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Do men who have sex with men who report alcohol and illicit drug use before/during sex (chemsex) present moderate/high risk for substance use disorders?

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ABSTRACT

Background: We evaluated the prevalence of sexualized drug use (Chemsex) and its association with moderate/high risk for substance use disorders and HIV sexual risk behavior among men who have sex with men (MSM).
Methods: We conducted a cross-sectional web-based survey among MSM from Rio de Janeiro (Brazil). The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) was used to screen people at moderate/high-risk for substance use disorders. Individuals found to be using substances in the prior three months were asked if they used before/during sex. Sexualized drug use was classified into: no sexualized drug use, sex using only alcohol (alcohol-sex), sex using only illicit drugs (drug-sex) and sex using alcohol and illicit drugs (alcohol-drug-sex). The questionnaire included questions about sociodemographic, HIV status/prevention and risk behavior. A multinomial regression model was performed to assess the factors associated with sexualized drug use.
Results: Overall, 1048 MSM completed the questionnaire; median age was 29 years. Prevalence of alcohol and illicit drug use in previous 3 months was 89 % and 49 %, respectively. Most MSM (64 %) reported sexualized drug use: 28 % alcohol-sex, 9 % drug-sex and 27 % alcohol-drug-sex. Median ASSIST scores were higher among those reporting sexualized drug use compared to no use. All HIV sexual risk behavior variables presented increasing prevalence across the outcome categories. In the adjusted multivariate model, having moderate/high-risk for substance use disorders were associated with sexualized drug use.
Conclusions: MSM reporting sexualized drug use should receive brief intervention for substance use disorders and be evaluated for combination HIV prevention strategies including PrEP.

1. Introduction

HIV continues to disproportionately affect gay, bisexual, and other men who have sex with men (MSM) worldwide (Baral et al., 2007; Beyrer et al., 2012; De Cock et al., 2012, 2012). This burden has been explained both by biological factors, related to the increased chance of HIV infection through condomless anal sex (Patel et al., 2014), and by sociostructural factors, such as stigma, discrimination and lack of appropriate health services (Davis et al., 2017). In Latin America, the HIV epidemic is still concentrated among key populations (De Boni et al., 2014; Luz et al., 2019), and approximately 40 % of new infections occur among MSM (UNAIDS, 2019) and their sexual partners. Despite Brazil having in place polices of free access to universal treatment and prevention, the burden of HIV infection continues to increase among MSM. The second National HIV Biological and Behavioral Surveillance Survey (BBSS), conducted in 2016, showed an increased HIV prevalence (18.4 %; 95 % CI: 15.4–21.7) among MSM compared to the first survey (Kerr et al., 2018), conducted in 2009 (12.1 %; 95 % CI: 10.0–14.5) (Kerr et al., 2013). In 2016, HIV-infected MSM were notably younger than in the previous study (Guimarães et al., 2018) and data from the Ministry of Health shows that MSM aging 15–24 years-old are at increased risk for HIV infection (Brasil, Ministério da Saúde, 2018). Among Brazilian

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MSM, data point to an unequal distribution of poor HIV treatment and prevention outcomes among Black/Afro-Brazilians, including late HIV diagnosis, not on ART, not virologically suppressed, and poor pre-exposure prophylaxis (PrEP) adherence (Grinsztejn et al., 2018; Pascom et al., 2018).

MSM present higher prevalence of substance use and substance use disorders than heterosexual cisgender men and women (Allen and Mowbray, 2016; Boyd et al., 2019; Evans-Polce et al., 2019, p.; Kerridge et al., 2017; McCabe et al., 2019). More recently, there has been an increased interest in the evaluation of sexualized drug use. Sexualized drug use is the intentional use of illicit drugs before or during sex to enable, enhance or prolong sexual interactions (Edmundson et al., 2018), which sometimes is also called as chemsex. Chemsex is defined as a subset of sexualized drug use and usually refers to the use of certain substances, particularly methamphetamine, gamma-hydroxybutyric acid/gamma-butyrolactone (GHB/GBL), or mephedrone (Edmundson et al., 2018). However, there is no consensus on the definition of chemsex as its concept is socially constructed and is subject to the popularity and availability of illicit drugs across countries and among subcultures within countries (Maxwell et al., 2019).

Studies on sexualized drug use among MSM are scarce in Latin America. Prevalence of alcohol use before sex ranged from 20 % to 56 % in studies conducted in Brazil and Peru, while the prevalence of illicit drug use before sex ranged from 4 % to 20 % (Cunha et al., 2015, 2014; Deiss et al., 2013; Delgado et al., 2017; Galea et al., 2017; Young et al., 2016). A web-based survey recently conducted among MSM from Brazil, Mexico and Peru found a prevalence of alcohol and illicit drug use before/during sex of 36 % and 16 %, respectively (Torres et al., 2019a). Major limitations from the aforementioned studies include small sample sizes (which make it difficult to disaggregate the types of substances used) and a lack of standardized questionnaires, which preclude the evaluation of substance use disorders.

The understanding of the patterns of sexualized drug use among MSM, including the presence of alcohol and illicit drug use disorders, sociodemographic characteristics and HIV sexual risk behavior is an important step to build better strategies for HIV and sexual transmitted infections (STI) prevention. Individuals reporting sexualized drug use could benefit from combination HIV prevention technologies including PrEP, and those who are presenting moderate/high risk for substance use disorders may benefit from substance use disorder treatment. This information presents a gap in both the international literature and in Latin American countries. In this context, this study aims to evaluate in a sample of MSM from Rio de Janeiro, Brazil: (1) prevalence of sexualized drug use, including alcohol; (2) the association of moderate/high risk for substance use disorders with sexualized drug use; (3) the association of HIV sexual risk behavior with sexualized drug use.

2. Method

A cross-sectional web-based survey was conducted between May 14th and June 30th, 2018. The questionnaire was programmed on SurveyGizmo® and advertised on Facebook® and Hornet®. The survey responses were recorded anonymously, and we did not collect any identification (IP number, for example). Individuals read and completed an online informed consent form before initiating the survey.

The project was approved by the Instituto Nacional de Infectologia Evandro Chagas (INI/Fiocruz) Review Board (CAAE # 83508518.2.0000.5262). At the end of the survey, individuals were offered the opportunity to see their scores and the addresses of public health facilities offering treatment for alcohol/substance use disorders.

2.1. Study population and sample size

Participants were individuals with internet access who self-identified as men at birth, were aged 18 years or older, lived in Rio de Janeiro and its metropolitan region, and reported having had sex with another man or transgender woman in the previous 6 months. Individuals who reported that they had already answered the survey were excluded.

As the prevalence and variance of sexualized drug use was mostly unknown in Brazil, sample size was calculated by considering the most conservative parameter (prevalence of 50 %), with a 3 % error and 95 % significance level. Thus, the sample size should include 1099 MSM. Considering the approximately 25 % attrition rate (individuals who did not complete the survey) encountered in our previous web-based surveys with this population (Torres et al., 2019a, 2019b; Torres et al., 2018), we multiplied the original estimate by 1.25 (n = 1373). Sample size was calculated using OpenEpi (Dean et al., 2014).

2.2. Outcome

Sexualized drug use was assessed by the question: “Have you used this substance before/during sex?”. This question was asked to all individuals who reported using a specific substance in the prior 3 months (per ASSIST). Sexualized drug use was then classified into the following four mutually exclusive categories: no sexualized drug use (no alcohol or illicit drug use before/during sex), sex using only alcohol (alcohol-sex), sex using only illicit drugs (drug-sex; either cannabis, cocaine/crack, amphetamines, inhalants, or hallucinogens) and sex using alcohol and illicit drugs (alcohol-drug-sex). We did not include prescription drugs (sedatives and opioids) as illicit drugs. Different from North America, Europe and Asia, heroine is not widely available in the illicit drug market in Brazil. Those who reported neither alcohol nor illicit drug use in the prior 3 months (n = 90) were included in the “no sexualized drug use” category.

2.3. Primary exposure variable

The primary study factor (moderate/high risk for substance use disorders) was a categorical variable with four possible and mutually exclusive responses: (1) no moderate/high risk for substance use disorder; (2) moderate/high risk for alcohol use disorder; (3) moderate/high risk for any illicit drug use disorder; (4) moderate/high risk for alcohol and illicit drug use disorders. Risk for substance use disorders was screened using the WHO Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (WHO, 2016), validated to Brazilian Portuguese (Henrique et al., 2004). The ASSIST encompasses eight questions that evaluate lifetime use, past 3-month use and the pattern of use of nine substance groups (alcohol, tobacco, cannabis, cocaine, amphetamines, inhalants, sedatives, hallucinogens and opioids). For each substance, the test provides a score indicating low-, moderate- and high-risk use. As per WHO (2016) scoring, ASSIST scores $\geq$ 10 for alcohol were considered moderate risk for alcohol disorder. Moderate risk for illicit drug use disorders was considered as a score $\geq$ 4 either for cannabis, cocaine, amphetamines, inhalants or hallucinogenics. Scores equal to or higher than 27 were considered high risk for substance use disorders. For this study, “moderate risk” and “high risk” were collapsed into “moderate/high risk for substance use disorders”.

2.4. Covariates

App use was assessed through the questions “Where did you hear about this survey?” (possible answers were Hornet®, Facebook®, Grindr®, and Other) and “How frequently do you use apps for sex?” (Never, Once a month, Once a week and Daily).

Sociodemographic information included age, sexual orientation, gender, education, color/race, family income and whether or not they had a steady partner. Each of these variables were categorical, and response options were chosen to keep comparability with previous studies from our group (Hoagland et al., 2017; Machado et al., 2017). Tobacco abuse was considered as an ASSIST score $\geq$ 4.

HIV sexual risk behavior was assessed using the four questions from The HIV Incidence Risk Index for MSM (HIRI-MSM) (Smith et al.,

2012), i.e., number of sexual partners, number of condomless receptive anal sex, number of HIV-positive partners, number of times being insertive with an HIV-positive partner. This scale is recommended by the Centers for Disease Control and Prevention as a first screen for PrEP evaluation. Scores were calculated using the aforementioned 4 questions on sexual risk behavior and the 2 additional HIRI-MSM questions about age and stimulant use. Scores equal or higher than 10 indicate a high risk for HIV infection and the need for intensive prevention measures, such as PrEP. In addition, we asked about transactional sex ("In the previous 6 months, did you exchange sex for drugs or money?") and STI treatment.

HIV status was self-reported (Positive, Negative, or Unknown). Those reporting a "Negative" or "Unknown" status were asked about the likelihood of getting HIV in the next 12 months (Hoagland et al., 2017; Torres et al., 2019c), i.e., HIV risk perception. Possible answers were dichotomized into "None" and "Some". Having ever used biomedical prevention measures (post-exposure prophylaxis [PEP] and PrEP) was also investigated and responses were dichotomized as "Yes" or "No".

Attitudes and behaviors related to sexualized drug use were assessed. The following questions evaluated sexual practices and places potentially associated with sexualized drug use: "In the previous 3 months, do you think your use of alcohol and/or drugs facilitated some of the following sexual practices?" (answers included group sex, anal sex, fist fucking, fellatio, gang bang, bareback, and/or double penetration), and "In the previous 3 months, did you go to any of the following places to have sex under the influence of alcohol and/or drugs?" (answers included orgy parties, saunas, sex clubs, private parties organized online, and/or public places). For the multinomial regression model (see item 2.4), options for both questions were combined and the following two variables were derived: (1) believed substance use facilitated sexual practices in the prior 3 months; (2) places frequented for sex under influence of substances. Other attitudes regarding substance use before/during sex were evaluated through the concordance with the following proposed sentences (Glynn et al., 2018): "I like using drugs before/during sex and my sexual life is under control", "Substance use before/during sex leads to a more intense experience", "I have used drugs before/during sex due to peer pressure", and "I have unsafe sex under the influence of drugs". Possible answers were "Agree", "Disagree" and "Neither agree nor disagree".

2.5. Statistical methods

Absolute and relative frequencies (prevalence) of each substance used (including alcohol) in the prior 3 months, as well as median ASSIST scores and sexualized drug use were described.

To first explore the factors associated with sexualized drug use, we described absolute and relative frequencies of primary exposure variable (moderate/high risk for substance use disorders) and covariates by the outcome (sexualized drug use). Bivariate analysis was conducted to test the unadjusted association of the independent variables and the outcome.

Subsequently, we conducted a multinomial regression model to compare three categories of sexualized drug use (alcohol-sex, drug-sex and alcohol-drug-sex) with the reference ("no sexualized drug use") in a single procedure. Variables presenting a p-value equal to or lower than 0.2 in bivariate analysis were included in the model while variables used to calculate the HIRI-MSM score were not included to avoid multicollinearity. We also conducted an additional multinomial analysis including only MSM using illicit drugs to explore the magnitude of the associations especially on alcohol use disorder (Supplementary Table 2). Analyses were performed using R (R Core Team, 2019).

3. Results

3.1. Characteristics of study population

Overall, 2549 questionnaires were initiated, 2540 individuals provided informed consent, 2370 were answering for the first time, 2114 lived in the Rio de Janeiro metropolitan area, 1928 were assigned male at birth and 1341 had a male or transgender female sexual partner in the prior 6 months. From the 1341 eligible MSM, 1048 (78.1 %) completed the questionnaire and were included in the present analysis. Most individuals self-identified as cisgender man (n = 867, 89.7 %) and their sexual orientation as gay/homosexual (n = 787, 81.5 %). Median age was 29 years (interquartile range [IQR] = 23–34), and 47.3 % (n = 496) had completed a college education.

3.2. Prevalence of sexualized drug use

The point prevalence of sexualized drug use was 64.4 % (n = 675/1048); 36.6 % (n = 384) of MSM reported sex using any illicit drug and 54.9 % (n = 575) sex using alcohol. Regarding the sexualized drug use categories, 27.8 % (n = 291) reported alcohol-sex, 9.5 % (n = 100) drug-sex and 27.1 % (n = 284) alcohol-drug-sex. The most frequently substances used before/during sex were cocaine/crack (n = 114; 73.7 %, i.e., of those reporting cocaine/crack use in prior 3 months, 73.7 % used it before/during sex), inhalants (n = 99/142; 69.7 %), cannabis (n = 305/480; 63.5 %), alcohol (n = 575/935; 61.5 %) and amphetamines (n = 79/163; 48.5 %). MSM reporting sexualized drug use had higher median ASSIST scores compared to those who had no sexualized drug use for all substances (Table 1). Prevalence of ASSIST scores higher than 27 (considered high risk for substance use disorders) are depicted on Supplementary Table 1.

3.3. Primary exposure and covariates according to sexualized drug use

Moderate/high risk for substance use disorders, sociodemographic characteristics and HIV sexual risk behavior by sexualized drug use are depicted on Table 2. Among MSM reporting alcohol-sex, 30.6 % (n =

Table 1
Prevalence of prior 3-month substance use, prevalence of sexualized drug use of specific substances and median ASSIST scores (n = 1048). Rio de Janeiro, 2018.

	Use of specific substances in prior 3 months n (%)	Sexualized use of specific substances[1]		No Sexualized use of specific substances[1]	
		n (%)	ASSIST score*	n (%)	ASSIST score*
Alcohol	935 (89.2)	575 (61.5 %)	9 (5–15)	360 (38.5 %)	4 (2–9)
Cannabis	480 (45.8)	305 (63.5 %)	9 (3–17)	175 (36.4 %)	3 (2–7)
Cocaine/crack	156 (14.8)	115 (73.7 %)	12 (7–23)	41 (26.3 %)	6 (2–15)
Amphetamines	163 (15.5)	79 (48.5 %)	6 (2–13)	84 (51.5 %)	3 (2–8)
Inhalants	142 (13.5)	99 (69.7 %)	3 (2–7)	43 (30.3 %)	2 (2–7)
Hallucinogens	115 (10.9)	37 (32.2 %)	3 (2–5)	78 (67.8 %)	2 (2–5)
Opioids	23 (2.2)	6 (26.1 %)	16 (5–22)	17 (73.9 %)	2 (2–5)

*Median (IQR).[1] Denominators are individuals reporting the use of specific substance in the prior three months.

Table 2
Moderate/high risk for substance use disorders, sociodemographic **c**haracteristics and HIV sexual risk behavior by sexualized drug use (n = 1048). Rio de Janeiro, 2018.

	No sexualized drug use n = 373 (35.6 %)	Alcohol-sex n = 291 (27.8 %)	Drug-sex n = 100 (9.5 %)	Alcohol-drug-sex n = 284 (27.1 %)	p-value
Primary Exposure Variable					< 0.001
No moderate/high risk for substance use disorder	289 (77.5)	145 (49.8)	14 (14.0)	31 (10.9)	
Moderate/high risk for alcohol use disorder	37 (9.9)	89 (30.6)	2 (2.0)	19 (6.7)	
Moderate/high risk for any illicit drug use disorder	28 (7.5)	23 (7.9)	64 (64.0)	113 (39.8)	
Moderate/high risk for alcohol and illicit drug use disorders	19 (5.1)	34 (11.7)	20 (20.0)	121 (42.6)	
Recruitment					0.303
Hornet	66 (17.7)	68 (23.4)	19 (19.0)	51 (17.9)	
Facebook	94 (25.2)	81 (27.8)	25 (25.0)	80 (28.2)	
Other	213 (57.1)	142 (48.8)	56 (56.0)	153 (53.8)	
Uses social networks for sex	191 (51.2)	162 (55.7)	68 (68.0)	191 (67.2)	< 0.001
Demographic characteristics					
Age –median (IQR)	29 (23–34)	28 (23–33)	29 (24–34)	28 (24–34)	0.914
Sexual Orientation					0.036
Gay/Homosexual	297 (79.7)	248 (85.2)	87 (87.0)	220 (77.4)	
Other	76 (28.3)	43 (14.8)	13 (13.0)	64 (22.6)	
Gender					0.138
Cisgender man	324 (86.9)	265 (91.1)	8 (88.0)	261 (92.0)	
Other	49 (13.1)	26 (8.9)	1 (12.0)	23 (8.0)	
Education					0.891
College or more	174 (46.7)	136 (46.7)	46 (46.0)	140 (49.3)	
Less than college	199 (53.3)	155 (53.3)	54 (54.0)	144 (50.7)	
Color/race					0.072
Black	66 (17.7)	45 (15.5)	15 (15.0)	42 (14.8)	
Mixed	115 (30.8)	92 (31.6)	17 (17.0)	80 (28.2)	
White	192 (51.5)	154 (52.9)	68 (68.0)	162 (57.1)	
Family income[1]					0.002
3 minimum wages or less	192 (51.5)	135 (46.4)	40 (40.0)	106 (37.3)	
More than 3 minimum wages	181 (48.5)	156 (53.6)	60 (60.0)	178 (62.7)	
Steady partner (yes)	169 (45.3)	136 (46.7)	39 (39.0)	124 (43.7)	0.576
HIV sexual risk behavior in the prior 6 months					
# of sexual partners					< 0.001
1	143 (38.3)	95 (32.7)	17 (17.0)	46 (16.2)	
2-5	151 (40.5)	107 (36.8)	37 (37.0)	103 (36.3)	
6-10	45 (12.1)	51 (17.5)	16 (16.0)	56 (19.7)	
More than 10	34 (9.1)	38 (13.1)	30 (30.0)	79 (27.8)	
# of condomless receptive anal sex					< 0.001
None	222 (59.5)	154 (52.9)	51 (51.0)	115 (40.5)	
1 or more	151 (40.5)	137 (47.1)	49 (49.0)	169 (59.5)	
# of HIV-positive sexual partners					< 0.001
None	325 (87.1)	252 (86.6)	80 (80.0)	214 (75.6)	
1 or more	48 (12.9)	39 (13.4)	20 (20.0)	69 (24.4)	
# of times being insertive with an HIV positive partner					0.001
None	304 (81.5)	213 (73.2)	70 (70.0)	197 (69.4)	
1 or more	69 (18.5)	78 (26.8)	30 (30.0)	87 (30.6)	
Transactional sex	5 (1.3)	12 (4.1)	6 (6.0)	40 (14.0)	< 0.001
STI treatment	34 (9.1)	50 (17.2)	18 (18.0)	62 (21.8)	< 0.001
HIRI-MSM score ≥10	193 (51.7)	187 (64.3)	78 (78.0)	247 (87.0)	< 0.001
Believed substance use facilitated sexual practices in the prior 3 months					
Group sex	9 (2.7)	37 (12.7)	25 (25.0)	107 (37.7)	< 0.001
Anal sex	22 (6.5)	76 (26.1)	39 (39.0)	140 (49.3)	< 0.001
Fist fucking	3 (0.9)	4 (1.4)	6 (6.0)	24 (8.4)	< 0.001
Fellatio	6 (1.8)	17 (5.8)	8 (8.0)	41 (14.4)	< 0.001
Gang bang	3 (0.9)	7 (2.4)	4 (4.0)	28 (9.8)	< 0.001
Bareback	10 (2.9)	34 (11.7)	21 (21.0)	90 (31.7)	< 0.001
Double penetration	5 (1.5)	12 (4.1)	7 (7.0)	38 (13.4)	< 0.001
Any of the above[2]	27 (8.0)	100 (34.4)	46 (46.0)	189 (66.5)	< 0.001
Places frequented for sex under influence of substances					
Orgy parties	4 (1.2)	11 (3.8)	9 (9.0)	50 (17.6)	< 0.001
Sauna	3 (0.9)	21 (7.2)	12 (12.0)	41 (14.4)	< 0.001
Sex Club	5 (1.5)	9 (3.1)	4 (4.0)	23 (8.1)	< 0.001
Private parties	3 (0.9)	5 (1.7)	5 (5.0)	35 (12.3)	< 0.001
Public places	12 (3.6)	21 (7.2)	9 (9.0)	40 (14.1)	< 0.001
Any of the above[3]	21 (6.2)	45 (15.5)	29 (29.0)	99 (34.8)	< 0.001
HIV prevention and status					
Have ever used PEP (yes)	30 (8.0)	30 (10.3)	11 (11.0)	40 (14.1)	0.099
Have ever used PrEP (yes)	13 (4.0)	14 (5.6)	3 (4.3)	18 (7.9)	0.266
Reported HIV status					0.002
Negative	251 (67.3)	200 (68.7)	57 (57.0)	182 (64.1)	
Positive	48 (12.9)	42 (14.4)	30 (30.0)	56 (19.7)	

(*continued on next page*)

Table 2 (*continued*)

	No sexualized drug use n = 373 (35.6 %)	Alcohol-sex n = 291 (27.8 %)	Drug-sex n = 100 (9.5 %)	Alcohol-drug-sex n = 284 (27.1 %)	p-value
Unknown	74 (19.8)	49 (16.8)	13 (13.0)	46 (16.2)	

Alcohol-sex = Sex using alcohol only. Drug-sex = Sex using illicit drugs only. Alcohol-drug-sex = Sex using alcohol and illicit drugs. HIRI-MSM = The HIV incidence Risk Index for MSM (Smith et al., 2012). Scores ≥10 indicate high risk of HIV infection and the need of intensive prevention measures. [1] As of December 2019, three minimum wages in Brazil were equivalent to R$2994.00 or US$730.00. [2] Believed substance use facilitated group sex and/or anal sex and/or fist fucking and/or fellatio and/or gang bang and/or bareback and/or double penetration. [3] Reported having frequented orgy parties and/or sauna and/or sex clubs and/or private parties and/or public places for sex.

89/291) presented ASSIST scores compatible with moderate/high risk for alcohol use disorder, 7.9 % (n = 23/291) with moderate/high risk for any illicit drug use disorder and 11.7 % (n = 34/291) with moderate/high risk for alcohol and illicit drug use disorders. Of those reporting drug-sex, 2.0 % (n = 2/100) presented scores of moderate/high risk for alcohol use disorder, 64.0 % (n = 64/100) of moderate/high risk for any illicit drug use disorder and 20.0 % (n = 20/100) of moderate/high risk for alcohol and illicit drug use disorders. Finally, among MSM reporting alcohol-drug-sex, 6.7 % (n = 19/284) presented moderate/high risk for alcohol use disorder, 39.8 % (n = 113/284) moderate/high risk for any illicit drug use disorder and 42.6 % (n = 121/284) moderate/high risk for alcohol and illicit drug use disorders.

Considering demographic characteristics, gender, education, color/race and having a steady partner were not different among the sexualized drug use categories, but the prevalence of having a monthly family income that was higher than three minimum wages (e.g., in December 2019, three minimum wages in Brazil were equivalent to R $2994.00 or US$730.00) increased from no sexualized drug use to alcohol-drug-sex.

All variables related to HIV sexual risk behavior in the prior 6 months presented an increasing prevalence across the outcome categories with statistically significant differences, i.e., the prevalence increased from no sexualized drug use to alcohol-drug-sex. The prevalence of an HIRI-MSM score equal or higher than 10 (indicating the need for intensive prevention measures, such as PrEP) was 51.7 % (n = 193/373) for no sexualized drug use, 64.3 % (n = 187/291) for those reporting alcohol-sex, 78.0 % (n = 78/100) for drug-sex and 87.0 % (n = 247/284) for alcohol-drug-sex ($p < 0.001$). Self-reporting an HIV-positive status was more frequent (n = 30/100; 30 %) among those reporting drug-sex, followed by alcohol-drug-sex (n = 56/284; 19.7 %), alcohol-sex (n = 42/291; 14.4 %) and no sexualized drug use (n = 48/373; 12.9 %), $p = 0.002$.

Among individuals reporting an HIV-negative or unknown status (n = 872; 83.2 %), most (n = 498/872; 57.1 %) perceived themselves in risk of getting HIV in the next 12 months, as follows: 48.0 % (n = 156/325) of those reporting no sexualized drug use, 56.6 % (n = 141/249) of those reporting alcohol-sex, 61.4 % (n = 43/70) of those reporting drug-sex and 69.3 % (n = 158/228) of those reporting alcohol-drug-sex ($p < 0.001$, data not shown). There was no difference among outcome categories for having ever used PEP and PrEP.

3.4. Factors associated with sexualized drug use

In the multivariate model, presenting moderate/high risk for alcohol use disorder was associated with three times higher likelihood of having alcohol-sex and alcohol-drug-sex compared to those with no sexualized drug use. Having moderate/high risk for any illicit drug use disorder was strongly associated with higher likelihood of having drug-sex and alcohol-drug-sex. MSM presenting moderate/high risk for alcohol and illicit drug use disorders had higher likelihood of alcohol-sex, drug-sex and alcohol-drug-sex compared to those with no sexualized drug use (Table 3). Restricting the analysis to MSM using illicit drugs only, moderate/high risk for alcohol use disorder is no longer associated with sexualized drug use. The association with moderate/high risk for any illicit drug use disorder remains, but the magnitude of the effect is reduced for both drug-sex and alcohol-drug-sex categories. Lastly, moderate/high risk for alcohol and illicit drug use disorders is no longer associated with drug-sex, while the effect associated with alcohol-drug-sex is reduced (Supplementary Table 2).

Believed that substance use facilitated sexual practices lead to an almost 4-fold increase in the odds of having alcohol-sex, drug-sex and alcohol-drug-sex compared to no sexualized drug use. Frequenting places for sex under influence of drugs lead to an almost 2-fold increase in the odds of having drug-sex and alcohol-drug-sex, but not with alcohol-sex. Other covariates also associated with sexualized drug use were: STI treatment with alcohol-sex (AOR 1.18, 95 % CI 1.09–3.26); sexual orientation different than gay/homosexual (AOR 2.07, 95 % CI 1.18, 3.63), family income higher than 3 MW (AOR 1.72, 95 % CI 1.10, 2.70) and presenting an HIRI-MSM score ≥ 10 (AOR 3.27, 95 % CI 1.92, 5.55) with alcohol-drug-sex.

3.5. Attitudes regarding sex according to sexualized drug use categories

Compared to those with no sexualized drug use, MSM reporting alcohol-sex, drug-sex and alcohol-drug-sex more frequently like to use substances before/during sex and think their sexual lives are under control, agree that substance use leads to a more intense experience, have used substances before/during sex due to peer pressure and have unsafe sex under the influence of substances (Table 4).

4. Discussion

The prevalence of sexualized drug use in a sample of MSM from Rio de Janeiro, Brazil was 64 %. Sexualized drug use was common among alcohol and illicit drug users, and the ASSIST scores were higher among those reporting sexualized drug use. The multinomial analysis shows that moderate/high risk for alcohol and illicit drug disorders is strongly associated with sexualized drug use even when adjusted by sociodemographic and HIV sexual risk behavior covariates. The prevalence of substance use and sexualized drug use was higher than found in a previous web-based survey conducted in Brazil (Torres et al., 2019a). This disparity may be explained by the different recall time frame which sexualized drug use was measured (previous 6 months) and the use of a single question about sexualized use, which comprised any illicit drug use. In addition, Brazil is a continental, unequal and culturally diverse country, and this study was restricted to Rio de Janeiro metro area. Worldwide, prevalence of sexualized drug use ranged from 3.6 % to 93.7 %. Such a huge range probably reflects the different epidemiological, cultural and market contexts from various countries, as well as methodological differences on the drugs considered for sexualized drug use (Tomkins et al., 2019).

Our results show the association of moderate/high risk for alcohol and illicit drug use disorders and sexualized drug use, even when the analysis is restricted to illicit drug users only. We were not able to find other studies reporting these associations. Considering the widespread use of PrEP to prevent HIV infection, Infectious Diseases specialists and PrEP prescribers may be more prone to screen sexualized drug use due to its association with HIV sexual risk behavior and STI infection.

Table 3
Multinomial regression model evaluating factors associated with sex using alcohol only (alcohol-sex), illicit drugs only (drug-sex) and alcohol and illicit drugs (alcohol-drug-sex) (reference = no sexualized drug use) among MSM (n = 1048).
Rio de Janeiro, 2018.

	Alcohol-Sex AOR (95 % CI)	Drug-Sex AOR (95 % CI)	Alcohol-Drug-Sex AOR (95 % CI)
Primary Exposure Variable			
No moderate/high risk for substance use disorder	1	1	1
Moderate/high risk for alcohol use	3.5 (2.19, 5.61)***	0.82 (0.18, 3.85)	2.65 (1.26, 5.57)*
Moderate/high risk for any illicit drug use disorder	1.06 (0.56, 2.01)	29.69 (13.7, 64.34)***	16.44 (8.56, 31.58)***
Moderate/high risk for alcohol and illicit drug use disorders	2.26 (1.16, 4.43)*	14.55 (5.76, 36.75)***	22.94 (11.14, 47.23)***
Uses social networks for sex	0.87 (0.61, 1.25)	1.11 (0.62, 1.97)	0.82 (0.52, 1.31)
Sexual Orientation			
Gay/Homosexual	1	1	1
Other	0.88 (0.55, 1.39)	1.09 (0.51, 2.33)	2.07 (1.18, 3.63)*
Color/race			
Black	1	1	1
Mixed	1.28 (0.76, 2.15)	0.75 (0.31, 1.81)	1.01 (0.52, 1.98)
White	1.14 (0.7, 1.86)	1.57 (0.74, 3.34)	1.28 (0.69, 2.37)
Family income			
3 MW or less	1	1	1
More than 3 MW	1.18 (0.83, 1.68)	1.30 (0.75, 2.26)	1.72 (1.10, 2.70)*
Tobacco use disorder	0.95 (0.63, 1.43)	0.81 (0.45, 1.46)	1.09 (0.67, 1.78)
Transactional sex	1.66 (0.53, 5.16)	1.54 (0.36, 6.47)	2.72 (0.82, 9.05)
STI treatment	1.89 (1.09, 3.26)*	1.04 (0.48, 2.27)	1.59 (0.83, 3.01)
HIRI for MSM score ≥10	1.26 (0.88, 1.80)	1.57 (0.84, 2.95)	3.27 (1.92, 5.55)***
Believed substance use facilitated sexual practices in the prior 3 moths	4.52 (2.72, 7.52)***	4.13 (2.12, 8.06)***	10.45 (5.95, 18.36)***
Places frequented for sex under influence of substances	1.51 (0.82, 2.78)	2.29 (1.08, 4.86)*	2.19 (1.14, 4.21)*
Reported HIV status			
Negative	1	1	1
Positive	0.8 (0.47, 1.36)	1.28 (0.62, 2.61)	0.69 (0.36, 1.3)
Unknown	0.67 (0.42, 1.05)	0.58 (0.27, 1.25)	0.57 (0.31, 1.02)
Have ever used PEP (yes)	1.32 (0.72, 2.41)	1.44 (0.58, 3.59)	1.62 (0.78, 3.37)

***p-value = 0.001, **p-value = 0.01, *p-value = 0.05. Alcohol-sex = Sex using alcohol only. Drug-sex = Sex using illicit drugs only. Alcohol and drug-sex = Sex using alcohol and illicit drugs. HIRI-MSM = The HIV incidence Risk Index for MSM (Smith et al., 2012). Scores ≥10 indicate high risk of HIV infection and the need of intensive prevention measures.

However, these professionals are not always trained for screening, diagnosing and treating substance use disorders. Our results show that a positive answer for sexualized drug use should lead to the screening of substance use disorders, and in case of a positive screening (moderate/high risk for substance use disorders), to treatment. Access to substance use disorders treatment, however, is a major challenge because of the lack of trained human resources, stigma and funding - among other reasons described by the Lancet Commission on Global Mental Health and the Sustainable Development (Patel et al., 2018). In this sense, our results (the ASSIST scores) indicate that a brief intervention (WHO recommended treatment for substance use disorders (WHO, 2016)), could be helpful for the majority of MSM positively screened. The ASSIST itself presents a manualized brief intervention that may be provided by non-mental health specialists, and could be an interesting option in the context of PrEP. Nevertheless, this intervention has not been evaluated among Brazilian MSM and additional studies are necessary to show its acceptability, feasibility and efficacy.

The majority of international studies evaluating sexualized drug use prevalence do not include alcohol, which was the most commonly substance used in our study, as well as in a bio behavioral survey conducted in 13 European countries (Rosińska et al., 2018). Alcohol is widely available in Western countries, including Latin America (WHO,

Table 4
Attitudes regarding sex according to sexualized drug use categories (n = 1012).
Rio de Janeiro, 2018.

	No sexualized drug use[a] n = 337 (%)	Alcohol-Sex n = 291 (%)	Drug-Sex n = 100 (%)	Alcohol-Drug-Sex n = 284 (%)	p-value
I like using substances before/during sex and my sexual life is under control.					< 0.001
Agree	9 (2.7)	24 (8.2)	42 (42.0)	137 (48.2)	
Neither agree or disagree	66 (19.6)	70 (24.0)	30 (30.0)	80 (28.2)	
Disagree	262 (77.8)	197 (67.7)	28 (28.0)	67 (23.6)	
Substance use before/during sex leads to a more intense experience.					< 0.001
Agree	39 (11.6)	49 (16.8)	59 (59.0)	183 (64.4)	
Neither agree or disagree	90 (26.7)	94 (32.3)	21 (21.0)	61 (21.5)	
Disagree	208 (61.7)	148 (50.8)	20 (20.0)	40 (14.1)	
I have used substances before/during sex due to peer pressure.					< 0.001
Agree	5 (1.5)	8 (2.7)	5 (5.0)	25 (8.8)	
Neither agree or disagree	19 (5.6)	24 (8.2)	3 (3.0)	25 (8.8)	
Disagree	313 (92.9)	259 (89.0)	92 (92.0)	234 (82.4)	
I have unsafe sex under the influence of substances.					< 0.001
Agree	25 (7.4)	46 (15.8)	23 (23.0)	79 (27.8)	
Neither agree or disagree	32 (9.5)	49 (16.8)	18 (18.0)	55 (19.4)	
Disagree	280 (83.1)	196 (67.3)	59 (59.0)	150 (52.8)	

[a] n = 36 individuals who never used any substances did not answer these questions. Alcohol-sex = Sex using alcohol only. Drug-sex = Sex using illicit drugs only. Alcohol and drug-sex = Sex using alcohol and illicit drugs.

2018). It has been previously associated with increased chances of sexual risk behavior, STI and HIV acquisition among MSM (Cunha et al., 2015; Delgado et al., 2017; Young et al., 2016), as well as with poor adherence to antiretroviral therapy and loss to follow up among people living with HIV/AIDS (De Boni et al., 2018, 2016). Alcohol has been considered the "forgotten drug" in the HIV epidemic (Fritz et al., 2010), but our results suggest that it should not be forgotten in sexualized drug use evaluation due to the association of alcohol-sex with STI treatment and the belief that substance use fostered some sexual practice in the prior three months. In addition, alcohol use disorders increased the likelihood of reporting alcohol-sex and alcohol-drug-sex, thus brief interventions would have been indicated to those MSM.

In accordance with previous studies, all HIV sexual risk behavior variables were more frequent among MSM reporting sexualized drug use (Delgado et al., 2017; Glynn et al., 2018; Kenyon et al., 2018; Pufall et al., 2018; Rosińska et al., 2018; Sewell et al., 2017). A unique aspect of our study demonstrates that there is a gradient on the frequencies of these behaviors across the categories of no sexualized drug use, alcohol-sex, drug-sex and alcohol- drug-sex. Thus, individuals reporting no sexualized drug use present the lowest frequencies of any HIV sexual risk sexual behavior covariate followed by those reporting alcohol-sex, drug-sex and alcohol and drug-sex, respectively. This increasing prevalence is reflected in the frequencies of HIRI-MSM scores equal or higher than 10 and previous STI treatment, which remained associated with alcohol- drug-sex and alcohol-sex (respectively) after the multivariate analysis. These results indicate that interventions addressing substance use broadly, including alcohol use, could be beneficial among MSM populations engaging in sexualized drug use.

Considering the above findings, it is worrisome that PEP use was not associated with sexualized drug use. We did find a higher HIV risk perception among those reporting sexualized drug use, as well as higher frequencies of PEP and PrEP use. HIV risk perception was not included in the multivariate model (as it was only asked to those with a negative/unknown HIV status), and PEP/PrEP use was not significantly different across groups in either the bivariate or the multivariate analyses. Our previous studies have already shown the low use of PEP among Brazilian MSM (Torres et al., 2018, 2019a, 2019b), which is probably related to low awareness of this prevention strategy (Hoagland et al., 2017). Regarding PrEP, it was expected that the previous use would be low, given that it became available in the public health system only five months before this survey was conducted. Interestingly, in the PrEP Brasil Study, MSM reporting stimulant use presented a higher likelihood of PrEP adherence after a 48-week follow-up (Grinsztejn et al., 2018), which may be a promising harm reduction strategy for those presenting sexualized drug use.

This study is not free of limitations. First, as with any web-based sample, it is not probabilistic and does not represent the entire MSM population from Rio de Janeiro. However, the associations found in this sample suggest that interventions for substance use disorders and harm reduction must be considered for MSM reporting sexualized drug use. Second, even in anonymous web-based surveys, sensitive questions are prone to social desirability bias, which could potentially underestimate the prevalence of sexualized drug use, risk for substance use disorders and HIV sexual risk behavior. Third, ASSIST is a screening questionnaire, and the results presented should not be considered to be substance use disorder diagnoses. Forth, cross-sectional studies are not appropriate for drawing conclusions about causality, so the direction of the associations should be interpreted with caution. Finally, this study did not address motivation related to sexualized drug use, which is an important step in the understanding of this behavior. As motivation may be influenced by sociocultural context, and there is no data from Brazilian MSM, qualitative studies are necessary to start this field in our country. We did include some questions regarding the pleasure, intensity of the experience and peer pressure that may be useful as an exploratory step. Results are similar to those found in a qualitative study conducted among MSM from London, where motivations included enhancing the quality of sex (increasing libido, confidence, disinhibiting and stamina) and the qualities of the sex that men value, as drugs make other men more attractive, increase physical sensations, intensify perceptions of intimacy and facilitates a sense of sexual adventure (Weatherburn et al., 2017). Our results may be viewed as a preliminary attempt to shed light on this issue, but further research is necessary.

5. Conclusions

Considering the high prevalence of sexualized drug use, as well as its association with moderate/high risk for substance use disorders and HIV sexual risk behavior, our findings suggest that MSM reporting sexualized drug use should be screened for substance use disorders, receive appropriate treatment and be evaluated for combination HIV prevention strategies, including PrEP.

Contributors

TST, LK and RBDB conceptualized the study and completed the literature search. TST, LK, NMF and RBDB designed the questionnaire. TST and RIM supervised the questionnaire programming. TST, DRBB and AG coordinated the social media campaign. TST, LK, LB and RBDB supervised data collection. LB analyzed the data and generated the tables. TST, LK, LB, VG, BG and RBDB interpreted the data. All authors revised the manuscript and contributed intellectually.

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Declaration of Competing Interest

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Appendix A. Supplementary data

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