JIKM. 2025; 17 (4): 201-210
DOI: 10.52022/jikm.v17i4.823
p-ISSN: 2085-4366, e-ISSN: 2684-950X

Jurnal Ilmiah Kesehatan Masyarakat:
Media Komunikasi Komunitas Kesehatan Masyarakat

Tattooing, Piercing, Drug Use and Their Associations with Sexually Transmitted Infections among Young Men Who Have Sex with Men

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Abstract

Background: *Young men who have sex with men (MSM) in Indonesia face a high vulnerability to sexually transmitted infections (STIs). However, evidence on the role of body modification and drug use remains limited. This study tattooing, piercing, drug use, and their association with sexually transmitted infections among young men who have sex with men.*

Methods: *Data were obtained from the 2018—2019 Integrated Biological and Behavioral Survey, a cross-sectional respondent-driven sampling study involving 1,988 men aged 18—24 years across multiple Indonesian cities. Weighted logistic regression was used to estimate adjusted odds ratios (aORs) for sexually transmitted infection symptoms in relation to tattooing, piercing, drug use, condom use, HIV prevention knowledge, and sociodemographic factors.*

Results: *The prevalence of self-reported sexually transmitted infection symptoms was 22.8%. Tattooing, piercing, and drug use were not independently associated with these symptoms after adjustment. In contrast, low human immunodeficiency virus (HIV) prevention knowledge (Adjusted OR = 8.53; 95% CI: 2.38—30.4) and inconsistent condom use (never: aOR = 32.3; 95% CI: 1.34—775.5; occasional: aOR = 3.57; 95% CI: 1.12–11.4) showed strong associations with reported STI symptoms.*

Conclusion: *Among young MSM in Indonesia, STI symptoms were more strongly associated with inadequate HIV prevention knowledge and inconsistent condom use, rather than tattooing, piercing, or drug use. Interventions should prioritize sexual health education, condom promotion, and appropriate regulation of body modification services.*

Keywords*: Drug use, Piercing, Sexually transmitted infections, Tattooing practices, Young men who have sex with men*

INTRODUCTION

Sexually Transmitted Infections (STIs) continue to pose a significant challenge to global public health, disproportionately affecting marginalized groups such as Men who have Sex with Men (MSM).[1] Among young MSM, the burden of STIs, including HIV, *syphilis, gonorrhea*, and *chlamydia,* remains exceptionally high, reflecting not only biological vulnerability but also behavioral and social determinants of risk.[2] According to the World Health Organization (WHO), over one million new cases of STIs are reported worldwide each day, with adolescents and young adults accounting for a substantial portion of these infections.[3] Consistently, MSM experience higher infection rates than the general population, underscoring the persistent disparities in sexual health outcomes.[4,5]

In the Indonesian context, national surveillance data indicate a slight decline in the proportion of MSM reporting STI symptoms (approximately 2%) between 2023 and 2024. Nevertheless, MSM continue to rank as the third most at-risk group for experiencing at least one STI symptom, following clients of sex workers and individuals with other high-risk partners.[6,7] While traditional sexual behaviors such as multiple partnerships and inconsistent condom use are well-established risk factors, emerging evidence suggests that non-sexual practices, including tattooing, body piercing, and

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Received: June 12, 2025
Accepted: November 04, 2025
Published: November 23, 2025

recreational drug use, may further amplify STI vulnerability among young MSM. These practices, often conducted in informal or unregulated settings, can facilitate exposure to infectious agents through unsafe needle use, impaired decision-making, or participation in high-risk social networks.[8,9]

Tattooing and piercing, although culturally and socially significant for many young adults, have been associated with increased risk of bloodborne infections when performed without proper sterilization.[10–12] Recent surveillance in urban Indonesian cities such as Jakarta, Surabaya, and Bali shows that high STI prevalence among young MSM frequently co-occurs with these body modification practices and recreational drug use.[13,14] In particular, drug use is consistently linked to elevated sexual risk-taking and reduced condom use, both globally and in Southeast Asia. Taken together, these findings suggest that non-sexual behaviors may interact with sexual practices, creating a multifactorial risk environment for STIs among young MSM.[13,15,16]

However, few studies in Indonesia have simultaneously examined the combined effects of body modification (tattooing and piercing) and recreational drug use on STI vulnerability among young MSM. Most studies have focused on individual risk factors or HIV alone, without examining how tattooing, piercing, and recreational drug use might collectively influence the broader spectrum of STIs.[17] Existing research has tended to analyze these factors in isolation, either focusing on sexual risk behaviors or substance use without integrating them within a single analytical framework. This gap limits our understanding of how cultural and lifestyle practices intersect to shape STI risk in this population. To address this knowledge gap, the present study investigates the associations between tattooing practices, recreational drug use, and body piercing with STI prevalence among young MSM in Indonesia. By integrating behavioral and cultural dimensions, this research provides novel insights into the multifactorial risk environments often overlooked in STI prevention research. The findings may inform the development of targeted interventions that extend beyond conventional sexual health strategies by accounting for lifestyle and cultural considerations shaping STI vulnerability among young MSM. Specifically, this study aims to quantify the independent and combined associations of tattooing, body piercing, and recreational drug use with STI symptoms among young MSM in Indonesia. Based on existing literature and the behavioral risk framework, we hypothesize that young MSM with a history of tattooing or body piercing—particularly when performed in unregulated settings—are more likely to report STI symptoms. Additionally, we hypothesize that recreational drug use is independently associated with a higher prevalence of STI symptoms and that the combination of these non-sexual risk factors further amplifies overall STI vulnerability.

METHOD

Participants and Study Design

This study employed a cross-sectional design using secondary data from the 2018—2019 Indonesian Integrated Biological and Behavioural Surveillance (IBBS) and focused on MSM. A total of 1,988 young MSM aged 15—24 years from 24 provinces were included. A cross-sectional design was chosen because nationally representative data were available, enabling the identification of behavioral and cultural correlates of STI symptoms at the population level. Data were collected through community-based outreach sites and drop-in centers for key populations in Indonesia's predominantly urban and semi-urban provinces. Eligibility criteria were (1) being biologically male, (2) reporting anal or oral sex with a male partner in the past 12 months, and (3) providing informed consent. Participants were excluded if they failed the eligibility screening, declined to participate, or provided incomplete data on key variables. Of the 2,045 individuals initially screened, 57 were excluded due to ineligibility or missing data, resulting in a final analytic sample of 1,988 participants. The sample size was determined by the number of eligible participants with complete data in the existing IBBS dataset, as no additional sampling or power calculation was required for this secondary analysis. Recruitment was conducted using Respondent-Driven Sampling (RDS), a peer-referrals method suitable for hidden populations, which improves representativeness despite stigma-related recruitment challenges. Data were collected by trained field enumerators using standardized questionnaires. National-level supervision and periodic data audits were conducted to ensure.

Measurements and Procedure

Dependent variable. STI symptoms: defined as self-reported experience of ≥1 of the following symptoms within the past 12 months: genital ulcers/sores, painful urination, abnormal penile or anal discharge, genital or Anal warts. Coding: 0 = No symptom reported; 1 = At least one symptom reported.

Independent variable. Tattooing practices: self-reported history of tattooing using non-sterile or unregulated equipment. Coding: 0 = No/unsterile not reported; 1 = Yes (tattoo with non-sterile equipment). Piercing practices: self-reported body piercing with potentially unsterile equipment. Coding: 0 = No/unsterile not reported; 1 = Yes (piercing with non-sterile equipment). Drug use: recreational drug use in the past 12 months. Coding: 0 = No; 1 = Yes. Injecting drug use with non-sterile equipment: reported injection drug use where equipment sterility could not be guaranteed. Coding: 0 = No; 1 = Yes.

Covariates: Sociodemographic characteristics: Marital status: 0 = Unmarried; 1 = Married. Educational level: 1 = Primary, 2 = Junior High, 3 = Senior High, 4 = University/College. Employment status: 0 = Unemployed, 1 = Freelance, 2 = Employed. Living arrangement: 1 = Alone, 2 = With spouse, 3 = With friends. Knowledge-related variables: HIV transmission knowledge: assessed via a standardised set of items on correct routes of HIV transmission; categorised as High (≥ median score) vs. Low (< median score). HIV prevention knowledge: assessed via items on condom use and other prevention methods; categorised as High (≥ median score) vs. Low (< median score). Sexual behaviours: Condom use consistency: 0 = Consistent use, 1 = Occasional use, 2 = Never used. Condom leakage: 0 = No, 1 = Yes. Frequency of anal sex with male clients in the past month: 0 = ≤2 times, 1 => 3 times. Other behavioural covariates: Alcohol consumption: 0 = No, 1 = Yes (any use in past 12 months). HIV testing history: 1 = Voluntary, 2 = Referral, 3 = Both, 4 = Never tested. All items, including STI symptoms and HIV knowledge, were adapted from the standardized IBBS instrument, which was developed in alignment with WHO guidelines and Indonesia's Ministry of Health protocols, ensuring national consistency and validity. Cut-off points for categorical variables (e.g., frequency of anal sex ≤2 vs. >3 times) were based on median distribution and consistency with prior behavioral surveillance studies among MSM populations.

Statistical Analysis and Ethical Clearance

All analyses accounted for the RDS design, including network size and recruitment weights. Descriptive statistics were used to generate weighted frequencies and proportions. Weighted chi-square tests were used to assess bivariate associations between STI symptoms and each independent variable. Multivariable logistic regression was used to estimate adjusted odds ratios (aORs) and 95% Confidence Intervals (CIs), controlling for potential confounders. Missing data (<5%) were handled using listwise deletion after verifying that missingness was random. Model diagnostics included multicollinearity checks using variance inflation factors (VIF < 2.5) and the Hosmer-Lemeshow test for model fit. Multivariable models adjusted for marital status, education, HIV prevention knowledge, alcohol use, and condom use, based on theoretical and empirical evidence from prior STI studies. Statistical significance was defined as $p < 0.05$. All analyses were conducted using STATA 16 (StataCorp, College Station, TX, USA).

The IBBS protocol received ethical approval from the Research and Community Engagement Ethics Committee, Faculty of Public Health, Universitas Indonesia (Approval No. 727/UN2.F10/PPM 00.02/2018). Written informed consent was obtained from all participants before data collection, in accordance with national and international ethical standards. The present analysis utilized de-identified secondary data, thereby ensuring participant confidentiality and anonymity throughout the research process.

RESULT

The findings indicate that approximately one in five young MSM (22.8%) reported experiencing at least one symptom suggestive of a sexually transmitted infection. The most common symptom was painful urination (16.0%), followed by abnormal penile discharge (4.9%). Other symptoms, such as genital ulcers (2.7%), genital warts (2.6%), anal ulcers (1.5%), and anal discharge (0.9%), were less frequently reported. Although the overall prevalence of specific symptoms is relatively low, the high proportion of participants experiencing painful urination highlights a potential undercurrent of untreated infections, particularly given the overlapping risks associated with sexual

behavior and limited access to stigma-free health services, as shown in Table 1. Participants could report more than one symptom; for analytical purposes, the outcome variable 'any STI symptom' was coded as one if they reported at least one symptom. Overall, these biases likely led to an underestimation of true STI prevalence and to the attenuation of observed associations.

Table 1. Distribution of Self-Reported STI Symptoms among Young MSM in Indonesia (RDS-Weighted Estimates, IBBS 2018-2019)

Variable	Category	Frequency (n=1,988)	% (RDS Weight)
STI Symptom (any)	No	1,534	77.2
	Yes	454	22.8
Painful urination	No	1,670	84.0
	Yes	318	16.0
Genital warts	No	1,936	97.4
	Yes	52	2.6
Anal warts	No	1,943	97.7
	Yes	45	2.3
Genital ulcers or sores	No	1,934	97.3
	Yes	54	2.7
Anal ulcers or sores	No	1,958	98.5
	Yes	30	1.5
Abnormal penile discharge	No	1,890	95.1
	Yes	98	4.9
Abnormal anal discharge	No	1,970	99.1
	Yes	18	0.9

The analysis of behavioral and sociodemographic factors identified several key determinants of self-reported STI symptoms among MSM. Tattooing with unsterile equipment was strongly associated with symptom reporting (33.9% vs. 21.3%; $p = 0.030$), whereas a similar, though nonsignificant, trend was observed for piercings. Substance use showed mixed effects: neither recent drug use nor unsafe injection practices were associated with STI symptoms, but alcohol consumption was linked to a higher prevalence (25.8% vs. 20.2%, $p = 0.003$). Marital status emerged as an essential sociodemographic marker. Married men reported substantially higher rates of symptoms than their unmarried peers (36.0% vs. 22.5%, $p = 0.025$). By contrast, education level and employment status did not demonstrate consistent or significant associations. Living arrangements showed suggestive differences, with men living with a spouse reporting the lowest prevalence, though this did not reach significance. Knowledge-related variables highlighted the role of HIV prevention awareness. While general knowledge of HIV transmission showed no significant association, low prevention knowledge was strongly associated with a higher prevalence of symptom reporting (26.8% vs. 16.6%, $p = 0.001$) (Table 2).

Sexual practices provided some of the most robust indicators. Men who experienced condom leakage (29.6%) or who never used condoms (46.1%) reported far higher rates of STI symptoms compared to those without leakage (21.7%, $p = 0.022$) or those who used condoms consistently ($p = 0.001$). Occasional condom users also showed elevated prevalence (30.6% vs. 19.5%). By contrast, the frequency of anal sex with male clients did not show significant variation. HIV testing history presented an intriguing pattern. Prevalence was highest among those who underwent voluntary testing (35.7%), lower among men tested through referral (26.1%), and lowest among those tested through both routes (14.7%, $p < 0.001$). Men without prior STI testing reported a relatively low prevalence of its symptoms (18.1%), which may reflect undiagnosed infections rather than genuinely reduced risk exposure. Together, these findings highlight the multifaceted drivers of STI symptoms among MSM, underscoring the central roles of prevention knowledge, alcohol use, condom reliability, and body modification practices (Table 2).

Table 2. Association between Selected Risk Factors and STI Symptoms among Young MSM (IBBS 2018—2019)

Variables	Category	STI Symptom		p-value (RDS X^2)
		No (% RDS)	Yes (% RDS)	
Tattooing with non-sterile equipment	No	78.7	21.3	
	Yes	66.1	33.9	0.030*
Piercing with non-sterile equipment	No	66.4	33.6	
	Yes	63.3	36.7	0.524
Drug use (12 mo.)	No	77.1	22.9	
	Yes	77.8	22.3	0.816
Drug injection with non-sterile equipment	No	77.3	22.7	
	Yes	73.2	26.8	0.538
Marital status	Unmarried	77.5	22.5	
	Married	64.0	36.0	0.025*
Educational Level	University/college	72.5	27.5	
	Senior High School	77.8	22.2	0.089
	Junior High School	76.5	23.5	0.429
	Primary High School	78.2	21.8	0.119
Employment	Employed	80.2	18.8	
	Freelance	75.4	24.6	0.061
	Unemployed	76.5	23.5	0.107
Living arrangement	Alone	77.3	22.7	
	With spouse	85.7	14.3	0.087
	With friends	74.1	25.9	0.314
Knowledge about HIV transmission	High	78.7	21.3	
	Low	76.1	23.9	0.182
HIV prevention knowledge	High	83.4	16.6	
	Low	73.2	26.8	0.001*
Condom Leakage	No	78.4	21.7	
	Yes	70.4	29.6	0.022*
	Never used a condom	53.9	46.1	0.001*
Consistency of condom use	Consistent	80.5	19.5	
	Occasional	69.4	30.6	0.001*
	Never	75.6	24.4	0.248
Frequency of anal sex with male clients (last month)	δ2 times	73.5	26.5	
	ε3 times	77.5	22.5	0.410
Alcohol consumption	No	79.8	20.2	
	Yes	74.2	25.8	0.003*
HIV Testing history	Voluntary testing	64.3	35.7	
	Referred for testing	73.9	26.1	0.020*
	Both voluntary and referred	85.3	14.7	0.001*
	Never tested	81.9	18.1	0.001*

***Note: p <0.05 indicates statistical significance**

The multivariable analysis highlights several significant associations between behavioral factors and the presence of STI-related symptoms among young MSM. Tattooing, piercing, and recent drug use did not demonstrate significant independent associations after adjustment, although the direction of effects varied. For instance, men with a history of tattooing using non-sterile equipment had higher odds of reporting STI symptoms (aOR = 1.83; 95% CI: 0.28—11.8), although the association was not statistically significant. Piercing was associated with lower odds of symptom reporting, but this association was also not statistically significant (aOR = 0.33; 95% CI: 0.05—1.99). Similarly, drug use within the past 12 months (aOR = 1.38; 95% CI: 0.34—5.59) and injecting with non-sterile equipment (aOR = 0.11; 95% CI: 0.05—2.78) showed no meaningful associations with STI symptoms. By contrast, knowledge of HIV prevention emerged as a strong predictor. Participants with low prevention knowledge had more than eight times the odds of reporting STI symptoms compared with those with higher knowledge (aOR = 8.53; 95% CI: 2.38—30.4, p = 0.001). Condom-related variables showed strong associations with STI symptoms. Men who never used condoms had markedly higher odds of

reporting STI symptoms (aOR = 32.3; 95% CI: 1.34—775.5, p = 0.032), while inconsistent condom use was associated with more than threefold higher odds (aOR = 3.57; 95% CI: 1.12—11.4, p = 0.031) compared with consistent condom use. Condom leakage, however, was not significantly associated with STI symptoms. Alcohol use was associated with higher odds of reporting STI symptoms, although this association was not statistically significant (aOR = 1.94; 95% CI: 0.51—7.44) (Table 3). Taken together, these findings suggest that gaps in HIV prevention knowledge and inconsistent condom use remain key contributors to STI vulnerability in this population, while other factors, such as tattooing, piercing, and substance use, were not independently associated with STI symptoms in this analysis and warrant further investigation.

Table 3. The Model for Behavioral and Sociodemographic Correlates of Self-reported STI Symptoms among Young MSM

Variables	Category	cOR	95% CI	aOR	95% CI	p-value
Tattooing with non-sterile equipment	No	Ref		Ref		
	Yes	1.72	0.42 – 6.96	1.83	0.28 – 11.8	0.526
Piercing with non-sterile equipment	No	Ref		Ref		
	Yes	0.64	0.14 – 2.83	0.33	0.05 – 1.99	0.228
Drug use (12 mo.)	No	Ref		Ref		
	Yes	1.14	0.15 – 8.51	1.38	0.34 – 5.59	0.650
Drug injection with non-sterile equipment	No	Ref		Ref		
	Yes	0.98	0.10 – 2.56	0.11	0.05 – 2.78	0.186
HIV prevention knowledge	High	Ref		Ref		
	Low	7.23	2.56 – 28.9	8.53	2.38 – 30.4	0.001*
Condom Leakage	No	Ref		Ref		
	Yes	0.58	0.12 – 3.76	0.65	0.13 – 3.14	0.594
	Never used a condom	31.2	1.20 – 667.5	32.3	1.34 – 775.5	0.032*
Consistency of condom use	Consistent	Ref		ref		
	Occasional	3.12	1.10 – 11.4	3.57	1.12 – 11.4	0.031*
	Never	0.97	0.05 – 2.13	0.12	0.06 – 2.46	0.172
Alcohol consumption	No	Ref		Ref		
	Yes	1.82	0.49 - 7.04	1.94	0.51 – 7.44	0.333

***Note: p <0.05 incicates statistical significance**

DISCUSSION

Tattooing & Piercing

Although our adjusted analysis did not reveal statistically significant associations for piercing and showed only imprecise elevated estimates for tattooing with unsterile equipment, these results should be interpreted cautiously. Systematic reviews and case reports have shown that unsafe tattooing and piercing can transmit bacterial and viral infections, including hepatitis B, hepatitis C, and occasionally HIV, particularly when aseptic techniques are inadequate. [18,19] Several factors may explain the lack of statistically significant associations observed in this study, including limited sample size for relatively uncommon exposures, potential residual confounding related to sexual practices, and potential misclassification due to self-reported information on equipment sterility. Importantly, existing epidemiological evidence indicates that infection risk is highly context-dependent. Procedures performed in regulated settings are generally considered to have a low risk of STIs, whereas informal or unregulated practices are associated with a greater risk of bloodborne infection. Although this study did not find statistically robust associations, the observed trend toward higher odds of STI symptoms among participants reporting unsterile tattooing remains biologically plausible and aligns with findings from previous studies. These observations highlight the importance of preventive education on safe body modification practices, especially in informal or unregulated settings.[20,21]

Drug Use

No significant adjusted associations were observed between recent drug use or injecting with non-sterile equipment and STI symptom reporting. Nonetheless, growing international evidence—particularly studies of sexualized drug use (chemsex) among MSM consistently links substance use

with risky sexual behaviors, including condomless sex and multiple partnerships, and with higher STI incidence.[22] Cohort and multicenter studies confirm that chemsex contributes to increased STI burden among MSM, even among PrEP users.[23] The lack of association in our model likely reflects limited sample power, heterogeneous patterns of substance use (occasional versus chemsex contexts), and mediation through sexual behaviors. Thus, these findings caution against interpreting the absence of an independent effect as evidence that drug-related practices are unrelated to STI risks.[24,25]

HIV prevention knowledge

Low HIV-prevention knowledge strongly predicted self-reported STI symptoms (aOR = 8.53; 95% CI: 2.38—30.4). Participants with lower knowledge were substantially more vulnerable, consistent with findings from Asia and sub-Saharan Africa showing that insufficient prevention knowledge reduces self-efficacy in condom negotiation and consistent use.[26] Knowledge-focused interventions, therefore, remain a cornerstone of STI prevention strategies among MSM.

Condom Leakage

Condom use behavior followed the expected pattern: individuals who never or inconsistently used condoms had significantly higher odds of STI symptoms compared with consistent users. These findings align with extensive global evidence demonstrating that consistent and correct condom use remains one of the most reliable strategies for STI prevention.[27] Programmatic strategies should therefore prioritize not only condom availability but also skills-building and motivational components to support correct and consistent use. Our findings are also consistent with recent international research, including an e-health intervention study demonstrating that strengthening condom self-efficacy reduced condomless sex, as well as research among PrEP users indicating that participation in chemsex is associated with elevated risk of condomless sexual practices.[24,28]

Consistency of condom use

In our adjusted models, condom leakage was not significantly associated with STI symptoms. This null finding should be interpreted with caution, as condom failure events are relatively rare yet clinically meaningful. The reliance on self-reported leakage and the limited statistical power of our sample may obscure a modest but real effect. Prior studies underscore that condom errors and failures contribute to ongoing STI transmission when they occur.[29] Other studies have identified a significant association between imperfect condom use and an increased risk of sexually transmitted infections (STIs) among high-risk populations. These findings underscore the importance of consistent and correct condom use in preventing STI transmission.[30] To clarify the potential role of leakage in this context, future research should employ larger samples and direct measures of condom use errors, such as observational checklists or biomarkers of semen exposure, rather than retrospective self-reports. The wide confidence intervals for certain behavioral factors, particularly condom use categories, indicate limited precision likely due to small subgroup counts. Due to sample-size limitations across several subgroups, stratified or sensitivity analyses were not feasible. Future research with larger and more diverse samples is required to confirm whether these associations vary by age, region, or other contextual factors.

Alcohol Consumption

Alcohol consumption showed a non-significant increase in odds in our adjusted model (aOR 1.94; 95% CI: 0.51—7.44). However, systematic reviews and recent international studies report that heavy episodic or hazardous drinking is associated with greater sexual risk and higher STI rates, likely through impaired judgment and reduced condom negotiation.[31] Among MSM in San Francisco, heavy or binge drinking was independently linked to a higher number of male partners and increased STI incidence.[32] Our null result may be due to measurement limitations (binary indicator of alcohol use in the past 12 months) and residual confounding. Despite the lack of statistical significance, alcohol remains a plausible risk factor that warrants targeted interventions and improved measurement in future surveys.

Policy Implication

Indonesia's National HIV Strategic Plan emphasizes prevention, testing, and tailored interventions for key populations, including MSM, supported by both national and international partners. Strengthening culturally competent prevention services, including condom and lubricant distribution, harm reduction for drug users, outreach HIV/STI education, and access to sterile body-modification services aligns with these priorities.[33,34] Policy actions should integrate messaging on safe tattooing and piercing and expand harm-reduction programs that engage chemsex participants by combining behavioral counseling, condom provision, and accessible STI screening. Given that prevention commodities (condoms, PrEP, sterile equipment) still depend in part on external donors, disruptions in international support could affect program reach and should be closely monitored during future scale-up efforts.[34,35] These findings support the national commitment to the 2020—2024 Indonesia HIV/AIDS Strategic Plan, which prioritizes integration of STI prevention with harm-reduction, education, and outreach programs for key populations.

Strengths and limitations

This study employed respondent-driven sampling (RDS) with weighting adjustments to effectively reach a hard-to-reach population of MSM. The use of RDS weighting improves representativeness within urban MSM networks, allowing cautious inference at the population level. However, because recruitment occurred primarily in urban and semi-urban centers, generalization to MSM in rural or less connected regions should be made with caution. The use of multivariable models controlling for plausible confounders strengthens the validity of observed associations and provides valuable community-level insights in the absence of population-based registers. Several limitations warrant consideration. First, both the outcome (self-reported STI symptoms) and key exposures were self-reported, which may introduce misclassification and social desirability bias. Participants might underreport symptoms due to stigma or overreport preventive behaviors such as condom use. The reliance on self-reported STI symptoms, rather than laboratory-confirmed diagnoses, increases the likelihood of both false positives and negatives, potentially diluting observed associations. Second, wide confidence intervals for several variables indicate limited statistical power for less common exposures. Third, the cross-sectional design limits causal interpretation of observed associations. Additionally, key assumptions underlying RDS, specifically accurate reporting of network size and connectivity, may not have been fully met, potentially resulting in residual bias in the weighted estimates. Moreover, the measure of tattooing or piercing with non-sterile equipment relied on participants' perceptions rather than objective verification of aseptic practices, which may have led to misclassification of exposure status.

CONCLUSION

In this study, tattooing, body piercing, and recreational drug use were not independently associated with self-reported STI symptoms among young MSM in Indonesia. Nonetheless, biological plausibility and evidence from other settings suggest that unsafe body modification and drug-related practices remain relevant concerns in STI prevention. The most consistent correlates of STI symptoms in this study were low HIV prevention knowledge and inconsistent or absent condom use. These findings highlight the importance of strengthening HIV prevention education and condom promotion as core components of MSM-focused interventions, while also incorporating risk communication regarding safe body modification and substance use practices. Integrating these strategies into Indonesia's National HIV Strategic Plan may improve the effectiveness and sustainability of sexual health programs targeting young MSM.

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