

Characteristics of cannabis use among men who have sex with men in Nepal

A respondent-driven cross-sectional survey

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Abstract

Men who have sex with men (MSM) have an elevated risk of adverse outcomes associated with cannabis use. Many studies have been conducted globally; however, there is a lack of research regarding the existing status and factors associated with cannabis use among MSM in Nepal. Therefore, this study aimed to examine the characteristics and factors associated with cannabis use among MSM in Nepal. A cross-sectional respondent driven survey was conducted among MSM in Kathmandu Valley, Nepal between October and December 2022. Overall proportions were weighted in respondent driven sampling analyst software, and 95% confidence intervals (CIs) were calculated. Bivariate and multivariable logistic regression analyses were used to evaluate independent correlates of cannabis use in the last 6 months. Among 250 participants, 27.3% of them used cannabis at least once in their lifetime, and 15.6% had used it within the last 6 months. Older MSM were less likely to have used cannabis (adjusted odds ratio [aOR]: 0.8, 95% CI: 0.7–0.9). Participants who were single (aOR: 21.5; 95% CI: 2.6–175.6), detained at least once by the police (aOR: 11.4; 95% CI: 2.2–58.4), and smoked tobacco daily (aOR: 4.6; 95% CI: 1.2–17.9) had higher odds of cannabis use. Participants who had seen a doctor in the last 6 months (aOR: 0.2; 95% CI: 0.1–0.6) and had trusted healthcare provider (aOR: 0.1; 95% CI: 0.01–0.2) were less likely to use cannabis. Given the known negative health effects of cannabis use such as increased risk of HIV transmission, polydrug use, and heightened sexual health risks, special attention should be directed toward MSM who are young, single, and daily smokers. Participants who had seen a doctor in the last 6 months and had trusted healthcare provider were less likely to use cannabis. This highlights the importance of connecting individuals to regular healthcare services and building trust with providers.

Abbreviations: aOR = adjusted odds ratio, CI = confidence interval, MSM = men who have sex with men, NPR = Nepalese rupee, OR = odds ratio, RDS = respondent driven sampling, USD = United States dollar, YMSM = young men who have sex with men.

Keywords: cannabis, men who have sex with men, Nepal, substance use

1. Introduction

Cannabis, also known as *marijuana*, is one of the most commonly used psychoactive substances worldwide, with over 188 million users globally as of 2024.^[1,2] Cannabis use has increased globally in recent years for both recreational and

medicinal purposes, with an estimated 2.5% of individuals aged 15–64 years reporting use.^[1,3] Cannabis use is more prevalent among men who have sex with men (MSM) than general population, with daily use reaching 40% compared with 7%.^[4]

KP and RM contributed to this article equally.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

Informed consent was obtained from all participants upon proceeding with the survey.

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The institutional review boards at the University of Connecticut (H22-0039) and the Nepal Health Research Council (Ref: 43; Protocol number: 239/2022 P) approved the study.

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MSM in Nepal represent a marginalized subgroup because of several intersecting psychological (depression, suicidal behaviors), social (social rejection, verbal abuse), health, and legal challenges.^[5,6] In Nepal, homosexuality is not criminalized, and the rights of MSM are guaranteed by the constitution.^[7] However, despite these legal safeguards, MSM still face societal and cultural stigma and discrimination.^[7] Systematic and narrative reviews highlight that MSM use cannabis as a coping mechanism linked to minority stress.^[8,9]

Cannabis is not been legal in Nepal since the 1970s, but there has been an ongoing debate about legalizing cannabis use and its cultivation for medicinal purposes.^[10] Cannabis is quite popular among people in Nepal for religious purposes.^[11] It is also used as a traditional medicine by people for diseases like diarrhea, chronic pain, nausea, muscle spasms, and so forth.^[10,12]

Multiple studies and systematic reviews on cannabis report that cannabis use has short-term risks like road traffic accidents and unprotected sex.^[13,14] Its heavy and long-term use is linked with cannabis-induced psychosis, schizophrenia precipitation, and depressive symptoms.^[11,15,16] It also counts as a critical risk factor associated with increased suicide rates among MSM.^[17] In Nepal, cannabis is commonly used as a gateway drug among youth, and studies have shown that cannabis users are more likely to initiate sex at an earlier stage in young adulthood and have multiple sex partners.^[18,19] Such risky sexual behaviors become major drivers for the transmission of HIV and other sexually transmitted infections, polydrug use, and heightened social marginalization, especially among the MSM population.^[20] The emerging use of cannabis, in this context, is certain to pose an alarming public health threat to the MSM community.^[21]

The topic of cannabis use among MSM is largely unexplored in the Nepali context since discussions relating to sexual orientation, sexual acts, and cannabis use, individually and combined, are considered highly conservative. Given the heightened use of cannabis among MSM globally, its short-term health effects, as well as a correlation of its heavy and long-term use, with various adverse psychosocial and health consequences.^[22] There is scant information available on cannabis use among MSM in Nepal. Therefore, this study aimed to demonstrate the prevalence of cannabis use among Nepali MSM and bridge the data gap by exploring factors that influence cannabis use within Nepali MSM residing in the Kathmandu Valley.

2. Methods

2.1. Study design

Data were drawn from a cross-sectional survey conducted among Nepali MSM between October and December 2022. The study was carried out in Kathmandu Valley, which is comprised of 3 districts: Kathmandu, Bhaktapur, and Lalitpur. Kathmandu is the capital city of Nepal, which is densely populated and the largest metropolitan city, whereas Bhaktapur and Lalitpur are neighboring districts inside the valley.

2.2. Study participants

For this study, 250 Nepali MSM participated in the survey. Individuals who were at least 18 years, identified themselves as MSM, and could read and understand the Nepali and/or English languages were eligible to participate.

Previous studies studying substance use, HIV, mental health, and related risk factors among MSM in Nepal recruited samples of between 100 and 300.^[6,23–25] We aimed to mirror these studies with a representative sample of MSM in the Kathmandu Valley in Nepal, within the constraints of recruitment challenges for this hard-to-reach population.

Choosing 5 seeds and 5 waves for recruiting MSM allows for broad population reach while remaining feasible and contextually

appropriate.^[26] This sampling strategy enables access to diverse MSM subgroups through multiple recruitment chains.^[26] Since it was a pilot formative study, sample size was moderate. In Nepal, MSM face stigma and operate within discrete networks^[5,6], limiting the number of waves also helps protect participant confidentiality and reduces the risk of recruitment fatigue.

2.3. Study procedures

Respondent-driven sampling (RDS), a network-based sampling method often used for hard-to-reach populations, was used to recruit participants. RDS was found to effectively enroll hidden and hard-to-reach populations using their social network by employing a variant of chain referral sampling.^[27,28] We purposively selected 5 MSM “seeds” based on recommendations from community-based organizations that provide services to MSM, with attention given to socio-demographic representation (e.g., age, ethnicity). We gave them 5 recruitment coupons to distribute to potential participants. Each subsequent participant who completed the interviewer-administered questionnaire was given an additional 5 recruitment coupons to recruit additional peers.

After obtaining informed consent, trained research assistants administered the questionnaire to participants in person. Each participant received an incentive of 1000 Nepalese rupees (NPR) (~USD 8) for study participation and 500 NPR (~USD 4) for each eligible peer they successfully referred to and recruited into the study (up to 5 per participant).

2.4. Ethics

The Institutional Review Boards at the University of Connecticut (H22-0039) and the Nepal Health Research Council (Ref: 43; protocol number: 239/2022 P) approved the study. Written informed consent was obtained from all participants upon proceeding with the survey. All methods were carried out under relevant guidelines and regulations.

Participants were informed that they could ask questions if they did not understand any part of the study, and the research assistant provided clarifications when questions were raised. They were also clearly informed that their participation was entirely voluntary, and they could withdraw at any time without any consequences. It was emphasized that choosing not to participate or withdrawing would not affect their relationship with the researchers or the organizations involved in the study.

2.5. Measures

The primary outcome variable for this study is cannabis use, which is defined as the proportion of participants who reported cannabis use within the last 6 months.

We included participants’ socio-demographic characteristics and sexual and health-related behaviors as independent variables.

3. Independent variables

3.1. Socio-demographic characteristics

Age, province, monthly income, sexual orientation, relationship status, and disclosed sexual orientation were assessed. Participants from all provinces other than Bagmati Province were merged into a single category: *outside Bagmati*, and those from Bagmati Province were included in the *Bagmati Province* category. In addition, participants were asked to report their monthly income in NPR, and this was reported with the categories: <NPR 20,000 (~USD 150) and ≥ 20,000 and above. Sexual orientation was divided into 2 categories: gay and bisexual. Relationship status was measured in 2 categories: single and married/partnered. Participants were asked if they disclosed their sexual orientation to anyone (yes/no).

3.2. Behavioral characteristics

The behavioral characteristics included questions like whether they used alcohol within the last 12 months (yes/no), smoked tobacco daily (yes/no), and ever detained by police (yes/no).

3.3. Sexual risk and health-related characteristics

Sexual risk behaviors such as engagement in anal sex in the last 6 months (yes/no), engagement in sex work (yes/no), and HIV risk perception (none to low and moderate to high) were asked. Participants were asked if they had seen a doctor in the last 6 months (yes/no) and if they trusted their healthcare providers enough to follow their advice (yes/no).

3.4. Data analysis

The statistical software Stata SE Corp version 17.0 was used for data analysis. Descriptive statistics were used to summarize the data and included frequency and percentages for categorical variables and mean and standard deviation for continuous variables.

To minimize biases associated with chain referral sampling, weights were created in RDS analysis Tool 7.1 (RDSAT; Cornell, New York) using the RDSII estimator to account for the effect of differences in participants' social network sizes. These weights were exported from RDSAT and merged into a Stata dataset comprising participants' demographic and behavioral data.

The chi-square test was used to assess the relationship between categorical independent and dependent variables. Multivariable logistic regression analysis was conducted to identify potential factors associated with the outcome variable. Adjusted odds ratios (aORs) were calculated with 95% confidence intervals (CIs), and a P value $< .05$ was considered to be statistically significant. Bivariate analysis was used to identify significant variables for inclusion in the adjusted regression analysis, where $P < .10$ was used as a criterion for inclusion, which is shown in the Table S1, Supplemental Digital Content 1. Multivariate logistic regression models were also built with RDS weighting. P value < 0.05 were used to indicate statistical significance.

4. Results

Participant characteristics are described in Table 1. The mean age of participants was 27.6 (standard deviation = 8.9) years, and over half of the participants were single (64.4%). The sexual orientation of 63.2% of the participants was gay, while the remainder of the participants identified as bisexual. Additionally, more than two-thirds of the participants consumed alcohol in the last 12 months (71.6%) and disclosed their sexual orientation to anyone (85.2%).

Figure 1 demonstrates the percentage of participants who reported ever using substances in their lifetime and the percentage of participants who reported active substance use (in the last 6 months). The most used illicit drug among the participants was cannabis (marijuana), with 27.2% of participants reporting lifetime use and 15.6% of participants reporting active use (within the last 6 months).

Table 2 displays the variables associated with cannabis use in the last 6 months ($N = 39$). Increasing age was associated with lower odds of cannabis use (aOR: 0.8; 95% CI: 0.7–0.9). Compared with participants in a relationship, those who were single had significantly higher odds of cannabis use (aOR: 21.5; 95% CI: 2.6–175.6). Participants who reported ever being detained by the police (aOR: 11.4; 95% CI: 2.2–58.4) had higher odds of cannabis use. Participants who reported smoking tobacco daily (aOR: 4.6; 95% CI: 1.2–17.9) had higher odds of cannabis use. MSM who had seen a doctor within the last 6 months (aOR: 0.2; 95% CI: 0.1–0.6) and trusted their healthcare provider (aOR: 0.1; 95% CI: 0.01–0.2) had lower odds of cannabis use.

5. Discussion

This is the first study to examine cannabis use among MSM in Nepal, and results indicate a notably high prevalence of cannabis use within this population. Previous studies have identified cannabis as a preferred substance in sexualized drug use among MSM,^[29] which is consistent with our findings, where cannabis emerged as the most commonly used drug among participants. These higher rates of cannabis use align with similar studies conducted among the MSM population and are significantly higher than those observed in the general population.^[30,31] In addition, cannabis tends to be used among MSM before sex specifically to enhance the experience of sexual pleasure, including euphoria, relaxation, and heightened sensation.^[18,32] Consequently, MSM who used cannabis were more likely to engage in high-risk sexual behaviors, such as condomless sex and having multiple sexual partners, and reported that condom use negatively affected their sexual pleasure.^[21] These findings highlight the need for special attention toward MSM cannabis users, who can be involved in risky sexual activities, yet this has been largely overlooked.

Younger MSM (YMSM) in this study exhibited higher odds of cannabis use, consistent with findings from other studies.^[21,33] For instance, a study among racial and ethnic minority YMSM found that those who had their sexual debut before the age of 16 reported higher rates of drug use, especially cannabis.^[34] Younger individuals often exhibit greater risk-taking behaviors and may be less concerned about the long-term health consequences associated with cannabis use.^[35,36] In addition, YMSM might have less emotional and psychological control over substance use than their more mature counterparts, making them more susceptible to a range of drug-related health risks. The transition to adulthood typically brings shifts in responsibilities, such as career and family obligations, in addition to a greater awareness of health risks,^[37,38] which could lead to a decline in substance use. This could explain our findings regarding YMSM having higher rates of cannabis use than older MSM.

Moreover, our study revealed that single MSM have higher rates of cannabis use when compared to those in relationships, replicating a similar study that has linked cannabis use to condomless anal sex with casual sex partners among MSM.^[39] One possible explanation for this pattern is that single MSM may feel relatively liberated to engage in casual sexual encounters and are thus more likely to use cannabis in conjunction with condomless anal sex.^[21,40] In contrast, MSM in relationships may have a greater sense of responsibility and control, both in terms of their own behavior and their partner's preferences, which could discourage cannabis use. In addition, single MSM have more frequent social interactions in environments such as bars or social gatherings where cannabis use is more normalized.^[41] Furthermore, being single might expose MSM to higher levels of stress, social isolation, and discrimination,^[42] all of which could increase cannabis use as a coping mechanism.

Our study found that MSM who have ever been detained by the police had higher odds of cannabis use. This may explain our findings that MSM may be trying to cope with the traumas and/or negative emotions of being detained. From a causation point of view, MSM may have been detained for selling or obtaining cannabis since it is legally banned in Nepal.^[43]

Consistent with other studies, our findings indicate that MSM who smoke tobacco daily have higher odds of using cannabis. Tobacco use is associated with increased anxiety, while cannabis is known to relieve anxiety.^[44] Therefore, MSM who smoke tobacco daily may experience higher stress levels, driving them to use cannabis as a means of stress management.^[44] Another possible explanation is the well-documented link between tobacco and cannabis co-use, where individuals who smoke tobacco are more likely to experiment with or regularly use cannabis because of the overlapping social and behavioral contexts of these substances.^[45] In the cultural context of Nepal,

Table 1
Socio-demographic characteristics of the participants.

Variables	Number	Crude percentage	RDS weighted percentage (95% CI)
Demographic characteristics			
Age			
Mean ± SD	27.6 ± 8.9		
Province of birth			
Bagmati	148	59.2	60.7 (54.7–66.8)
Outside	102	40.8	39.3 (33.2–45.4)
Monthly income level			
Less than NPR 20,000	113	45.2	48.7 (42.5–54.9)
NPR 20,000 or above	137	54.8	51.3 (45.1–57.5)
Sexual orientation			
Gay	158	63.2	49.1 (42.9–55.4)
Bisexual	92	36.8	50.9 (44.6–57.1)
Relationship status			
Single	161	64.4	67.2 (61.4–73.1)
Married/partnered	89	35.6	32.8 (26.9–38.7)
Disclosed sexual orientation to anyone			
Yes	213	85.2	78.1 (72.9–83.3)
No	37	14.8	21.9 (16.8–27.1)
General behaviors			
Smokes tobacco daily			
Yes	105	42.0	51.9 (44.4–59.5)
No	145	58.0	48.1 (40.5–55.6)
Alcohol consumption in the last 12 months			
Yes	179	71.6	63.8 (57.8–69.7)
No	71	28.4	36.4 (30.3–43.2)
Ever detained by police			
Yes	52	20.8	12.1 (8.0–16.2)
No	198	79.2	87.9 (83.9–91.9)
Sexual risk behaviors			
Anal sex within the last 6 months			
Yes	182	72.8	61.9 (55.8–67.9)
No	68	27.2	38.1 (32.1–44.2)
Ever engaged in sex work			
Yes	55	22.0	13.7 (9.4–17.9)
No	195	78.0	86.3 (82.1–90.6)
Perceived HIV risk			
None to low	204	81.6	85.6 (81.3–90.0)
Moderate to high	46	18.4	14.4 (10.0–18.7)
Healthcare behaviors			
Seen a doctor within the last 6 months			
Yes	155	62.0	56.7 (50.5–62.9)
No	95	38.0	43.3 (37.1–49.5)
Had trusted healthcare provider			
Yes	171	68.4	67.9 (62.1–73.7)
No	79	31.6	32.1 (26.3–37.9)

CI = confidence interval, NPR = Nepalese rupee, RDS = respondent driven sampling.

where powdered cannabis “*bhang*” holds religious significance and is commonly associated with Lord Shiva, MSM tobacco users might tend to use cannabis in conjunction with tobacco, such as by stuffing it into cigarettes. Such practices occur more often among tobacco users than nontobacco users, potentially leading to higher cannabis usage within the former group. These findings highlight the importance of integrating tobacco control efforts with strategies that address the concurrent use of tobacco and cannabis, considering their combined impact on smoking behaviors.

Our study found that MSM who trusted their healthcare providers and/or had seen a doctor within the last 6 months had lower odds of cannabis use compared with their counterparts. Almost half of the cannabis users in this study reported not having a healthcare provider whom they trust, likely because of stigma and/or healthcare discrimination (e.g., being told same-sex relationships are immoral, being called derogatory names) against MSM in Nepali society, a pattern observed in studies globally.^[16] This mistrust because of anticipated stigma may lead MSM to avoid healthcare settings, leaving them unaware

of their health status. In contrast, MSM who have access to healthcare, trust in healthcare providers, and recent medical visits may be better informed about the harmful effects of cannabis use and more conscious of their health, contributing to their lower usage. Healthcare providers must provide stigma-free, trauma-informed care, including discussing substance use, offering preventive services, screening for substance use disorders, and providing harm-reduction services tailored to MSM.^[46] By fostering trust and addressing the unique needs of MSM, healthcare providers can play a pivotal role in reducing cannabis use in this population.

The strengths of our study include the use of the RDS method. We used RDS for data collection and data analysis, which allowed us to survey this hard-to-reach population and obtain valid results.^[47] Additionally, to our knowledge, this is the first study analyzing cannabis use among MSM in Nepal, which is another strength of this study. However, there are also limitations to this study. Specifically, like similar health-related studies, our study was conducted by self-report, leaving open the possibility for recall bias and/or social desirability

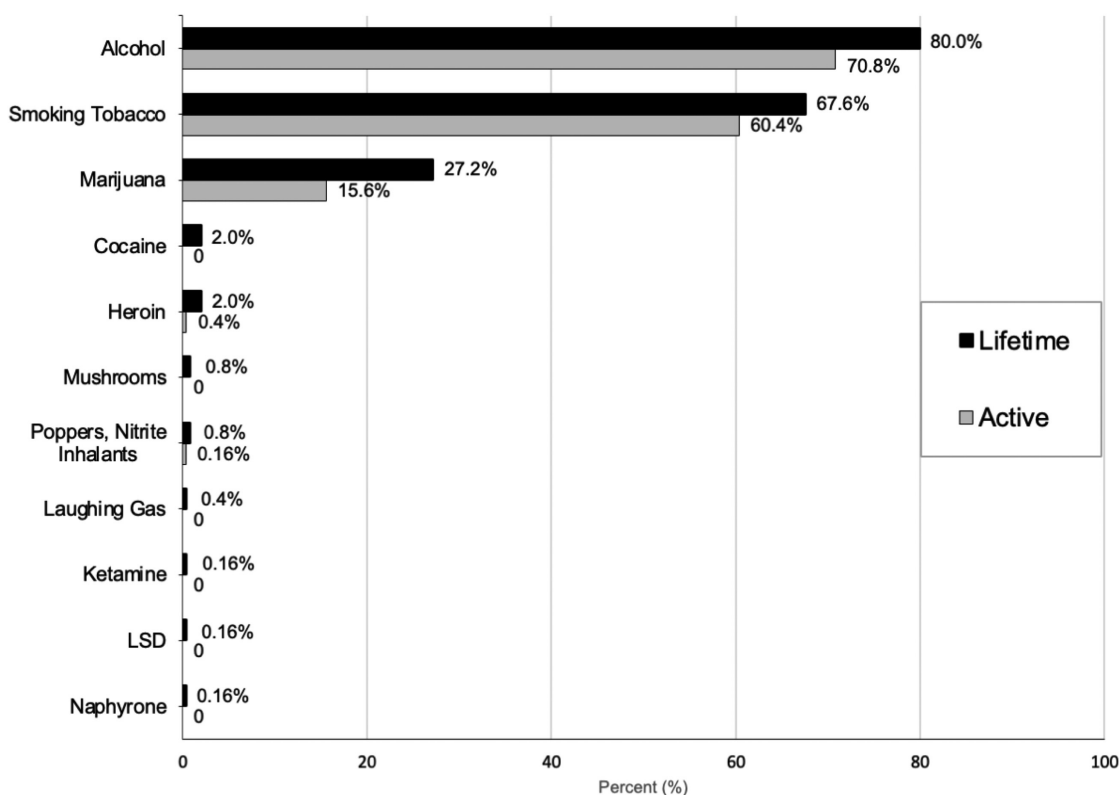


Figure 1. Lifetime history and active substance use.

Table 2

Factors associated with cannabis use among study participants.

Variables	Crude RDS weighted OR (95% CI)	RDS weighted aOR (95% CI)	P value
Age	0.9 (0.9–1.0)	0.8 (0.7–0.9)	.030
Relationship status			
Single	13.0 (2.4–70.2)	21.5 (2.6–175.6)	.004
Married/partnered	Ref	Ref	
Ever detained by police			
Yes	3.0 (1.2–7.3)	11.4 (2.2–58.4)	.003
No	Ref	Ref	
Smokes tobacco daily			
Yes	4.7 (1.6–13.5)	4.6 (1.2–17.9)	.028
No	Ref	Ref	
Seen a doctor within the last 6 months			
Yes	0.3 (0.1–0.6)	0.2 (0.1–0.6)	.008
No	Ref	Ref	
Alcohol consumption in the last 12 months			
Yes	2.2 (0.9–5.1)	0.4 (0.1–1.8)	.240
No	Ref	Ref	
Had trusted healthcare provider			
Yes	0.3 (0.1–0.6)	0.1 (0.01–0.2)	<.001
No	Ref	Ref	

aOR = adjusted odds ratio, CI = confidence interval, NPR = Nepalese rupee, OR = odds ratio, RDS = respondent driven sampling.

bias. Participants may have answered questions in ways they deemed to be socially desirable, leaving a chance for underestimation or overestimation of the prevalence of their drug use. It is recommended to access the complete form of the questionnaire used for data collection in the future.^[48] The questionnaire used for data collection did not capture everyone who uses drugs in the Kathmandu Valley, so results cannot be generalized to the entire population of the Kathmandu Valley. In addition, our study was done in the Kathmandu Valley and, therefore, cannot be generalized to the entire country of Nepal

or beyond. Finally, it is possible that temporality issues may explain some of the results found in this study.

6. Conclusion

Cannabis use is prevalent among MSM in Nepal's Kathmandu Valley, particularly among younger, single, police-detained individuals, and who do not trust their healthcare providers or do not have access to care. Our findings highlight the need for targeted health education and substance use interventions for this

population. While there are eHealth and community programs helping MSM with stigma, healthcare access, and general substance use, programs specifically for cannabis are rare. Only a few community studies have successfully focused on reducing cannabis use among MSM. Notably, there are few feasible web-based programs in Switzerland, Germany^[49] and Australia,^[50] which can be culturally adopted for MSM by incorporating awareness of minority stress, sexual health, and social contexts of cannabis use. In addition, to reduce cannabis use, we recommend improving healthcare access and training providers to build trust with MSM. These steps can address key factors influencing cannabis prevalence and inform future tailored treatments for this group.

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References

- [1] Maggirwar SB, Khalsa JH. The link between cannabis use, immune system, and viral infections. *Viruses*. 2021;13:1099.
- [2] World Drug Report 2019. wdr.unodc.org/wdr2019/en/index.html. Accessed June 12, 2024.
- [3] Hasin D, Walsh C. Trends over time in adult cannabis use: a review of recent findings. *Curr Opin Psychol*. 2021;38:80–5.
- [4] Bruce D, Harper GW, Fernandez MI; The Adolescent Medicine Trials Network for HIV AIDS Interventions (ATN). Heavy marijuana use among gay and bisexual male emerging adults living with HIV/AIDS. *J HIV AIDS Soc Serv*. 2013;12:26–48.
- [5] Paudel K, Bhandari P, Gautam K, et al. Mediating role of food insecurity in the relationship between perceived MSM related stigma and depressive symptoms among men who have sex with men in Nepal. *PLoS One*. 2024;19:e0296097–e0296097.
- [6] Deuba K, Ekström AM, Shrestha R, Ionita G, Bhatta L, Karki DK. Psychosocial health problems associated with increased HIV risk behavior among men who have sex with men in Nepal: a cross-sectional survey. *PLoS One*. 2013;8:e58099–e58099.
- [7] Gautam K, Paudel K, Wickersham JA, Shrestha R. More than marriages: how Nepal's marriage equality law shape public health? *Health Prospect*. 2024;23:28–30.
- [8] Parnes JE, Kiekens WJ, Mereish EH, Sawyer K, Miranda R. LGBT-THC: a systematic review of psychosocial mechanisms linking minority stressors and cannabis use among sexual and gender minoritized individuals. *Curr Addict Rep*. 2024;11:1055–71.
- [9] Dyar C. A review of disparities in cannabis use and cannabis use disorder affecting sexual and gender minority populations and evidence for contributing factors. *Curr Addict Rep*. 2022;9:589–97.
- [10] Shaky DR, Upadhaya SR, Thapa M. Cannabis use and abuse in Nepal: a review of studies. *JNMA J Nepal Med Assoc*. 2021;59:954–61.
- [11] Copeland J, Acharaya S, Howard J. Cannabis, Lord Shiva and holy men: cannabis use among Sadhus in Nepal. *Drug Alcohol Depend*. 2015;156:e48–e48.
- [12] Clarke RC. Traditional cannabis cultivation in Darchula District, Nepal – seed, resin and textiles. *J Industrial Hemp*. 2007;12:19–42.
- [13] Collins C. Adverse health effects of marijuana use. *N Engl J Med*. 2014;371:879.
- [14] Nguyen HV, Mital S, Bornstein S. Short-term effects of recreational cannabis legalization on youth cannabis initiation. *J Adolesc Health*. 2023;72:111–7.
- [15] Becker MP, Collins PF, Luciana M. Neurocognition in college-aged daily marijuana users. *J Clin Exp Neuropsychol*. 2014;36:379–98.
- [16] Hanson KL, Winward JL, Schweinsburg AD, Medina KL, Brown SA, Tapert SF. Longitudinal study of cognition among adolescent marijuana users over 3 weeks of abstinence. *Addict Behav*. 2010;35:970–6.
- [17] Meyer IH, Northridge ME. *The Health of Sexual Minorities: Public Health Perspectives on Lesbian, Gay, Bisexual, and Transgender Populations*. Springer; 2007.
- [18] Brodbeck J, Matter M, Moggi F. Association between cannabis use and sexual risk behavior among young heterosexual adults. *AIDS Behav*. 2006;10:599–605.
- [19] Smith L, Jackson SE, Jacob L, et al. Association between cannabis use and sexual behavior among adolescents aged 12–15 years in 21 low- and middle-income countries. *Addict Behav*. 2019;99:106073–106073.
- [20] Koff A, Goldberg C, Ogbuagu O. Condomless sex and HIV transmission among serodifferent couples: current evidence and recommendations. *Ann Med*. 2017;49:534–44.
- [21] Bustamante MJ, Palfai TP, Luehring-Jones P, Maisto SA, Simons JS. Cannabis use and sexual risk among MSM who drink: understanding why more frequent cannabis users may engage in higher rates of condomless sex. *Drug Alcohol Depend*. 2022;232:109282–109282.
- [22] Gobbi G, Atkin T, Zytynski T, et al. Association of cannabis use in adolescence and risk of depression, anxiety, and suicidality in young adulthood: a systematic review and meta-analysis. *JAMA Psychiatry*. 2019;76:426–34.
- [23] Kohlbrenner V, Deuba K, Marrone G. Perceived discrimination is an independent risk factor for suicidal ideation among sexual and gender minorities in Nepal. *PLoS One*. 2016;11:e0159359.
- [24] Gautam K, Paudel K, Ahmed A, et al. High interest in the use of mhealth platform for HIV prevention among men who have sex with men in Nepal. *J Community Health*. 2024;49:575–87.
- [25] Gautam K, Aguilar C, Paudel K, et al. Preferences for mHealth intervention to address mental health challenges among men who have sex with men in Nepal: qualitative study. *JMIR Hum Factors*. 2024;11:e56002–e56002.
- [26] Beyrer C, Malone J, Baral S, et al; HPTN 078 Study Team. Comparing recruitment strategies to engage hard-to-reach men who have sex with men living with HIV with unsuppressed viral loads in four US cities: Results from HPTN 078. *J Int AIDS Soc*. 2021;24:e25798.
- [27] Goel G, Salganik MJ. Assessing respondent-driven sampling. *Proc Natl Acad Sci USA*. 2010;107:6743–7.

- [28] Abdolreza S, Raj SB, Aziz S. Approaches to recruiting 'hard-to-reach' populations into research: a review of the literature. *Health Promotion Perspect.* 2012;1:86–94. https://hpp.tbzmed.ac.ir/Article/HPP_73_20120617105704.
- [29] Kasprzyk A, Santaguida M, Kennedy-Turner K. Cannabis and sexual behavior: focus on men who have sex with men. *Springer Link.* 2022.
- [30] McCarty-Caplan D, Jantz I, Swartz JA. MSM and drug use: a latent class analysis of drug use and related sexual risk behaviors. *PubMed.* 2014;18:1339–51.
- [31] Substance Abuse and Mental Health Services Administration. National Survey on Drug Use and Health (NSDUH). Rockville, MD: SAMHSA; [2023]. Available at: <https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health>. Accessed June 15, 2024.
- [32] Passaro RC, Castañeda-Huaripata A, Gonzales-Saavedra W, et al. Contextualizing condoms: a cross-sectional study mapping intersections of locations of sexual contact, partner type, and substance use as contexts for sexual risk behavior among MSM in Peru. *BMC Infect Dis.* 2019;19:958–958.
- [33] Jeffers AM, Glantz S, Byers A, Keyhani S. Sociodemographic characteristics associated with and prevalence and frequency of cannabis use among adults in the US. *JAMA Netw Open.* 2021;4:e2136571–e2136571.
- [34] Outlaw AY, Phillips G, Hightow-Weidman LB, Fields SD, Hidalgo J, Halpern-Felsher B, Green-Jones M; The Young MSM of Color SPNS Initiative Study Group. Age of MSM sexual debut and risk factors: results from a multisite study of racial/ethnic minority YMSM living with HIV. *AIDS Patient Care STDS.* 2011;25:S23–9.
- [35] Salomon EA, Mimiaga MJ, Husnik MJ, et al. Depressive symptoms, utilization of mental health care, substance use and sexual risk among young men who have sex with men in EXPLORE: implications for age-specific interventions. *AIDS Behav.* 2009;13:811–21.
- [36] Strathdee SA, Hogg RS, Martindale SL, et al. Determinants of sexual risk-taking among young HIV-negative gay and bisexual men. *J Acquir Immune Defic Syndr Hum Retrovirol.* 1998;19:61–6.
- [37] Bachman JG, Wadsworth KN, O'Malley PM, Johnston LD, Schulenberg JE. Smoking, Drinking, and Drug Use in Young Adulthood: the Impacts of New Freedoms and New Responsibilities. Lawrence Erlbaum Associates; 1997.
- [38] Paudel K, Gautam K, Bhandari P, et al. Suicidal ideation, plan, and attempt among men who have sex with men in Nepal: findings from a cross-sectional study. *PLOS Glob Public Health.* 2023;3:e0002348.
- [39] Starks TJ, Jones SS, Kyre K, et al. Testing the drug use and condomless anal sex link among sexual minority men: the predictive utility of marijuana and interactions with relationship status. *Drug Alcohol Depend.* 2020;216:108318.
- [40] Shilo G, Mor Z. COVID-19 and the changes in the sexual behavior of men who have sex with men: results of an online survey. *J Sex Med.* 2020;17:1827–34.
- [41] Grov C, Rendina HJ, Breslow AS, Ventuneac A, Adelson S, Parsons JT. Characteristics of men who have sex with men (MSM) who attend sex parties: results from a national online sample in the U.S. *Sex Transm Infect.* 2014;90:26–32.
- [42] Zhang X, Zhou Y, Zhang K. Social capital, perceived stress, and mental health of men who have sex with men in China: a cross-sectional study. *Front Psychol.* 2023;14:1134198–1134198.
- [43] Flores R, Kerman J, Schneider J, Harawa N. "I feel like marijuana is the only drug that wouldn't kill me": perceptions of cannabis use in previously incarcerated Black men who have sex with other men. *Harm Reduction J.* 2023;20:13.
- [44] Chen WT, Shiu C, Yang JP, Chuang P, Berg K, Chen L-C, Chi P-C. Tobacco, alcohol, drug use, and intimate partner violence among MSM living with HIV. *PubMed Central.* 2019;30:610–8.
- [45] Agrawal A, Budney AJ, Lynskey MT. The co-occurring use and misuse of cannabis and tobacco: a review. *Addiction.* 2012;107:1221–33.
- [46] Compton WM, Jones CM. Substance use among men who have sex with men. *N Engl J Med.* 2021;385:352–6.
- [47] Raifman S, DeVost MA, Digitale JC, Chen Y-H, Morris MD. Respondent-driven sampling: a sampling method for hard-to-reach populations and beyond. *Springer Link.* 2022; 9:38–47 doi: 10.1007/s40471-022-00287-8
- [48] Cannizzaro E, Lavanco G, Castelli V, et al. Alcohol and nicotine use among adolescents: an observational study in a sicilian cohort of high school students. *Int J Environ Res Public Health.* 2022;19:6152.
- [49] Schaub MP, Wenger A, Berg O, et al. A web-based self-help intervention with and without chat counseling to reduce cannabis use in problematic cannabis users: 3-arm randomized controlled trial. *J Med Internet Res.* 2015;17:e232.
- [50] Bohanna I, Bird K, Copeland J, Roberts N, Clough A. A service-level action research intervention to improve identification and treatment of cannabis and related mental health issues in young Indigenous Australians: a study protocol. *BMJ Open.* 2014;4:e005689.