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Correlates of Sexualized Drug Use Among Men Who Have Sex with Men (MSM) in Malaysia

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Abstract

Sexualized drug use (SDU), also known as ‘chemsex’ or ‘chem-fun,’ is an emerging public health concern. This HIV risk behavior is a major issue and marginalized communities such as men who have sex with men (MSM) may be overlooked for prevention efforts or struggle to access adequate treatment. This study aims to determine the correlates of SDU to inform interventions, policy, and prevention of SDU. A convenience sample of Malaysian MSM were recruited through advertisements on geosocial networking apps (GSN) for gay men (e.g., Grindr, Hornet) and on popular social media platforms (i.e. Facebook). From June-July 2020, participants completed an anonymous online survey that took an average of 10-12 minutes. Participants answered questions about demographics, sexual health, HIV testing practices, and preference for future HIV prevention programs. Bivariate and multivariable logistic regression were used to assess associations between SDU and participants' characteristics and other variables. Of a sample of 355 participants, the mean age was 33.1 (± 8.9) years, about half (53.3%) were Malay, and 84.5% had above a tertiary level of education. Forty-two participants (11.8%) reported engaging in SDU in the past six months. The results of the multivariable logistic regression revealed that the most highly associated factors of participating in SDU in the past 6 months at a 95% CI and an alpha level of 0.05 were age, participation in group sex, and recent injection drug use, and PrEP use in a lifetime. Opportunities for SDU reduction among MSM in Malaysia, exist in prevention efforts that focus on associated factors of SDU. Accessible harm reduction focused on mitigating the associated factors of SDU may result in an overall reduction of SDU prevalence.

Keywords: sexualized drug use, HIV, men who have sex with men, chemsex, Malaysia

Introduction

Human immunodeficiency virus (HIV) is a highly prevalent disease that if left untreated, can lead to acquired immunodeficiency syndrome (AIDS) (CDC, 2021). HIV/AIDS is a fatal virus that attacks the body's immune system (CDC, 2021). There is no effective cure for HIV, however, it is preventable and controllable with appropriate medical treatment. Despite the ability to prevent and control the disease, it is still extremely prevalent and considered an epidemic. In 2020, an estimated 37.7 million people were living with HIV/AIDS and 680,000 died from HIV-related causes worldwide (WHO, 2021). HIV/AIDS infection has been shown to disproportionately affect the following populations: people who inject drugs, transgender women (TGW), sex workers and their clients, and gay men and men who have sex with men (CDC, 2021). These key populations have a 35, 34, 26, and 25 times increased risk of acquiring HIV, respectively (CDC, 2021).

Specifically, in Malaysia and other low-to-middle-income countries, HIV has an alarmingly high prevalence (12-18 times higher) among MSM and transgender women compared to the general population (Malaysia Ministry of Health, 2016). Attempts to mitigate HIV are further complicated since those who participate in same-sex activities and drug use are highly stigmatized and even criminalized. The punishment for same-sex intercourse is up to 20 years of imprisonment according to section 377 of the Malaysian Penal Code (NQAPIA, 2020). There is further perpetuation of stigma against the lesbian, gay, bisexual, and transgender (LGBT+) community in Malaysia due to the Shariah law forbidding homosexuality and cross-dressing (Earnshaw et al., 2016; Ferro et al., 2017). These discriminatory attitudes also exist among healthcare providers, making it difficult for MSM to seek care and trust providers (Earnshaw et al., 2016). These fears only worsen health outcomes for MSM, as they are not receiving equal

healthcare. These legal barriers and societal attitudes surrounding these groups exacerbate their isolation and make it more difficult for HIV education and prevention efforts to circulate, putting MSM and TGW at a higher risk of contracting the disease. Studies researching stigma against HIV-positive MSM have reported finding high levels of stigma even amongst medical students and healthcare providers, meaning those who have already been infected with HIV have challenges seeking and adhering to treatment (Earnshaw et al., 2016; Ferro et al., 2017). All of these factors combined result in MSM having a high risk of contracting HIV as well as finding adequate healthcare support to prevent and treat the disease.

Another factor potentially contributing to the high prevalence of HIV is sexualized drug use, recently also known as ‘chemsex’ or ‘party play’. Sexualized drug use (SDU) is “the practice of intentionally using drugs (before or during sex to increase both sexual pleasure and arousal” (Pufall, 2018). This risk behavior is observed predominantly among gay, bisexual, and other MSM (Pufall, 2018). The use of methamphetamine (ice), ketamine (k), gamma hydroxy butyrate (GHB), gamma-butyrolactone (GBL), and other stimulant drugs amongst gay/MSM communities in Malaysia and the surrounding region have risen in past years (Newland, 2021). A study conducted in Malaysia by Iskander et al. (2016), found that 17% of 990 respondents to an online survey had engaged in SDU in the previous 12 months.

SDU sessions could increase the risk of HIV and other STI transmission due to the typical behaviors that arise from this practice. For example, common outcomes during SDU sessions include unprotected anal intercourse (AUI) or sex with multiple partners, as well as risk related to prolonged sex and impaired decision making (González-Baeza et al., 2018). The risks of these behaviors include STIs (gonorrhea) and blood borne-viruses (hepatitis C syphilis, gonorrhea, and HIV) (Donnadieu-Rigole, 2020). Additionally, the use of drugs for SDU can

result in adverse health outcomes such as agitation, hallucinations, anxiety, suicidal ideation, paranoia, and confusion (Donnadieu-Rigole, 2020). Those consuming these drugs may be left in vulnerable positions and settings, which could potentially be dangerous to their health and safety.

The growth of social media platforms and networking sites, especially those tailored to MSM, have expanded SDU. Together, the advancement of the Internet and geosocial networking platforms (GSN) has created more opportunities for MSM interested in SDU to connect, if desired (Donnadieu-Rigole, 2020). In addition to geosocial networking apps being extremely common among MSM seeking SDU, a meta-analysis found that MSM utilizing GSN to find sexual partners are more likely to have STIs than non-users (Wang et al., 2018). Additionally, substance manufacturing has evolved to include a wide variety of new synthetic substances that have gained popularity among MSM communities engaging in SDU (Donnadieu-Rigole, 2020). Synthetic substances such as cathinone, methamphetamines, gamma-butyrolactone/gamma-hydroxybutyrate (GBL/GHB), ketamine, and cocaine have emerged over the years and are popular among MSM participating in SDU. The combination of more accessibility to sexual partners and substances combined with the research showing that MSM on GSN is more likely to have STIs and the consequences of SDU, present a concerning mix of factors that requires further attention. While SUD is an emerging public health concern, the lack of existing literature on SDU, especially in Malaysia, is concerning. Understanding the prevalence of SUD and how it affects HIV risks of MSM is important to tailor intervention approaches to reduce this risky practice.

An online survey collecting quantitative data on sexual risk behaviors and HIV testing behaviors among MSM in Malaysia and the feasibility of a mhealth app for HIV prevention will provide data about the correlates of SDU among MSM in Malaysia. Understanding the risk

factors of MSM that directly relate to SDU practices will help in creating resources and interventions that are more effective in this population. When considering the populations at the highest risk of HIV, SDU and its correlates cannot be ignored. We hypothesize that from research, we will find associations between SDU and the following sexual risk behaviors: anal sex, transactional sex, group sex, injection drug use, PrEP use, high self-perceived HIV risk, disclosure of sexual orientation, and diagnosis of STI in the past 12 months.

Overall, there is a need for more research on the practice of SDU and what factors put an individual at risk for this behavior and thus contracting HIV or other STIs. This information from this current study will help contribute to existing research that is integral for designing interventions. It is particularly important to understand the social climate and misconceptions that contribute to increasing the potential for SDU and how it relates to other sexual risk behaviors. SDU will only continue to increase if interventions do not address the driving factors of this risky behavior.

Literature Review

Global HIV Epidemic

HIV/AIDS has been a prevalent global health concern for decades, affecting millions of people annually. However, the epidemiology and burden of disease have been shown to impact MSM at disproportionately higher rates. HIV/AIDS prevention methods such as screening donated blood, antiretroviral (ART), pre-exposure prophylaxis medication, and access to sterile injection equipment have all been successful efforts to reduce HIV/AIDS risk (Phanuphak, 2020). MSM is a high-risk subpopulation that remains at a disproportionately high risk of HIV/AIDS (MOH, 2020). Globally, this subgroup experiences a higher burden of HIV. Data from UNAIDS (2019),

shows that “the estimated median HIV prevalence in MSM ranges from 5% in South-East Asia to 12.6% in Eastern and Southern Africa. In 2019, MSM accounted for 44% of new HIV infections in Asia and the Pacific” (WHO, 2021). MSM are also at a 26 times higher risk of acquiring HIV than the general population (WHO, 2021).

HIV Epidemic in Malaysia

Specifically, in Malaysia, the first reported case of HIV was in 1986 (MOH, 2020). Data from 2019, reports that 77,903 people were living with HIV in Malaysia (MOH, 2020). 3,564 people were newly infected with HIV in 2019 (MOH, 2020). The HIV epidemic is also more prevalent in urbanized states of Malaysia. Selangor, Kuala Lumpur, and Johor are three urbanized states where 50% of Malaysia’s new HIV cases originate (MOH, 2020). While there have been successful efforts to reduce the prevalence of new annual HIV infections, Malaysia has experienced a plateau in progress since 2010 (MOH, 2020).

HIV among MSM in Malaysia

Mirroring the global trends, MSM is a key population of interest in Malaysia when it comes to HIV/AIDS prevention. However, this subpopulation continues to have a high prevalence of HIV/AIDS. Research shows that barriers to this population such as stigma and discrimination, make it more challenging to implement prevention measures (MOH, 2020). These barriers result in the HIV/AIDS risk among MSM increasing further. Reports from biobehavioral surveys distributed in Malaysia have shown alarming increases in HIV prevalence among MSM. Not only was there a 21.% prevalence of HIV among MSM, but the prevalence of HIV among MSM in Malaysia’s capital increased from 22% to 43% between 2014-2018 (Ministry of Health Malaysia, 2018).

Risk Factors

Historically, MSM has been considered a difficult-to-reach population (Gama, 2017). However, allocating resources toward research and interventions for this population is a critical component of HIV/AIDS prevention. Current research has shown some of the intervention approaches that tend to be more successful when working with the MSM population.

Another important factor when considering MSM and HIV risk is the social climate of the area and the attitudes towards MSM. In Malaysia, the prevalence of HIV risk is even higher among MSM – an already vulnerable group – due to stigma and discrimination. Stigma and discrimination are known to create barriers to HIV care (Earnshaw et al., 2016). In Malaysia, since same-sex relations are criminalized, this environment leads to an increased burden of HIV risk falling among MSM. This increased risk is a concern as it can lead to even more HIV risk behaviors and the spreading of HIV. Researchers [Beyrer and colleagues] have warned that “the next wave of global HIV” is the increased prevalence of HIV among MSM (Earnshaw et al., 2016). Not only does MSM continue to be a population that is at high risk for HIV, but the advancement of social media and technology has also posed both benefits and threats to this community in terms of HIV risk.

The development of social media and technology can provide dynamic ways to develop interventions and mhealth strategies. Social media helps connect communities and provide educational resources. However, these technologies can also cause harm. These advanced and widespread technologies have allowed for the popularization and widespread use of GSN apps – a preferred method for MSM who are seeking partners for SDU – to increase the risk of engaging in sexual risk behaviors. Research has shown that MSM is more likely to find sexual partners through GSN apps and mobile applications (Beymer et. al, 2014). This practice puts MSM at a greater risk for contracting HIV and STIs due to the associations between finding

partners online and engaging in unsafe sexual practices (Beymer et. al, 2014). Learning how to use the benefits of technology for interventions, while mitigating the risks is important for HIV prevention.

SDU and HIV

SDU is an emergent public health concern, especially among MSM. Some motivations to participate in SDU are seeking enhanced and extended sexual gratification and pleasure, freedom and confidence to explore sexual fantasies, pride and empowerment, beauty and social power, social and sexual lubricant, and community identity and culture (Lim et. al, 2018; Tan et al., 2018). There are health and psycho-social motivations and impacts of SDU as well. These are using drugs as a coping mechanism, the belief that one can control their drug use, mental health, depression and suicidal ideation, negative physical effects of drug use, and negative psycho-social impacts of drug use (Lim et. al, 2018; Tan et al., 2018). SDU is also associated with HIV risk behaviors. Research has found that among MSM, “SDU was most commonly investigated in relation to condomless anal intercourse, followed by HIV prevalence, and then STI diagnoses. Drug use was generally associated with sexual health outcomes, but particularly in chemsex studies.” (Hibbert et. al, 2021). Additional findings have supported that SDU is associated with sexual risk-taking, condomless sex, HIV, and other STIs due to lowered inhibitions, reduced access to condoms, social norms, perceptions of sexual freedom, reduced sensitivity, and erections when using methamphetamine (Lin, 2018; Tan, 2018). Emergent trends are showing that sexual risk behaviors are associated with SDU. The implications of these findings are concerning when considering that MSM is already a high-risk population and historically difficult to reach for interventions. Combined with the fact that SDU is a risk behavior that is

likely to continue to grow with further development of technology, contributing to research on this public health concern is crucial for HIV prevention.

Methods

Study Sample

This study was designed as an online survey and distributed between June to July 2020 among MSM in Malaysia. Data collection was focused on understanding if a mHealth HIV prevention program would be feasible for this population by assessing attitudes, stigmas, and beliefs about this approach. To complete the survey, participants had to meet the following eligibility criteria: i) were 18 years or older; ii) identified as male; iii) self-reported HIV status as negative or unknown; iv) reported substance use or condomless anal sex with another man in the past 6 months; and v) were able to read and understand English or Bahasa Malaysia.

Study Setting

The online survey was administered to a convenience sample of MSM found on geosocial networking apps (GSN) in Malaysia. Malaysia is a Southeast Asian country sharing a border with Thailand (Sawe, 2019). It is located in the Malay Peninsula and is just north of Singapore. The language predominantly spoken in Malaysia is Malay. As of 2020, the population of Malaysia was estimated to be 32.36 million people. Of this population, an estimated 50.1% are Malay, while the remaining ethnic groups are Chinese (22.6%), non-Malay Bumiputera, other indigenous groups (11.6%), Indian (6.7%), and other groups (0.7%). The Malay culture predominantly consists of Hinduism, Buddhism, and animism. (Sawe, 2019). Religion is a considerable factor in the hostile climate towards LGBTQ+ individuals in Malaysia. The Sharia

law that is enforced by Islamic Religious Departments applies to Muslims. However, 60% of Malaysians are Muslims. The Sharia laws have strict and harsh punishments for consensual same-sex relations as well as gender nonconformity (Human Rights Watch, 2021).

Study Procedures

Study participants were recruited using advertisements placed within geosocial networking apps (GSN) for MSM (e.g., Grindr, Hornet) and on general well-known social media platforms (i.e., Facebook). GSN users encountered advertisements for the study as they interacted with GSN apps. On the social networking sites, study advertisements were placed as static ads on the right-hand pane of the website or displayed as a post in the user's feed. By clicking on these advertisements, users were redirected to the eligibility screening tool and consent form on Qualtrics. Those who completed the screening tool were able to enter a random drawing to win 1 of 10 RM (Malaysian ringgit) 635 vouchers (equivalent to \$150). The consent form disclosed this compensation information.

The consent form provided eligible prospective participants the opportunity to understand the risks, purpose, and benefits of completing the study survey. Should participants decline to participate, they were given instructions on how to enter the random drawing. Those who completed the survey were redirected to a separate website to enter the drawing. There were no risks to participating in the study. There was no monetary incentive besides the random drawing. Participants understood that there were no direct benefits to completing the survey, but they were providing information that would help in the creation of a smartphone app to improve HIV prevention programs for the LGBT community. The website for the drawing collected an email address, participant privacy was preserved, since the email address did not connect to their data

or responses. Participants were informed that the survey would take approximately 10-15 minutes to complete. The anonymous survey took participants 10-12 minutes to complete on average. In total, the survey consisted of 58 questions. Twelve of these questions were related to four short video clips that were embedded within the survey. The study protocol and consent form were approved by University of Malaya Research Ethics Committee (UMREC) and the Yale University Institutional Review Board.

Study Measures

Participant characteristics

The following demographic information was collected from the participants: age, sexual orientation, ethnicity, relationship status, education level, income (RM), and disclosure of sexual orientation to others. Participants were asked to provide self-reported HIV testing history in the past 3-, 6-, 12- months, and within their lifetime. Information about test results and STI diagnoses was also collected.

Sexual risk behaviors

Participants were also asked to answer questions about their sexual risk behaviors. These questions included engagement in anal intercourse with another man, engagement in condomless sex (CS), number of sexual partners, and engagement in group sex, commercial sex, and SDU. “Chemsex [sexualized drug use] was defined as the use of a psychoactive substance (e.g., crystal methamphetamine/’Batu’;/ice, ketamine, ecstasy, and gamma-hydroxybutyrate/ ’G’) before or during anal intercourse”(Daly, 2013; Schmidt et. al, 2016; Stephenson, 2014). Participants were asked about their engagement in SDU with the following question: “*In the past 6 months, have you used recreational drugs (Crystal meth/Ice, Ketamine, Ecstasy, GHB/GBL) before or during anal sex?*” The answer choices were dichotomous, “yes” and “no”.

Data Analysis

IMB SPSS version 28.0 was used to conduct the analysis. First, descriptive statistics were completed for all of the variables. Frequency was calculated for the categorical variables. For the continuous variables, mean and standard deviation were calculated. Bivariate analyses were calculated using a 95% confidence interval, and a $p < 0.05$ was used to determine statistical significance. To be included in the multivariate logistic regression model, variables from Table 1 were required to have a value of $p \leq 0.10$.

Results**Participant Characteristics**

The sample consisted of 355 participants. Table 1 contains the characteristics of this sample stratified by if they had engaged in SDU in the past 6 months. Just over half of the sample (53.5%), identified as Malay. Just over half of the sample (67.0%) reported that they were single, had above a secondary level of education (84.5%), and made at least 3000 RM (Malaysian ringgit) (52.7%). The vast majority of the sample (74.1%) identified as homosexual, while the remaining 25.9% identified as bisexual or other. The majority of respondents reported no engagement in HIV risk behaviors such as no transactional sex (64.8%), group sex (83.1%), or injection drug use (88.2%). The majority of participants engaged in the following notable HIV risk behaviors: anal sex (76.1%) and condomless sex (55.6%). Out of the 355 participants, 42 (11.8%) stated that they participated in SDU in the past 6 months. The mean age of this group was 36.4 (SD \pm 8.0) years, this is notably higher than the overall mean age of the group which was 33.1 (SD \pm 8.9) years.

Correlates of Sexualized Drug Use

Bivariate logistic regression analysis was used to determine the relationship between participants who reported engaging in SDU in the past 6 months and HIV transmission risk behaviors as well as HIV testing behaviors. Table 1 displays the odds ratios (OR) these results. At a value of $p < 0.01$, a 95% CI, and an alpha level of 0.05, anal sex (OR=7.217, $p = 0.007$), group sex (OR=15.480, $p < 0.001$), injection drug use (OR=62.200, $p < 0.001$), PrEP use in lifetime (OR=4.795, $p < 0.001$), disclosure of sexual orientation (OR=1.845, $p = 0.064$), and STI diagnosis (OR= 2.014, $p = 0.040$) in the past 6 months showed a statically significant correlation with SDU in the past 6 months.

Table 2 displays the independent correlates and adjusted odds ratios (aOR) of participating in SDU in the past 6 months. The results of the multivariate logistic regression revealed that the most highly associated factors of participating in SDU in the past 6 months at a $p > 0.010$, a 95% CI, and an alpha level of 0.05 were a mean age of 36.4 (± 8.0) (aOR=1.061, $p = 0.007$), participation in group sex (aOR=3.436, $p < 0.001$), injection drug use in the past six months (aOR=42.349, $p < 0.001$), and PrEP use in within their lifetime (aOR=3.404, $p = 0.001$). Those who participated in condomless sex (aOR=1.624, $p = 0.247$), transactional sex (aOR=1.501, $p = 0.603$), disclosed their sexual orientation (aOR=1.165, $p = 0.382$), and received an STI diagnosis in the past 12 months (aOR=1.464, $p = 0.444$) were not found to have an association with participation in SDU in the past 6 months.

Discussion

Our findings support previous research efforts that the following sexual risk behaviors are associated with SDU: age, participation in group sex, recent injection drug use, and PrEP use.

The findings of the study showed an association between the age of the participants in the study and their involvement in SDU. This indicates that the demographic of MSM participating in SDU in Malaysia is a bit older than other MSM not engaging in SDU. Not only can this knowledge inform interventions, but it is especially useful when thinking about approaches to prevention efforts since a powerful tool of risk reduction regarding any public health concern is early intervention and education. Since the average age of MSM in the sample was lower than the average age of MSM participating in SDU shows that there is a good opportunity to intervene early among this population. While there are no studies that have directly compared age and SDU, early intervention and education about SDU could be a possible intervention opportunity to deter MSM from engaging in SDU.

In past research, group sex has been found to show a relationship to increased condomless sex (Knox et al., 2020), as well as increased polydrug use (Hirshfield et al., 2015). The association between group sex and condomless sex amplifies HIV risk, especially when considering that multiple partners are involved. Since polydrug use has been cited as an associated factor of group sex, it is notable that this current study found associations between SDU and group sex, as well as SDU and injection drug use. In addition, MSM is at an increased risk since many are meeting sexual partners via GNS or mobile applications – a practice that has been associated with having more sexual partners and a higher risk of HIV infection and sexually transmitted infections (STI) (Chow et al. 2016; Ogilvie et al., 2008). Encouraging safe testing practices among MSM, as well as safe sexual practices, especially during sex, especially group sex, is important for mitigating HIV and SDU risk behaviors.

Recent injection drug use was found to be associated with SDU in the current study. While SDU does not always imply injection drug use, injecting drugs can be a part of engaging

in SDU or an associated factor of SDU. The act of injecting drugs for sex is “the most common first episode of drug injection and is the most efficient risky behavior for the transmission of HIV, hepatitis B or C and other blood-borne infections” (Guerras et al., 2021). Lowered inhibitions due to drug use can create situations where sexual risk behaviors are more likely to occur.

Research has demonstrated that SDU is not a barrier to PrEP initiation (Flores et. al, 2021). Since taking daily PrEP is a health behavior that requires self-motivation, this could support the idea that people who engage in SDU may be more likely to be self-motivated. Increased self-motivation is a tool for intervention methods, as it may mean that people are more likely to engage in protective measures. This becomes even more important when thinking about how other highly stigmatized risk factors (e.g. participation in group sex, injection drug use,) are associated with SDU. Working on accessible harm reduction programs for these risk factors could therefore reduce the overall prevalence of SDU (Newland, 2021). For example, sharing injection equipment is a risky practice, and an association between injection drug use and SDU suggests that a reduction in injection drug use could also reduce SDU, meaning continued and increased efforts towards safe injection interventions could be a success.

The study had a few strengths. The online format allowed participants to discreetly answer questions without feeling uncomfortable. This could potentially result in more candid and accurate responses about subjects that are usually uncomfortable. The study also asked participants about a wide range of sexual risk behaviors. The study was able to find associations between SDU and sexual risk behaviors, which will contribute literature to a topic where research is still fairly new.

There were also limitations to this study. Due to the sensitive nature of the questionnaire, participants may feel uncomfortable. They may also be subject to recall bias when answering questions about their past experiences. Additionally, the survey did not contain too many in-depth questions about sexual risk practices. While there was a good range of questions to assess the scope of an individual's sexual risk behaviors, more comprehensive data could have been collected should the survey contain more in-depth questions about SDU and sexual risk behaviors and patterns. Additionally, conducting research that specifically recruits a larger sample of only those who report engaging in SDU, may help with finding more associations between SDU and other sexual risk behaviors. Finally, correlation does not imply causation. Due to the cross-sectional design of the survey, causal inferences between SDU and other sexual risk behaviors could not be made.

Conclusion

SDU is an emergent and concerning HIV risk behavior. The correlates of SDU are still being investigated, but significant associations between age, participation in group sex, recent injection drug use, and using PrEP and SDU have been found from the results of this study. It was also found that those who reported participating in condomless sex, transactional sex, disclosing their sexual orientation, and receiving an STI diagnosis in the past 12 months were not associated with engaging in SDU. Researchers should continue to investigate the correlates of SDU among MSM. Due to the rising prevalence of SDU and the high risk of the MSM population, efforts should be continued and expanded to advance this research. Further evidence and identification of correlates of SDU, will help inform interventions, thus preventing deaths and prevalence of HIV/AIDS, especially among the most vulnerable populations.

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Tables

Correlates of Sexualized Drug Use Among Men Who Have Sex with Men (MSM) in Malaysia

Table 1: Characteristics of participants and HIV transmission risk behaviors, stratified by participating in sexualized drug use in the past 6 months (Bivariate associations; N=355)

Variables	Entire Sample (N = 355)		Sexualized Drug Use in the Past 6 Months ^e		OR ^f (95% CI ^g)	P
	Frequen cy	%	No (n = 313)	Yes (n = 42)		
Characteristics of participants						
Age: Mean (\pm SD), years ^a	33.1 (\pm 8.9)		32.7(\pm 9.0)	36.4 (\pm 8.0)	1.042 (1.008, 1.076)	0.014
Malay Ethnicity						
Yes	190	53.5	170 (54.3)	22 (52.4)	-	-
No	165	46.5	143 (45.7)	16 (38.1)	1.308 (0.686, 2.493)	0.415
Relationship status						
Single	238	67.0	213 (68.1)	25 (59.5)	-	-
Married/Partnered	117	33.0	100 (31.9)	17 (40.5)	1.448 (0.748, 2.803)	0.272
Education						
Secondary and below	55	15.5	46 (14.7)	9 (21.4)	-	-
Tertiary	300	84.5	267 (85.3)	33 (78.6)	0.632 (0.281, 1.407)	0.261
Income level						
< RM 3000	168	47.3	152 (48.6)	16 (38.1)	-	-
\geq RM 3000	187	52.7	161 (51.4)	26 (61.9)	0.652 (0.337, 1.262)	0.204
Homosexual/Gay/PLU						
Yes	263	74.1	235 (75.1)	28 (66.7)	-	-
No	92	25.9	78 (24.9)	14 (33.3)	1.506 (0.755, 3.006)	0.245
HIV transmission risk behaviors						
Anal Sex						
No	85	23.9	83 (97.6)	2 (2.4)	-	-

Yes	270	76.1	230 (85.2)	40 (14.8)	7.217 (1.706, 30.527)	0.007
Condomless Sex						
No	120	44.4	107 (89.2)	13 (10.8)	-	-
Yes	150	55.6	123 (82.0)	27 (18.0)	1.807 (0.888, 3.677)	0.103
Transactional Sex						
No	230	64.8	198 (86.1)	32 (13.9)	-	-
Yes	125	35.2	115 (92.0)	10 (8.0)	0.538 (0.255, 1.135)	0.104
Group Sex						
No	295	83.1	272 (92.2)	23 (7.8)	-	-
Yes	60	16.9	41 (68.3)	19 (31.7)	15.480 (2.747, 10.934)	< 0.001 *
Injected Drugs						
No	341	88.2	311 (91.2)	30 (8.8)	-	-
Yes	14	11.8	2 (14.3)	12 (85.7)	62.200 (12.293, 291.047)	< 0.001 *
Ever Used PrEP						
No	290	81.7	267 (92.1)	23 (7.9)	-	-
Yes	65	18.3	46 (70.8)	19 (29.2)	4.795 (2.421, 9.497)	< 0.001 *
Current HIV Risk						
Low	231	65.1	201 (87.0)	30 (13.0)	-	-
High	124	34.9	112 (90.3)	12 (9.7)	0.718 (0.354, 1.458)	0.359
Disclosed Sexual Orientation						
No	224	63.1	203 (90.6)	21 (9.4)	-	-
Yes	131	36.9	110 (84.0)	21 (16.0)	1.845 (0.965, 3.527)	0.064
HIV Testing Behaviors^d						
Ever tested for HIV						
No	81	22.8	75 (92.6)	6 (7.4)	-	-
Yes	274	77.2	238 (14.5)	36 (13.1)	1.891 (0.767, 4.662)	0.167

HIV testing in the past three months							
No	281	79.2	250 (89.0)	31 (11.0)	-	-	
Yes	74	20.8	63 (85.1)	11 (14.9)	1.408 (0.671, 2.955)	0.366	
HIV testing in the past six months							
No	204	57.5	184 (90.2)	20 (9.8)	-	-	
Yes	151	42.5	129 (85.4)	22 (14.6)	1.569 (0.822, 2.994)	0.172	
HIV testing in the past 12 months							
No	140	39.4	126 (90.0)	14 (10.0)	-	-	
Yes	215	60.6	187 (87.0)	28 (13.0)	1.348 (0.683, 2.660)	0.390	
STI diagnosis in the past 12 months							
No	259	73.0	234 (90.3)	25 (9.7)	-	-	
Yes	96	27.0	79 (82.3)	17 (17.1)	2.014 (1.034, 3.924)	0.040 **	

Note:

^aSD: standard deviation; ^bin the past 12 months; ^cin the past 30 days; ^dPrEP: pre-exposure prophylaxis; ^eLAI-PrEP: long-acting injectable PrEP; ^fodds ratio; ^gconfidence interval

Table 2: Multivariate logistic regression models of factors associated with ChemSex (N=355)

Variables	ChemSex in the Past 6 Months ^c		
	aOR ^c	95% CI ^d	<i>p</i>
Age	1.061	1.015, 1.110	0.007**
Condomless Sex			
No	Ref	-	-
Yes	1.624	0.681, 3.872	0.247
Transactional Sex			
No	Ref	-	-
Yes	1.501	0.486, 4.638	0.603
Group Sex			
No	Ref	-	-
Yes	3.436	1.445, 8.170	0.001**
Injected Drugs			
No	Ref	-	-
Yes	42.349	7.676, 233.650	<0.001***
Ever Used PrEP			
No	Ref	-	-
Yes	3.404	1.428, 8.112	0.001**
Disclosed Sexual Orientation			
No	Ref	-	-
Yes	1.165	0.493, 2.749	0.382
STI Diagnosis in the Past 12 Months			
No	Ref	-	-
Yes	1.464	0.603, 3.555	0.444
$R^2 = 0.388$			
Hosmer and Lemeshow Test: Chi-square = ; <i>p</i> =			

* Indicates statistical significance at $p < 0.05$.

** Indicates statistical significance at $p < 0.01$.

*** Indicates statistical significance at $p < 0.001$.

Abbreviations. MSM = men who have sex with men; PrEP = preexposure prophylaxis; B = beta coefficient; OR = odds ratio; CI = confidence interval; *p* = p-value