle over the life course.^{16–18}

The findings in this study should be interpreted cautiously. First, the analyses included just one encounter per participant, which limits our ability to disentangle the effects of personal characteristics (e.g., risk-taking personality) from situational characteristics (e.g., partner type or alcohol use by one or both partners). However, we did adjust for a variety of sociodemographic characteristics and behaviors, and we included partner type as a covariate.

Second, the study sample should be considered at relatively high risk. All the participants had to report using alcohol or other drugs at least 13 of the past 90 days, 55% tested positive for HIV, and 37% reported trading sex for money or drugs in the past 6 months. Engaging in multiple rounds of sex may be less prevalent among women who do not use alcohol or other drugs and who do not trade sex.

Conclusion

Sexual encounters involving multiple rounds of sex were common among the study participants and these encounters were associated with inconsistent condom use. Encounters in which both partners drank alcohol seemed to be higher risk than encounters in which one or neither partner drank. The findings raise measurement issues that could affect the validity of event-level studies of condom use and event-level studies that examine the association between alcohol use and condomless sex.

Future event-level studies of sex risk behaviors should consider assessing alcohol and other drug use by each partner. Future event-level studies that assess the prevalence of multiple rounds of sex could determine if these findings are generalizable to other samples. If so, it may be useful to assess condom use in encounters involving multiple rounds of sex. While the importance of collecting this information needs to be balanced with the additional burden on participants these assessments will entail, understanding the context in which condomless sex occurs may have important implications for public health education and prevention programs, particularly in high HIV prevalence areas such as South Africa.

To reduce HIV risk in similar populations and settings, HIV prevention interventions should provide education regarding the potential increase in condomless sex during encounters in which both partners drink alcohol and in encounters that involve multiple rounds of sex. However, these behaviors may be difficult to change, thus increasing the importance of biomedical interventions. In high prevalence settings where alcohol use is common, pre-exposure prophylaxis (PrEP) and antiretroviral therapy (ART) represent essential tools for preventing HIV transmission.

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Characteristics of participants and experience of multiple rounds of vaginal or anal sex and condom use at all rounds of last sex

Table 1

Global Characteristic	Last sex involved multiple rounds		Used condoms during every round of last sex		p-value
	Total (n=636)	Yes (n=340)	No (n=296)	Yes (n=235)	No (n=401)
% 25 years of age or older	72.3	67.1	78.4	74.9	70.8
% Completed 10 or more years of school	62.6	65.6	59.1	60.9	63.6
% Married or living as married	50.3	49.4	51.4	38.7	57.1
% Unemployed	85.7	83.2	88.7	86.8	85.1
% Living in an informal settlement	35.1	35.6	34.5	28.5	38.9
% Ever in substance use disorder treatment	6.1	5.3	7.1	6.4	6.0
% Any incarceration in past year	19.3	18.4	20.4	22.3	17.6
% Physically abused before age 18	3.9	3.8	4.1	4.3	3.7
% Sexually abused before age 18	6.3	6.2	6.4	7.2	5.7
% Physically abused within past year	11.3	12.9	9.5	12.8	10.5
% Raped or forced to have sex within past year	6.3	7.1	5.4	8.1	5.2
% Self-reported HIV-positive	36.2	28.2	45.3	47.7	29.4
% HIV positive test result	50.9	60.5	55.3	65.1	49.6
% Traded sex for money of drugs in past 6 months	41.0	52.7	30.9	30.2	75.8
AUDIT Scores					
% AUDIT score less than 8	16.0	13.5	18.9	14.5	17.0
% AUDIT score 8 to 13	23.6	27.1	19.6	24.3	23.2
% AUDIT score 14 to 19	29.6	27.1	32.4	30.2	29.2
% AUDIT score 20 or greater	30.8	32.4	29.1	31.1	30.7
Event-level characteristics					
% Last sex was with primary partner	69.8	78.8	59.5	31.5	92.3
% Woman drank alcohol	34.7	40.0	28.7	26.4	39.7
% Woman smoked marijuana	20.4	19.4	21.6	23.4	18.7
% Woman smoked Nyaope [*]	13.5	11.5	15.9	13.6	13.5
% Male drank alcohol	36.2	42.9	28.4	28.5	40.6
% Male smoked marijuana	16.7	17.6	15.5	8.1	21.7

Global Characteristic	Last sex involved multiple rounds			Used condoms during every round of last sex		
	Total (n= 636)	Yes (n=340)	No (n=296)	Yes (n = 235)	No (n = 401)	p-value
% Male smoked Nyaope *	8.8	7.9	9.8	4.3	11.5	0.002
% Both partners drank alcohol	25.8	31.8	18.9	16.2	31.4	< 0.001
% Multiple rounds of vaginal or anal sex	53.5			40.4	61.1	< 0.001

* Nyaope is heroin mixed with marijuana.

Table 2

Multivariable models

Table 2a. Logistic regression odds ratios (95% confidence intervals) for whether the participant engaged in multiple rounds of vaginal or anal sex during the most recent sexual encounter

	Unadjusted logistic regression		Multivariable logistic regression	
	Odds ratio (95% CI)	p-value	Odds ratio (95% CI)	p-value
25 years of age or older	0.56 (0.39, 0.80)	0.002	0.66 (0.45, 0.98)	0.037
Traded sex for money or drugs in past 6 months	0.40 (0.29, 0.55)	< 0.001	0.65 (0.43, 0.97)	0.036
Self-reported HIV-positive	0.48 (0.34, 0.66)	< 0.001	0.60 (0.42, 0.85)	0.005
Last sex was with primary partner	2.54 (1.79, 3.60)	< 0.001	1.76 (1.14, 2.70)	0.010
Both partners used alcohol (reference group includes one partner drank or neither partner drank)	2.00 (1.38, 2.89)	< 0.001	1.94 (1.32, 2.86)	0.001

Table 2b. Logistic regression odds ratios (95% confidence intervals) for whether condoms were used during every round of vaginal and anal sex in the most recent sexual encounter*

	Unadjusted logistic regression		Multivariable logistic regression	
	Odds ratio 95% CI)	p-value	Odds ratio 95% CI)	p-value
25 years of age or older	1.23 (0.85, 1.77)	0.268		
Last sex was with primary partner	0.04 (0.02, 0.06)	< 0.001	0.05 (0.03, 0.09)	0.000
Living in an informal settlement	0.63 (0.44, 0.89)	0.008	0.54 (0.34, 0.87)	0.011
Self-reported HIV-positive	2.18 (1.56, 3.05)	< 0.001	1.69 (1.07, 2.68)	0.024
Traded sex for money or drugs in past 6 months	7.24 (5.05, 10.38)	< 0.001	1.74 (1.06, 2.84)	0.028
Both partners used alcohol (reference group only one or neither partner drank)	0.42 (0.28, 0.63)	< 0.001	0.36 (0.21, 0.63)	0.000
Male partner smoked marijuana	0.32 (0.19, 0.54)	< 0.001	0.45 (0.21, 0.96)	0.040
Multiple rounds of vaginal or anal sex	0.43 (0.31, 0.60)	< 0.001	0.78 (0.50, 1.21)	0.268

* All participants, no matter the number of rounds of sex are included in this analysis. Participants who used a condom for all rounds (whether one or more) are coded as one on the outcome.