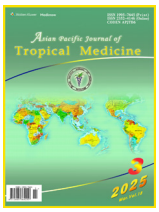

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Knowledge, attitude, and behaviour toward same-sex sexual intercourse and HIV/AIDS prevention: A cross-sectional survey in Indonesia

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ABSTRACT

Objective: To assess public knowledge, attitudes, and behaviours regarding same-sex sexual intercourse (SSI) in relation to HIV/AIDS transmission prevention, especially in an inclusive cultural and religious country like Indonesia, beyond established prevention methods like safe sex practices and Pre-Exposure Prophylaxis (PrEP).

Methods: We collected cross-sectional online survey data from the Indonesian 18 years or older population in December 2021 and August 2022. We determined participants' knowledge, attitude, and behaviour scores toward SSI and HIV/AIDS prevention. We critically explored each score and used multiple linear regression to identify the predictive factors.

Results: The survey included 386 adults [median age (IQR): 22 (20-35) years]. The median (IQR) score was 90/100 (80-100) for knowledge, 43/50 (39-46) for attitude and 70/70 (70-70) for behaviour. The number of men who had sex with men (MSM) was 7/129 (5.4%). Male sex, non-MSM, higher knowledge, and higher attitude scores were positively associated with higher behaviour scores (P<0.001).

Conclusions: This study highlights the need for inclusive HIV/AIDS prevention strategies that respect cultural and religious values, reduce stigma, and improve healthcare access, while aligning with international guidelines and scientific evidence

KEYWORDS: Men who have sex with men; Same-sex sexual intercourse; HIV/AIDS; Prevention

1. Introduction

Human immunodeficiency virus (HIV) infection and acquired immune deficiency syndrome (AIDS) are global health problems,

Summary

Question: How are the views and awareness of the public on the notion of reducing HIV transmission by preventing same-sex sexual intercourse (SSI), in addition to the established methods like safe sex practices and Pre-Exposure Prophylaxis (PrEP)?

Findings: This cross-sectional online survey with 386 participants from Indonesia assessed knowledge, attitude, and behaviour scores regarding SSI and HIV/AIDS prevention. The study found that behaviour to prevent SSI and HIV/AIDS is high [median (IQR): 70/70 (70-70)] and significantly associated with male sex, non-MSM status, higher knowledge, and higher attitude scores.

Meaning: This study emphasizes the importance of inclusive HIV/AIDS prevention strategies that respect cultural and religious values while adhering to international guidelines and scientific evidence.

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with the number of cases reaching 36.9 million in 2019. The HIV/AIDS prevalence rate reaches 476 out of 100 000 population per year, with an estimated 5 000 new cases daily. This disease can be found at all ages with the highest incidence rate between 20-39 years. HIV in productive ages (>18 years) is transmitted mainly through sexual intercourse and needle abuse. Improvements in the health system, anti-retroviral (ARV) treatment, and strengthening of the primary and secondary prevention movements have slowly reduced the HIV/AIDS mortality rate to 11 deaths per 100 000 cases in 2019[1]. However, the HIV incidence rate is increasing in men who have sex with men (MSM). One-third of HIV-positive cases in Asia and the Pacific are found in MSM. Indonesia recorded the highest HIV prevalence rate among MSM in this region, reaching 25.8% between 2011 and 2018[2].

Unprotected same-sex sexual intercourse (SSI) among males is a crucial driver of HIV transmission and related health risks[3]. The risk of HIV transmission through anal insertion without protection among MSM is 8.2 per 1 000 sexual contacts[4]. Factors that increase the risk of HIV infection in MSM include young age (20-24 years), having steady sex partners, using social media to find sex partners, high-risk sex, and alcohol and drug consumption. One-fifth of young MSM are also at risk for sexually transmitted infections such as gonorrhoea, chlamydia, and syphilis. In Indonesia, many MSM choose to keep their identity private from their nuclear family, influenced by societal perceptions that often reflect traditional religious and cultural values regarding gender and sexuality. These perceptions, which may associate lesbian, gay, bisexual, and transgender (LGBT) identities with behaviours seen as outside of these norms, contribute to the decision to maintain privacy[5]. A study on mass media coverage in Indonesia describes the LGBT as synonymous with sexual deviation, sexual orientation that is not inherited, contrary to religion, and criminal acts as actors and victims[6]. Thus, MSM also risk mental disorders due to internalized homophobia, a state of mind burden that arises from within themselves due to negative public perceptions of LGBT behaviour (homophobia)[7].

Several studies suggest preventing HIV/AIDS in MSM through condom use, pre-exposure prophylaxis (PrEP), HIV screening, and anti-homophobia campaigns[8,9]. Meanwhile, a recent genetic study involving 500 000 people shows no single genetic determinant or "gay gene" for the emergence of same-sex sexual behaviour[10]. SSI has been found to have significant genetic correlations with certain personality traits (like loneliness and openness), risky behaviours (such as smoking and cannabis use), and mental health disorders, although environmental factors like societal prejudice may influence the underlying causes[10,11]. Promoting strategies that encourage safer sexual practices could be a practical approach to reducing HIV/AIDS cases in Indonesia while being sensitive to local wisdom, religious beliefs, and sociocultural identities[12]. In addition, no relevant studies critically explore the community's knowledge, attitudes, and behaviour toward SSI and HIV/AIDS prevention. This research aims to complete the scientific basis for efforts to reduce HIV/AIDS transmission in the community.

2. Subjects and methods

2.1. Study design and data collection

This research was an observational study with a cross-sectional approach. We developed the survey questionnaire online in December 2021 and August 2022 using Google Forms based on an extensive review of the literature, which included studies on HIV/AIDS and MSM in Indonesia[13,14]. The survey was promoted through social events (Zoom meeting webinar), community organizations, and Whatsapp groups. We used a consecutive sampling method and targeted the Indonesian population aged 18 or older to critically explore their knowledge, attitude, and behaviour toward SSI and HIV/AIDS prevention. The power calculation for the sample size was 95%, with a minimal sample of 156.

2.2. Measures

The questionnaire was validated and considered reliable with the 195 participants' data in December 2021 using IBM SPSS version 25 (New York, USA). The knowledge, attitude, and behaviour reliability test results were acquired with Cronbach's Alpha of 0.67, 0.70, and 0.69, respectively. We used a corrected item-total correlation test to validate each question in the questionnaire. A correlation value >0.3 was considered valid, but we included some questions below this threshold to broaden the discussion. We used the same questionnaire in August 2022 to increase the number of study participants and minimize biases. The survey contains four sections: (1) participant's characteristics: initial, date of birth, sex, education level, occupation, and marital status; (2) knowledge section: consisting of ten questions with responses scored as 10 points for a correct answer and 0 points for a wrong answer, resulting in a total score ranging from 0 to 100; (3) attitude section: consisting of ten questions measuring participants' attitudes on a 5-point Likert scale, where responses range from 'strongly disagree' to 'strongly agree', with a total possible score ranging from 10 to 50, reflecting both positive and negative attitudes; and (4) behaviour section: consisting of seven questions, where participants choose the option that best describes their behaviour, and the results are presented as both the total number of actions taken and their proportion relative to the total possible behaviours.

2.3. MSM status

The MSM status was measured from the item "Do you ever have sex with the same sex?" in section 4. If the participants answered "yes", they were coded as MSM. Thus, only the participants who chose the answer "male" in the item question "sex" (section 1) were eligible for this category, and the females were excluded from the MSM status.

2.4. Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants before participating in the survey questionnaire. This study was approved by the Research Ethics Committee of Medical Faculty, Universitas Andalas, with grant number 611/UN.16.2/KEP-FK/2021 on December 9th, 2021.

2.5. Statistical analysis

Descriptive analyses were used to describe the median (IQR) of the age, knowledge score, attitude score, and behaviour score. We defined the categorical variable (age groups, sex, occupation, educational level, marital status, and MSM status of male participants) in frequency and percentage. Mann-Whitney or Kruskal-Wallis tests were used to find the relationship between the appropriate variables and knowledge, attitude, and behaviour scores. We used stepwise multiple linear regression to assess the model diagnostic and predictive factors for each score. A *P*-value <0.05 was considered statistically significant.

3. Results

A total of 386 participants approved their consent and completed the survey (Table 1). The median (IQR) age was 22 (20-35) years. The majority were under 30 years old (65.6%), females (66.6%), students (59.3%), undergraduates or lower (56.5%), and unmarried (66.8). The number of MSM was 7/129 (5.4%) (Table 1). We described the detailed characteristics of the participant's knowledge, attitude, and behaviour toward SSI and HIV/AIDS prevention in Table 2, based on questionnaire scores and proportions.

Table 1. Sociodemographic characteristics of the participants.

Variables	*N*	Percentage (%)
Age, years		
<30	253	65.5
30-39	61	15.8
40-49	43	11.1
50+	29	7.5
Sex		
Male	129	33.4
Female	257	66.6
Occupation		
Student	229	59.3
Professional	144	37.3
Unemployed	13	3.4
Educational level		
Undergraduate or lower	218	56.5
Graduate	168	43.5
Marital status		
Married	125	32.4
Unmarried	258	66.8
Separated/ divorced	3	0.8
MSM status of male participants (*n*=129)		
MSM	7	5.4
Non-MSM	122	94.6

MSM: men who have sex with men.

Table 2. Knowledge, attitude, and behaviour characteristics toward SSI and HIV/AIDS prevention.

Variable	Average score
Knowledge*	
HIV/AIDS definition[1]	7.37
Transmission route of HIV	8.78
Target of HIV in the body system	9.27
Symptoms of HIV/AIDS	6.68
HIV/AIDS cure[1]	7.05
HIV/AIDS prevention	9.33
Homosexual behaviour	9.20
MSM definition	8.03
Same-sex sexual intercourse may greater the risk for HIV/AIDS	9.27
Genetic inheritance of homosexuality and MSM[1]	8.08
Attitude	
Improving my understanding of religion and health can prevent me from getting infected with HIV**	4.13
Avoiding homosexual behaviour can prevent me from getting HIV/AIDS**	4.20
An MSM/LGBTQ needs to be punished to prevent new cases in the community[1]**	3.28
Homosexual behaviour can be changed if someone wants to change it seriously**	4.29
Homosexual/ MSM/ LGBTQ behaviour is a disorder and needs to be counselled/ medical therapy**	4.17
Changing partners in having sex is okay as long as you use a condom***	4.33
People living with HIV/AIDS should be kept away from social interactions***	4.03
MSM and LGBTQ (lesbian, gay, bisexual, transgender, and queer) are normal***	4.61
Same-sex sexual intercourse is a human right and can be protected by law even though it is prohibited by religion[1]***	4.30
Someone who is suspected of being an MSM needs to be announced to the public***	3.86
Behaviour [*n* (%)]	
Has sexual attraction to the same sex	14 (3.6)
Had sex with same-sex	7 (1.8)
Had sex with same-sex five times or more	4 (1.0)
Had sex outside of marriage	19 (4.9)
Had sex with multiple partners	9 (2.3)
Do not feel guilty and sinful if having sex outside of marriage[1]	33 (8.5)
Had a sexually transmitted infection (genital itching/ heat/ pain/ else)	11 (2.8)

*Knowledge score (true=10; false=0); **positive attitude (strongly disagree=1; disagree=2; neutral=3; agree=4; strongly agree=5); ***negative attitude (strongly agree=1; agree=2; neutral=3; disagree=4; strongly disagree=5); [1]item-corrected value <0.3.

3.1. Knowledge

To address the factors affecting the participants' knowledge scores, we evaluated the demographical characteristic pattern in every item of the knowledge section (Supplementary Table 1). The knowledge score [median (IQR): 90/100 (80-100)] correlated significantly with most variables, except MSM status (Figure 1). The lowest scores were found in participants under 30 years, male sex, occupied as students, with undergraduate or lower educational levels, separated/

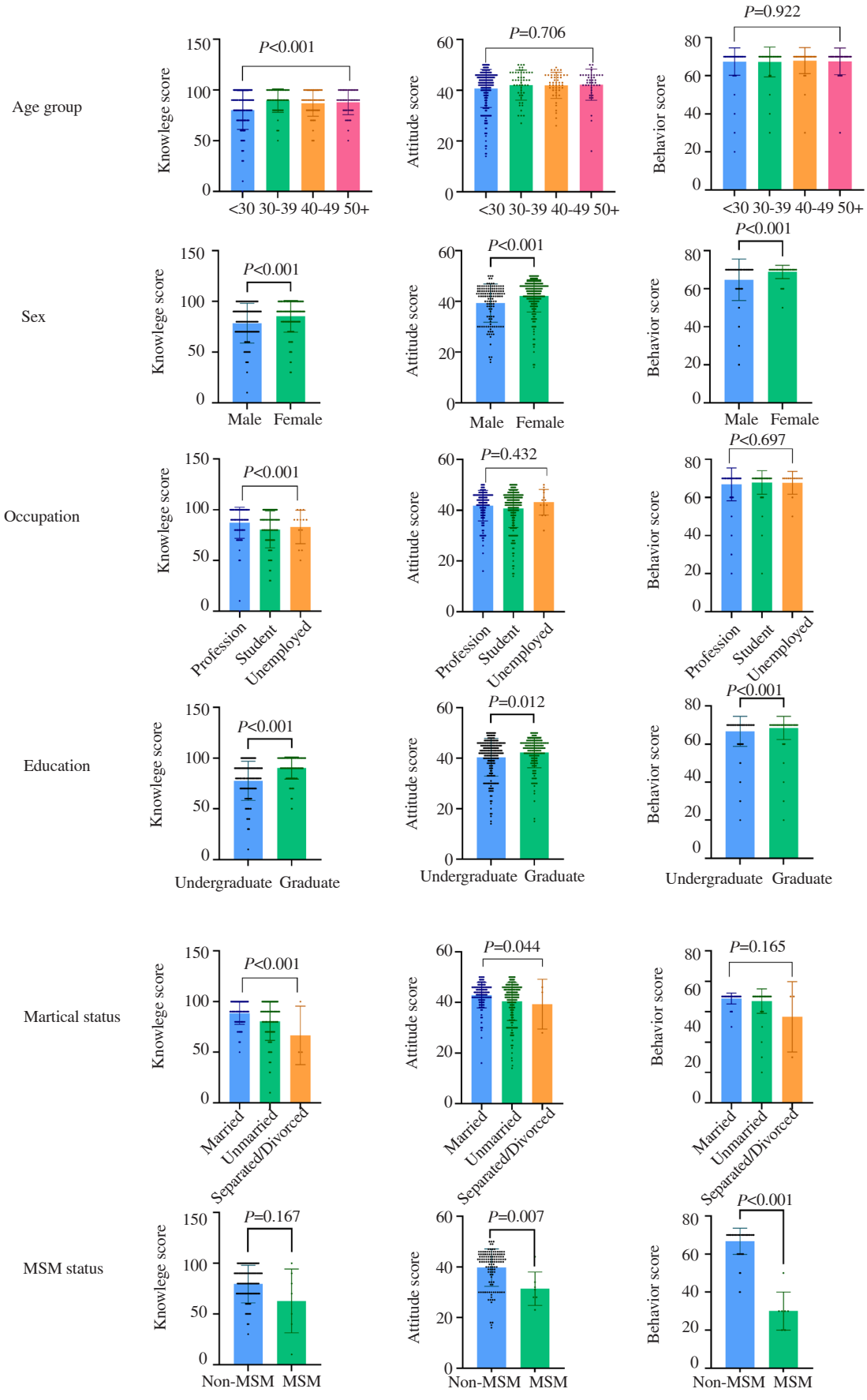

Figure 1. Box plots showing the distribution of knowledge, attitude, and behavior scores across different participant characteristics. The Mann-Whitney or Kruskal-Wallis test was used for comparison. MSM: men who have sex with men.

divorced, and those included as MSM. As shown in Table 2, the highest average knowledge score of all participants was on the item "HIV/AIDS prevention" (9.33), through the question "How to prevent HIV/AIDS infection?". Most participants answered: "not having sex outside marriage or with multiple partners" as the correct choice. Most participant knows that HIV targets the immune system, and understand unsafe SSI as a risk factor for HIV/AIDS (average score of 9.27). Meanwhile, nearly half of the participants did not know the symptoms of HIV/AIDS (average score of 6.68) and became the lowest score. This item is significantly different in sex (the male even had a lower score than the female, 5.58 *vs.* 7.24, reaching 2.86 among MSM) (Supplementary Table 1).

3.2. Attitude

We plotted the attitude items with each participant's demography to see both correlations (Supplementary Table 2). Based on our analysis, the attitude score [median (IQR): 43/50 (39-46)]) correlated significantly with sex, educational level, marital status, and MSM status (Figure 1). Most participants (n=342, 88.6%) had an attitude score above 30, followed by 26 (6.7%) and 18 (4.7%) participants with scores below and equal to 30, respectively (data not shown). The majority of participants strongly disagreed with the item "MSM and LGBTQ (lesbian, gay, bisexual, transgender, and queer) are normal", as the highest score for the attitude item (average score of 4.61) (Table 2). However, the participants tended to have a neutral to positive opinion on the item "An MSM/LGBTQ needs to be punished to prevent new cases in the community" (average score of 3.28) and "Someone who is suspected of being an MSM needs to be announced to the public" (average score of 3.86).

3.3. Behaviour

To determine the behaviour pattern of the participants, we analyzed the frequency and percentage of each behaviour item based on demographical characteristics and evaluated the correlations (Supplementary Table 3). The behaviour score [median (IQR): 70/70 (70-70)] correlated significantly with sex, educational level, and MSM status (Figure 1). A total of 14/386 (3.6%) of all participants (male: 9/129, 7.0%) had a sexual attraction to the same sex (homosexual), and as many as seven of them (all were males) had experienced SSI (MSM). Most of the MSM were aged 21-35 (5/7, 71.4%; median age=34), professionals (6/7, 85.7%), undergraduate or lower (5/7, 71.4%), and unmarried or divorced/separated (7/7, 100%). Four of seven MSM (57.1%) had SSI five times or more, and two of them (28.6%) had more than 20 times (data not shown). The proportion of sexual intercourse outside marriage was 4.9% (19/386), and as many as nine persons (9/386, 2.3%) had sex with multiple partners. Nearly one in ten participants (33/386, 8.5%) did not feel guilty and sinful if having sex outside marriage. Lastly, the prevalence of sexually transmitted infection in this study was 2.8% (11/386).

3.4. Multivariate analysis

We generated three models with multiple linear regression to address the correlation between all measures' knowledge, attitude, and behaviour scores (Table 3). All three scores were firmly correlated with each other. A higher educational level likely contributes to a higher knowledge score (variance of 10.2%). In comparison, the married participants tended to have a higher attitude score (variance of 13.1%), and male sex and non-MSM participants were likely to have a higher behaviour score (variance of 55.4%). In this study, we did not find a correlation between the age, age groups, and occupation of all three models.

Table 3. Predictive measurement of knowledge, attitude, and behaviour toward SSI and HIV/AIDS prevention in Indonesia.

Model	Predictors	Unstandardised coefficients		Standardised coefficients			Model		
		B	Std. Error	Beta (95% *CI*)	*t*	*P*	*R* square	*F*	*P*
Knowledge Score	Constant	35.703	7.975	-	4.477	<0.001	0.102	10.800	<0.001
	Education	11.137	1.624	0.319 (7.943-14.331)	6.856	<0.001			
	Attitude score	0.369	0.121	0.147 (0.130-0.607)	3.042	0.003			
	Behaviour Score	0.405	0.117	0.168 (0.176-0.635)	3.472	0.001			
Attitude Score	Constant	18.914	3.229	-	5.858	<0.001	0.131	19.229	<0.001
	Marital	1.532	0.685	0.109 (0.186-2.878)	2.239	0.026			
	Knowledge score	0.063	0.020	0.157 (0.024-0.102)	3.146	0.002			
	Behaviour Score	0.245	0.048	0.254 (0.152-0.339)	5.160	<0.001			
Behaviour Score	Constant	23.111	2.267	-	10.193	<0.001	0.554	118.403	<0.001
	Sex	-33.308	2.058	-2.190 (-37.354- -29.263)	-16.187	<0.001			
	MSM status	34.894	1.908	2.502 (31.143-38.645)	18.293	<0.001			
	Knowledge score	0.041	0.015	0.098 (0.012-0.070)	2.744	0.006			
	Attitude score	0.138	0.037	0.133 (0.064-0.211)	3.684	<0.001			

4. Discussion

The risk of HIV/AIDS in MSM communities has been well-addressed in the literature[15,16]. Nevertheless, the concept of preventing same-sex sexual intercourse (SSI) as a primary strategy to reduce HIV/AIDS transmission is still debated, particularly when SSI occurs alongside other high-risk behaviours such as unprotected intercourse, substance use, and multiple partners[17]. Methods such as barrier protection, PrEP, or HIV screening are also important strategies for HIV prevention in the MSM community. Despite its controversy in relation to international human rights law regarding sexuality[18,19], some local cultural, religious, and societal norms may advocate for avoiding certain sexual behaviours. However, no scientific data supports this idea as a stand-alone preventive measure. This study, based on a cross-sectional survey of the population aged 18 years or older in Indonesia, contributes valuable insights into the community's understanding of SSI and HIV/AIDS prevention. Our findings show that participants' knowledge, attitudes, and behaviours were more aligned with supportive views toward SSI and HIV/AIDS prevention strategies.

Our findings revealed that the community's average knowledge is good enough to understand HIV and MSM. People know that HIV is mainly transmitted through sexual intercourse, targeting the immune system, and should be prevented by avoiding multiple partners or free sex, similar to a study in developing countries[20]. However, about one-third of respondents (29.6%) do not realize there is no cure for HIV/AIDS, equivalent to a study in the United States[21], yet lower than those reported in adolescents[22]. In addition, the awareness of HIV/AIDS symptoms is inadequate for (128/386, 33.2%) people, which has never been reported in a similar study. In our study, the term "homosexual" and "MSM" is widely known, as well as their association with HIV/AIDS. Most participants stated no genetic inheritance in same-sex sexual behaviour, as reported in a large-scale study[10]. Our study confirmed that educational level is significantly correlated with knowledge of SSI and HIV/AIDS, as shown in multivariate analyses, which have also been reported in South Africa and the United States[23].

This study indicates that public attitudes are generally supportive of preventing SSI and HIV/AIDS. While most studies emphasize the freedom of safe sex practices for MSM through methods such as PrEP and condoms[24], our study shows that participants believe avoiding SSI can reduce the risk of HIV/AIDS transmission. In additon, participants do not view SSI as 'normal' in the context of human rights that should be legally protected (Attitude score >4.00). This finding may reflect existing stigmas and discrimination, as reported in previous studies[25]. On the other hand, our results challenge the idea of using law to legalize SSI to reduce discrimination and HIV/AIDS prevalence[26], suggesting instead that legal measures should focus on protecting individuals from the negative impacts of specific high-risk contexts, such as those involving MSM in open relationships, which are often linked to risky behaviours like drug use and unprotected sex[27]. While attitudes toward punishing or publicizing the behavior of MSM remain neutral (Attitude score of 3.28 and 3.86), there is strong support for education, counseling, and health services for MSM (Attitude score of 4.17). Participants also expressed the belief that individuals can change their sexual behaviours if they choose to do so. Many in the community believe that improvements in religious and health understanding are key to combating HIV/AIDS and promoting safer sexual practices. Positive effects of religiosity and spirituality have been reported in reducing high-risk behaviours among MSM[28]. Additionally, participants strongly disagree with the idea of isolating individuals living with HIV/AIDS (PLWHA) from social interaction, though they expressed concerns about practices like multiple partner sex, even with protection. This suggests a positive attitude toward PLWHA and HIV/AIDS prevention, contrasting with findings from other studies in specific communities[29]. Overall, these results indicate that promoting HIV/AIDS prevention and safer sexual practices should be done in a non-stigmatizing, private, and supportive manner, rather than through discrimination or violence.

To our knowledge, no study has explored the necessity of SSI prevention specifically. MSM are recognized as a vulnerable population facing societal inequities[30]. In our study, we found that public behaviour is generally positive toward SSI and HIV/AIDS prevention. This behaviour is particularly evident among individuals with higher educational levels and non-MSM individuals, as demonstrated in both bivariate and multivariate analyses. As part of the behavioural assessment, we also reported the percentage of homosexuality, SSI, and other high-risk sexual activities at the adult community level. Our findings show that the proportion of individuals identifying as homosexual was lower compared to a study on young adults in Thailand[31], but the percentage of SSI was higher compared to Japan[32]. The proportion of MSM among males in our study was 5.4%, lower than the rates reported in some South and Southeast Asian countries (6%-15%)[33]. However, the characteristics of MSM in our study align with those of larger studies conducted in Southeast Asia[34], with a focus on young adults under 40 years old, who were predominantly single and with lower educational levels. Our study also found that risky sexual behaviours, such as unprotected sex, multiple sexual partners, and the prevalence of sexually transmitted infections, were consistent with findings from other large studies in Southeast Asia[35], although they were significantly lower than those reported in studies from Ethiopia and some African countries[36].

Overall, our study has limitations in the distribution of data samples concentrated in West Sumatra and does not cover all

Indonesian islands and provinces widely. This study is part of a community study conducted through webinars and online forms; thus, it cannot explore people without internet access. Using a quantitative questionnaire also cannot provide a deep insight into the participants. Here, we describe Indonesian people's knowledge, attitudes, and behaviour as preliminary data towards SSI and HIV/AIDS prevention.

In conclusion, this study underlines the importance of developing inclusive HIV/AIDS prevention strategies that are sensitive to local cultural and religious values, yet simultaneously meet the health needs of those involved in higher-risk behaviours. The findings point out the need for education, reduced stigma, and improved access to healthcare services for all, including those affected by HIV, irrespective of their sexual orientation. Concerning varied societal perspectives, it becomes of essence to promote decision-making and prevention in health, thereby allowing every individual an opportunity for choices that offer protection of health and well-being despite their background. Future studies should investigate methods consistent with international guidelines and scientific evidence to find common ground that will balance sociocultural concerns with imperatives in public health.

Conflict of interest statment

There are no conflicts of interest in this study.

Funding

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Human ethics and consent to participate

This study was approved by the Research Ethics Committee of Medical Faculty, Universitas Andalas (approval number: 611/UN.16.2/KEP-FK/2021; approval date: December 9th, 2021) in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants before participating in the survey questionnaire.

Availability of data and material

Data and material are only available from the corresponding author at syandrez@med.unand.ac.id.

Authors' contributions

SPP is involved in study design, data collection and analyses, and manuscript drafting. RGL verified the data and validated the concept. SPP, RGL, RCA, DSJ, NW and SWY performed the survey. SWY guided the research. All authors read and approved the final manuscript.

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Publisher's note

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Supplementary Table 1. Participants' knowledge on HIV/AIDS and homosexual/ MSM.

Variables	Average of knowledge point (0-10)*									
	HIV/AIDS definition [1]	Transmission route of HIV	Target of HIV in the body system	Symptom of HIV/AIDS	HIV/AIDS cure [1]	HIV/AIDS prevention	Homosexual behaviour	MSM definition [1]	Same-sex sexual intercourse as the risk factor for HIV/AIDS	Genetic inheritance of homosexuality and MSM
Age Group										
<30	7.19	8.47	9.00	6.22	7.43	9.12	8.92	7.55	8.96	7.51
30-39	8.00	9.64	9.64	7.27	6.73	9.82	9.64	9.27	9.82	9.27
40-49	7.39	8.91	10.00	7.61	5.87	9.78	9.78	8.26	9.78	9.57
50+	7.78	9.44	9.72	7.78	6.39	9.44	9.72	9.17	10.00	8.33
p value	0.458	0.073	**0.046**	0.126	0.085	0.146	0.052	**0.005**	**0.018**	**0.002**
Sex										
Male	6.12	8.45	9.07	5.58	7.05	9.22	9.22	7.29	8.84	7.75
Female	8.02	8.95	9.38	7.24	7.04	9.38	9.18	8.40	9.49	8.25
p value	**<.001**	0.157	0.272	**0.001**	0.981	0.573	0.886	**0.009**	**0.019**	0.242
Occupation										
Student	7.21	8.52	9.00	6.29	7.42	9.17	8.95	7.55	8.95	7.47
Professional	7.71	9.24	9.65	7.15	6.53	9.51	9.51	8.89	9.86	9.10
Unemployed	6.92	8.46	10.00	8.46	6.15	10.00	10.00	6.92	8.46	7.69
p value	0.521	0.110	**0.035**	0.087	0.141	0.269	0.085	**0.004**	**0.002**	**<.001**
Educational level										
Undergraduate or lower	6.70	8.26	8.76	5.69	7.02	8.99	8.85	7.29	8.76	7.29
Graduate	8.27	9.46	9.94	7.98	7.08	9.76	9.64	8.99	9.94	9.11
p value	**<.001**	**<.001**	**<.001**	**<.001**	0.890	**0.003**	**0.005**	**<.001**	**<.001**	**<.001**
Marital status										
Married	7.76	9.44	10.00	7.60	6.56	9.76	9.68	8.96	9.76	9.04
Unmarried	7.21	8.49	8.95	6.28	7.29	9.15	8.99	7.64	9.03	7.60
Separated/ divorced	6.67	6.67	6.67	3.33	6.67	6.67	6.67	3.33	10.00	10.00
p value	0.497	**0.015**	**<.001**	**0.017**	0.341	**0.015**	**0.018**	**0.001**	**0.032**	**0.002**
MSM status of male participants										
MSM	7.14	8.57	5.71	2.86	4.29	5.71	5.71	7.14	8.57	7.14
Non-MSM	6.07	8.44	9.26	5.74	7.21	9.43	9.43	7.30	8.85	7.79
p value	0.571	0.927	**0.002**	0.137	0.100	**<.001**	**<.001**	0.930	0.822	0.693

*average of total score of each question. Each question is scored 10 for correct answer, scored 0 for wrong answer.

Test for significance is Mann-Whitney or Kruskal-Wallis

[1] item-corrected value <0.3

Supplementary Table 2. Participants' attitude toward HIV/AIDS and MSM prevention strategy.

Variables	Average of attitude score (1-5)*									
	Improving my understanding of religion and health can prevent me from getting infected with HIV**	Avoiding homosexual behavior can prevent me from getting HIV/AIDS**	An MSM/LGBTQ needs to be punished to prevent new cases in the community**[1]	Homosexual behavior can be changed if someone wants to change it seriously**	Homosexual/ MSM/ LGBTQ behavior is a disorder and needs to be counseled/ medical therapy**	Changing partners in having sex is okay as long as you use a condom***	People living with HIV/AIDS should be kept away from social interactions***	MSM and LGBTQ (lesbian, gay, bisexual, transgender, and queer) are normal***	Same-sex sexual intercourse is a human right and can be protected by law even though it is prohibited by religion***[1]	Someone who is suspected of being a MSM needs to be announced to the public***
Age Group										
<30	4.13	4.20	3.28	4.29	4.17	4.33	4.03	4.61	4.30	3.86
30-39	4.09	4.35	3.09	4.36	4.36	4.51	4.49	4.56	4.51	3.96
40-49	3.89	4.20	3.22	4.70	4.35	4.37	4.02	4.89	4.67	3.57
50+	3.94	4.25	3.00	4.31	4.47	4.67	4.17	4.81	4.50	3.89
p value	0.83	0.339	0.292	0.059	0.054	**0.006**	0.106	0.064	**0.003**	0.285
Sex										
Male	3.89	3.91	3.13	4.00	3.84	4.00	3.91	4.60	4.26	3.78
Female	4.26	4.34	3.35	4.44	4.33	4.49	4.09	4.62	4.33	3.90
p value	0.11	**0.03**	0.27	**0.02**	**0.00**	**<.001**	0.24	0.51	0.82	0.62
Occupation										
Student	4.21	4.15	3.38	4.22	4.06	4.22	3.91	4.54	4.14	3.87
Professional	3.96	4.22	3.06	4.38	4.34	4.50	4.24	4.71	4.53	3.88
Unemployed	4.69	4.85	3.85	4.62	4.08	4.38	3.69	4.92	4.62	3.46
p value	0.19	0.10	0.08	0.10	0.10	**<.001**	0.06	0.08	**<.001**	0.60
Educational level										
Undergraduate or lower	4.11	4.10	3.35	4.17	4.01	4.18	3.86	4.53	4.22	3.85
Graduate	4.17	4.32	3.18	4.45	4.36	4.52	4.24	4.72	4.41	3.88
p value	0.52	0.04	0.27	0.07	0.01	**<.001**	0.01	0.09	0.12	0.64
Marital Status										
Married	4.08	4.38	3.24	4.54	4.54	4.60	4.22	4.85	4.69	3.76
Unmarried	4.17	4.12	3.31	4.18	3.99	4.19	3.93	4.50	4.11	3.91
Separated/ divorced	3.67	3.67	2.33	3.67	3.33	5.00	4.33	4.67	4.67	4.00
p value	0.96	**0.04**	0.52	**0.01**	**<.001**	**<.001**	0.22	**<.001**	**<.001**	0.79
MSM status of male participants										
MSM	2.57	2.86	1.86	3.29	3.14	3.14	4.29	3.14	3.00	4.14
Non-MSM	3.97	3.98	3.20	4.04	3.88	4.05	3.89	4.68	4.33	3.76
p-value	**0.03**	0.08	**0.03**	0.21	0.17	0.19	0.51	**<.001**	0.04	0.38

*The higher the score means more positive in attitude

**shows the positive attitude toward HIV/AIDS or MSM prevention (score 5=strongly agree, 1=strongly disagree)

***shows the negative attitude toward HIV/AIDS or MSM prevention (score 5=strongly disagree, 1=strongly agree)

Test for significance is Mann-Whitney or Kruskal-Wallis

[1] item-corrected value <0.3

Supplementary Table 3. Participants' behaviour on HIV/AIDS and same-sex sexual intercourse

Variables	Has sexual attraction to the same sex		Had sex with the same-sex		Had sex with the same-sex 5 times or more		Had sex outside of marriage		Had sex with multiple partners		Do not feeling guilty and sinful if having sex outside of marriage [1]		Had a sexually transmitted infection (genital itching/ heat/ pain/ etc.)	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Age Group														
<30	10	4.0	3	1.2	1	0.4	10	4.0	6	2.4	27	10.7	6	2.4
30-39	3	4.9	2	3.3	1	1.6	2	3.3	2	3.3	4	6.6	1	1.6
40-49	1	2.3	1	2.3	1	2.3	4	9.3	1	2.3	0	0.0	1	2.3
50+	0	0.0	1	3.4	1	3.4	3	10.3	0	0.0	2	6.9	3	10.3
p value	0.233		0.166		0.108		0.474		0.818		0.118		0.433	
Sex														
Male	9	7.0	7	5.4	4	3.1	13	10.1	9	7.0	22	17.1	4	3.1
Female	5	1.9	0	0.0	0	0.0	6	2.3	0	0.0	11	4.3	7	2.7
p value	**0.013**		**<.001**		**0.005**		**0.001**		**<.001**		**<.001**		0.834	
Occupation														
Student	7	3.1	1	0.4	0	0.0	8	3.5	4	1.7	23	10.0	6	2.6
Professional	7	4.9	6	4.2	4	2.8	10	6.9	4	2.8	10	6.9	4	2.8
Unemployed	0	0.0	0	0.0	0	0.0	1	7.7	1	7.7	0	0.0	1	7.7
p value	0.515		0.028		0.034		0.292		0.349		0.311		0.564	
Educational level														
Undergraduate or lower	11	5.0	5	2.3	2	0.9	15	6.9	5	2.3	26	11.9	8	3.7
Graduate	3	1.8	2	1.2	2	1.2	4	2.4	4	2.4	7	4.2	3	1.8
p value	0.090		0.421		0.793		**0.043**		0.955		**0.007**		0.271	
Marital Status														
Married	0	0.0	0	0.0	0	0.0	6	4.8	1	0.8	5	4.0	4	3.2
Unmarried	14	5.4	6	2.3	3	1.2	12	4.7	8	3.1	28	10.9	6	2.3
Separated/ divorced	0	0.0	1	33.3	1	33.3	1	33.3	0	0.0	0	0.0	1	33.3
p value	**0.027**		**<.001**		**<.001**		0.074		0.363		0.070		**0.006**	
MSM status of male participants														
MSM	6	85.7	7	100.0	4	57.1	4	57.1	4	57.1	1	14.3	2	28.6
Non-MSM	3	2.5	0	0.0	0	0.0	9	7.4	5	4.1	21	17.2	2	1.6
p-value	**<.001**		**<.001**		**<.001**		**<.001**		**<.001**		0.842		**<.001**	

[1] item-corrected value <0.3