ORIGINAL RESEARCH ARTICLE

HIV knowledge, attitudes, and sexual characteristics of university male students who have sex with men: A cross-sectional survey

DOI: 10.29063/ajrh2026/v30i2.14

Xi Gong[1], Duoqin Huang[2],Yan Liu[3], Jiangqing Chen[1] and Hong Wang[1]*

The School of Humanities &Social Sciences, Gannan Medical University, Ganzhou, 341000, Jiangxi, China[1]; The First Clinical Medical College, Gannan Medical University, Ganzhou 341000, Jiangxi, China[2]; Ganzhou Wenqing Experimental School, Ganzhou 341000, Jiangxi, China[3]

***For Correspondence**: Email: *gongxihp@163.com*

Abstract

To explore the knowledge, attitudes, and sexual behaviors regarding HIV among university men who have sex with men (MSM) , we conducted a questionnaire survey with 462 students from 15 universities in 11city of Jiangxi Province. The HIV awareness rate was 69.1%..The reported rate of engaging in sexting was 65.2%. The overall attitude towards sex was relatively open, with 85.9% having engaged in high-risk sexual behaviors. Regression results indicated that factors influencing high-risk sexual behaviors included academic major, awareness of HIV knowledge, attitudes towards multiple sexual partners, attitudes towards premarital sex, and attitudes towards homosexual marriage. Although MSM university students have some knowledge of HIV, their attitudes and high-risk behaviors are a matter of concern. Targeted sexual health education and interventions are needed to reduce high-risk behaviors and HIV infection risks. *(Afr J Reprod Health 2026; 30 [2]: 166-178).*

Keywords: Men who have sex with men; High-risk sexual behavior; HIV; Sexual attitudes; Sexual health education

Résumé

Pour explorer les connaissances, attitudes et comportements sexuels relatifs au VIH parmi les hommes ayant des rapports sexuels avec des hommes (HSH) en milieu universitaire, une enquête par questionnaire a été menée auprès de 462 étudiants issus de 15 universités réparties dans 11 villes de la province du Jiangxi. Le taux de connaissance sur le VIH s'élevait à 69,1 %. Le taux déclaré de participation à des échanges de messages sexuels (sexting) était de 65,2 %. Une attitude globalement ouverte envers la sexualité a été observée, avec 85,9 % des participants ayant déjà adopté des comportements sexuels à haut risque. Les résultats de la régression ont indiqué que les facteurs influençant les comportements sexuels à haut risque incluaient la filière d'études, la connaissance du VIH, l'attitude envers les partenaires sexuels multiples, l'attitude envers les rapports sexuels avant le mariage et l'attitude envers le mariage homosexuel. Bien que les étudiants universitaires HSH disposent de certaines connaissances sur le VIH, leurs attitudes et comportements à haut risque restent préoccupants. Des interventions et une éducation ciblées en santé sexuelle sont nécessaires pour réduire les comportements à risque et les infections par le VIH. *(Afr J Reprod Health 2026; 30 [2]: 166-178).*

Mots-clés: Hommes ayant des rapports sexuels avec des hommes ; Comportements sexuels à haut risque ; VIH ; Attitudes sexuelles; Éducation à la santé sexuelle

Introduction

In recent years, the HIV epidemic in China has demonstrated evolving dynamics, with a particularly notable surge in infection rates among men who have sex with men (MSM).[1] Surveillance data from the Chinese Center for Disease Control and Prevention reveals that the MSM population has emerged as one of the primary contributors to new HIV infections nationwide.[2] Within this context, the university-attending MSM subpopulation has become a critical focus for HIV prevention efforts due to the distinctive characteristics of their sexual practices and social networks.[3] However, persistent social stigma and discrimination present substantial challenges for this demographic, manifesting as limited access to essential information and services, heightened psychological distress, and pronounced concerns about privacy protection.[4] A systematic investigation into the current status of HIV-related knowledge, attitudes, and sexual behaviors among

collegiate MSM populations is therefore imperative for developing targeted prevention strategies.[5]

Sexting behaviors have emerged alongside widespread internet use. University students are frequently exposed to online "soft pornography," which may lead to desensitization to such content and increased interest in quasi-pornographic or explicit sexual experiences. Sexting thus serves as a modern digital sexual behavior that often correlates with and may facilitate offline high-risk sexual encounters.

While existing research has begun addressing HIV prevention in broader MSM populations, significant gaps persist in understanding this specific student subgroup. Current literature predominantly concentrates on general MSM populations while insufficiently addressing the complex interplay between cultural norms, psychosocial factors, and individual behavioral patterns - which are critical determinants in translating HIV prevention knowledge into protective practices.[6] This study employs a data-driven approach to conduct a comprehensive analysis of HIV/AIDS-related knowledge, risk perceptions, and sexual behavioral characteristics among university-based MSM. The findings will elucidate critical gaps in health literacy, risk awareness development, and consistent condom use within this population. These insights will inform the development of precision health education frameworks, evidence-based policy recommendations, and culturally competent interventions aimed at reducing HIV transmission risks, promoting sexual health outcomes, and enhancing overall psychosocial well-being among young adults.

Methods

Study design and methods

This cross-sectional study was conducted between November and December 2023. The inclusion criteria for participants were: (1) male gender; (2) engagement in homosexual behaviors (including oral or anal sex) within the past year by self-report; (3) current enrollment as a full-time undergraduate student; and (4) provision of informed consent to voluntarily participate. All participants were informed of the anonymous nature of the survey and agreed to cooperate. The survey employed convenience sampling, selecting undergraduate students from these 15 universities between November and December 2023. Each university randomly selected one first-year, one second-year, and one third-year class for investigation, without considering differences in academic majors. All students from the selected classes were included in the survey. Each institution's minimum target was 1,000 students, and additional students were randomly selected from the entire student body if the initial class count was insufficient. Ultimately, 15,000 young students were surveyed. Considering the distribution of educational resources and university layouts in Jiangxi Province, we implemented the following strategies: First, we geographically divided universities into groups and adopted direct sampling to select participants. After obtaining informed consent, researchers required anonymous questionnaire completion. Following the removal of blank and incomplete responses, 13,976 valid questionnaires were obtained. From these valid questionnaires, 462 valid questionnaires were selected.

Participant recruitment and questionnaire

A combination of online advertisements and snowball sampling was used to recruit participants from 15 universities in Jiangxi Province. The questionnaire comprised two sections: a screening questionnaire and a formal questionnaire. Eligible respondents who met the inclusion criteria (assessed via screening questions on gender and homosexual behavior history) proceeded to complete the formal questionnaire. The formal survey included domains such as HIV/AIDS-related knowledge, attitudes toward HIV/AIDS, sexual attitudes, sexual behaviors, and demographic characteristics.

Demographic Questionnaire: Items were developed through extensive literature reviews and group discussions among research team members. Variables included gender, academic year, major, hometown, sexual orientation, parental education level, romantic relationship history, singleton status, and lifestyle habits.

HIV/AIDS Knowledge Assessment: An 8-item scale adapted from the China AIDS Prevention Supervision and Evaluation Framework (Trial) (State Council AIDS Working Committee Office, 2007) was used to evaluate awareness of HIV/AIDS fundamentals. Questions 1–3 required to be answered negatively, while Questions 4–8 required to be answered affirmatively. Correct answers to ≥6 items indicated adequate HIV/AIDS knowledge.

Sexual and HIV/AIDS-Related Attitudes:Sexual attitudes were assessed using items addressing behavioral attitudes (e.g., "Do you mind multiple sexual partners?" or "Do you mind premarital sex?") and orientation-related attitudes (e.g., "Is homosexuality a disease?" "Should homosexual individuals marry heterosexual partners?" "Do you understand homosexuality?"). HIV/AIDS-related attitudes were evaluated using 7 items adapted from Sun et al.,[7] including: "Would you mind having HIV-positive individuals in your social circle?" "Would you study with an HIV-positive peer?" "Would you maintain a friendship with an HIV-positive person?" "Should HIV-positive students be isolated?" "Would you oppose discrimination against HIV-positive individuals?"

Sexual Behaviors: High-risk behaviors were classified into four categories based on criteria from Wang et al.[8]: unprotected intercourse ("In the past year, did you consistently use condoms during sex?"), multiple sexual partners ("How many distinct sexual partners have you had in the past year?"), commercial sex ("Have you ever exchanged sex for material benefits?"), and "One-night stand" behavior ("Have you engaged in one-night stands?"). Engagement in ≥1 category defined high-risk behaviors. Sexting behaviors were assessed using three items from Madigan et al.(In this study, Sexting behaviors are operationally defined as: The exchange of sexually explicit or sexually suggestive messages, images, or videos via electronic communication devices, as part of interactive sexual communication. This includes engaging in erotic text-based role-playing that simulates or leads to sexual arousal.)[9]: "Have you exchanged text-based sexual content (descriptions of acts/feelings) online?" "Have you exchanged visual sexual content (images/videos) online?" "Have you engaged in live video-based sexual interactions?" Affirmative responses to ≥1 item were considered to indicate sexting behavior.

Quality control

During the investigation, after the respondents provided informed consent, they completed the questionnaire independently and anonymously. In the online recruitment method, each mobile phone IP was allowed to complete the questionnaire only once, which was set in the background. In the data analysis, statistical software was used to clean the data and remove the invalid questionnaires, so as to ensure the authenticity and objectivity of the survey data.

Statistical method

The data were collated and analyzed using Excel and SPSS26.0 software. The frequency and rate of the measurement data are expressed by [n (%)]. Descriptive statistics were used to report the status of sexual attitudes and HIV attitudes. Chi-square test was used to analyze the occurrence of AIDS knowledge and HIV-related behaviors; binary Logistic was used to analyze the influencing factors; $P < 0.05$ was significant, $\alpha = 0.05$.

Ethical issues

Ethical approval for this study was obtained from the Biomedical Research Ethics Committee of Gannan Medical University (Approval No. 2022361). Researchers thoroughly explained the study objectives to all invited participants, explicitly stating that all data would be strictly confidential and exclusively used for academic research purposes. Participants were assured they could withdraw from the study at any time without affecting their daily lives. After obtaining informed consent, all subjects were enrolled in the research. The entire study process was conducted in strict compliance with ethical standards.

Results

Basic demographic information

This study investigated 462 MSM. The cohort comprised 158 participants (34.2%) from urban areas and 304 (65.8%) from rural regions.

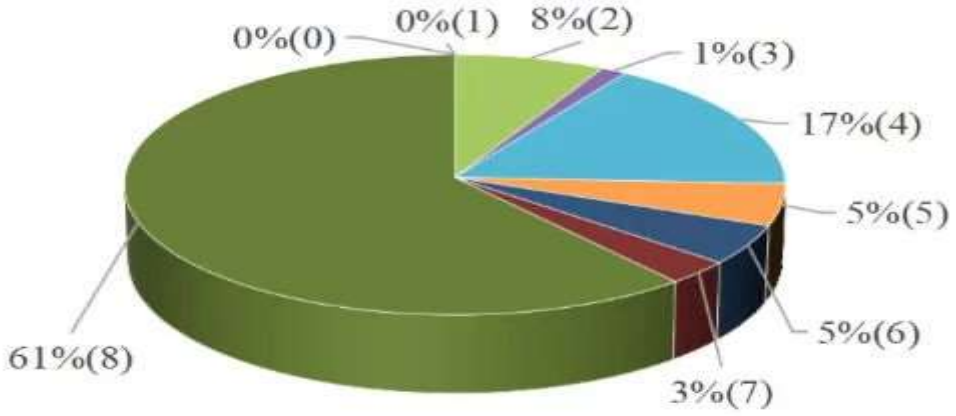

Figure 1: Distribution of HIV knowledge among MSM students (total number of correct questions)

Table1: HIV knowledge and sexual behavior of MSM students

Subject/Questionnaire	Item	Number	Report/Awareness rate(%)
HIV/AIDS Knowledge Assessment	Can a person infected with HIV see it from the outside?	360	77.9
	Can mosquito bites spread AIDS?	312	67.5
	Will eating with HIV infected or patients infected with AIDS?	366	79.2
	Can the blood with HIV get AIDS?	380	82.3
	Is it possible to get AIDS with HIV infected person?	382	82.7
	Is it possible for a woman infected with HIV to get AIDS?	407	88.1
	Can proper condom use reduce the spread of AIDS?	399	86.4
	Can having sex with only one sexual partner reduce the transmission of AIDS?	404	87.5
	Total	319	69.1
High-risk behaviors	In the past year, did you consistently use condoms during sex?	282	61.0
	How many distinct sexual partners have you had in the past year?	182	39.4
	Have you ever exchanged sex for material benefits?	78	16.9
	Have you engaged in one-night stands?	224	48.5
	Total	397	85.9
Sexting	Have you exchanged text-based sexual content (descriptions of acts/feelings) online	273	59.1
	Have you exchanged visual sexual content (images/videos) online?	242	52.4
	Have you engaged in live video-based sexual interactions?	247	53.5
	Total	301	65.2

Academic year distribution showed 92 freshmen (19.9%), 104 sophomores (22.5%), and 266 juniors (57.6%). Non-only children constituted the majority (294, 63.6%). Disciplinary distribution included 45 science majors (9.7%), 157 literature majors (34.0%), 106 medical students (22.9%), and 154 arts/sports majors (33.3%). Sexual orientation identification revealed 7 heterosexual (1.5%), 315

homosexual (68.2%), and 140 bisexual individuals (30.3%). Family education styles were categorized as democratic (88, 19.1%), despotic (172, 37.2%), neglectful (131, 28.4%), and drowning (71, 15.4%).

The awareness rate of HIV knowledge

The awareness rate of knowledge related to HIV was 69.1% (319 / 462).282 people answered correctly, accounting for 61.0% (Figure 1)."Can a person infected with HIV see it from the outside?"And" Can mosquito bites spread AIDS?"The two questions had the lowest accuracy rate, with77.9% and67.5%, respectively, as shown in Table 1. Among the 462 reports collected, 319 people were aware of AIDS-related knowledge, accounting for 69.1%. The results showed that the awareness rates of different grades, origin, major, unique sex, sexual orientation and family education style had statistical differences (P <0.05), as shown in Table 2.

Sexual attitude and HIV attitude situation

Among the 462 MSM participants, 59.3% expressed no objection to multiple sexual partners while 97.0%held accepting or no-mind views toward premarital sexual relationships. Divergent perceptions regarding homosexuality emerged:7.2% pathologized same-sex attraction as a disorder, with 2.4% reporting incomprehension. Notably, 24.9%endorsed heterosexual marriage as a viable option for homosexual individuals. While most participants demonstrated tolerant attitudes toward HIV-positive individuals, reservations emerged in intimate relationship contexts: 14.1% expressed discomfort with HIV-positive social media contacts, 18.4% with infected friends, and34.0% with seropositive roommates, Table 3.

Table2: Comparative analysis of HIV knowledge of MSM students under different characteristics

Item		Total Number	Known Number	Proportion (%)	X^2	*P* value
Grade	Freshman	92	81	88.0	23.299	<0.001
	Sophomore	104	59	56.7		
	Junior	266	179	67.3		
Origin of student	City	158	130	82.3	18.738[a]	<0.001
	Rural	304	189	62.2		
The only child	Yes	168	53	31.6	170.963[a]	<0.001
	No	294	266	90.5		
Major	Science	45	34	75.6	83.261	<0.001
	Literature	147	107	72.8		
	Medical	126	117	92.9		
	Eurhythmics	144	61	42.4		
Sexual orientation	Heterosexuality	7	2	28.6	73.197	<0.001
	Homosexuality	315	182	57.8		
	Bisexuality	140	135	96.4		
Family education	Democratic	95	93	97.9	51.297	<0.001
	Despotic	172	101	58.7		
	Neglect	126	75	59.5		
	Drowning	69	50	72.5		

Note: [a]: Calculate continuity correction square for 2x2 table

Occurrence of high-risk sexual behavior

Of the 462 MSM participants surveyed, 397 had experienced different types of high-risk sexual behaviors, with a reporting rate of85.9%. Unsex had the highest reporting rate of 61.0%, followed by booty or one-night stands with 224, and relatively less commercial with an incidence of 16.9% (78 / 398). See Table 1 for details.

Among the 398 MSM college students who had high-risk sexual behavior, 70.1% majored in literature and art, 34.7%(138 / 398) and 35.4% (141 / 398), respectively. Grade for the third year, sexual orientation for the gay accounted is relatively large.

Table 3: Sexual attitude and attitude towards HIV among MSM college students

Subject	Question	Item	Number	Proportion
Sexual behavior attitude	Do you mind multiple sexual partners?	Mind	188	40.7%
		Not	239	51.7%
		Doesn't matter	35	7.6%
	Do you mind having premarital sex?	Mind	14	3.0%
		Not	433	93.7%
		Doesn't matter	15	3.3%
Sexual orientation attitude	Do you think that homosexuality is a disease?	Yes	33	7.1%
		No	429	92.9%
	Can homosexuals marry the opposite sex?	Yes	115	24.9%
		No	290	62.8%
		Doesn't matter	57	12.3%
	Do you understand anything about homosexuality?	Understand	444	96.1%
		Not	11	2.4%
		Doesn't matter	7	1.5%
	Are any of your friends gay?	Yes	453	98.1%
		No	2	0.4%
		Don't know	7	1.5%
	Do you follow the relevant information about homosexuality?	Yes	454	98.3%
		No	1	0.2%
		Don't know	7	1.5%
HIV attitude	Would you mind having HIV-positive individuals in your social circle?	Mind	65	14.1%
		Not	240	52.0%
		Doesn't matter	157	34.0%
	Would you study with an HIV-positive peer?	Mind	56	12.1%
		Not	285	61.7%
		Doesn't matter	121	26.2%
	Would you maintain a friendship with an HIV-positive person?	Mind	85	18.4%
		Not	334	72.3%
		Doesn't matter	43	9.3%
	Would you live with an HIV-positive roommate?	Mind	157	34.0%
		Not	173	37.5%
		Doesn't matter	132	28.6%
	Should HIV-positive students be isolated?	Yes	83	18.0%
		No	253	54.8%
		Don't know	126	27.3%
	If your friend is infected with AIDS, will you continue to make friends with him or her as before	Yes	345	74.7%
		No	76	16.5%
		Don't know	41	8.9%
	Would you oppose discrimination against HIV-positive individuals?	Yes	293	63.4%
		No	34	7.4%
		Don't know	135	29.2%

Occurrence of high-risk sexual behavior

Table 4: Comparative analysis of reporting rate of high-risk sexual behavior in MSM students under different sociodemographic characteristics

Item		Number	Number of high-risk sexual behavior	Proportion (%)	X^2	*P* value
Grade	Freshman	92	70	76.1	17.268	<0.001
	Sophomore	104	84	80.8		
	Junior	266	244	91.7		
Origin of student	City	158	150	94.9	14.445[a]	<0.001
	Rural	304	248	81.6		
The only child	Yes	168	156	92.9	9.096[a]	0.003
	No	294	242	82.3		
Major	Science	45	31	68.9	63.380	<0.001
	Literature	147	138	93.9		
	Medical	126	88	69.8		
	Eurhythmics	144	141	97.9		
Sexual orientation	Heterosexuality	7	6	85.7	15.114	<0.001
	Homosexuality	315	284	90.2		
	Bisexuality	140	107	76.4		
Family education	Democratic	95	63	66.3	43.091	<0.001
	Despotic	172	158	91.9		
	Neglect	126	110	87.3		
	Drowning	69	67	97.1		

Note: [a]: Calculate continuity correction square for 2x2 table

The differences in the incidence of high-risk sexual behaviors between grades, origin, major, sexual orientation, family upbringing, and independence were statistically significant (P <0.05), as shown in Table 4.

People who did not read pornographic novels, videos or videos, casual behavior, and knowledge of HIV were at lower risk of sexual risk and had statistically significant differences. The difference in high-risk sexual behavior in drinking and smoking frequency was statistically significant (P <0.05). In terms of sexual attitude, the incidence of high-risk sexual differences in multiple dimensions (P <0.05), including: whether to accept multiple sexual partners, attitude to premarital sex, gay people marry the opposite sex, and whether will actively attention and understand other gay information and friends have gay, see Table 5.

Binary logistic regression analysis of factors associated with high-risk sexual behavior in undergraduate MSM

With the presence of high-risk sexual behavior (yes =1, no =0) as the dependent variable, the statistically significant factors in the univariate analysis were included in the binary Logistic regression analysis as the independent variable (entry criterion =0.05, exclusion criterion =0.10). The results showed that the risk factors affecting the occurrence of high-risk sexual behavior among college students included professionalism, HIV awareness, mind multiple sexual partners, pre-marital sexual behavior, and willingness to marry homosexuality and the opposite sex. Among them, compared with science and technology students, literature and history and art and physical education

Table 5: Comparative analysis of reporting rate of risky behavior in MSM students under different risk behaviors and consciousness characteristics

Item		Number	Number of high-risk sexual behavior	Proportion (%)	X^2	*P* value
Have you browsed pornographic novels, videos or movies on the Internet	Yes	338	334	98.8	169.010[a]	<0.001
	No	124	63	50.8		
Drink	Never	125	95	76.0	28.505	<0.001
	Seldom	190	178	93.7		
	Sometimes	90	73	81.1		
	Often	45	43	95.6		
	Always	12	8	66.7		
Smoke	Never	298	250	83.9	15.479	<0.001
	Seldom	49	46	93.9		
	Sometimes	35	25	71.4		
	Often	57	55	96.5		
	Always	23	21	91.3		
HIV knowledge known	Yes	319	257	80.6	23.137[a]	<0.001
	No	143	140	97.9		
Sexting	Yes	301	267	88.7		
	No	161	130	80.8	4.857[a]	0.028
Do you mind multiple sexual partners?	Mind	188	136	72.3	48.458	<0.001
	Not	239	228	95.4		
	Doesn't matter	35	33	94.3		
Do you mind having premarital sex?	Mind	14	2	14.3	61.327	<0.001
	Not	433	382	88.2		
	Doesn't matter	15	13	86.7		
Do you think that homosexuality is a disease?	Yes	33	30	90.9	0.353[a]	0.553
	No	429	367	85.6		
Can homosexuals marry the opposite sex?	Yes	115	93	80.9	9.628	0.008
	No	290	248	85.5		
	Doesn't matter	57	56	98.3		
Do you understand anything about homosexuality?	Understand	444	383	86.3	5.709	0.058
	Not	11	7	63.6		
	Doesn't matter	7	7	100.0		
Are any of your friends gay?	Yes	453	390	86.1	13.371	0.001
	No	2	0	0.0		
	Don't know	7	7	100.0		

Do you follow the relevant information about homosexuality?	Yes	454	390	85.9	7.254	0.027
	No	1	0	0.0		
	Don't know	7	7	100.0		

Note: [a]: Calculate continuity correction square for 2x2 table

Table 6 : Binary Logistic regression analysis of factors associated with high-risk sex in MSM students

	Item	β value	Standard error	WaldX^2	*P* value	*OR value (95%CI)*
HIV knowledge known	Yes					1.000
	No	-1.431	0.592	5.850	0.016	0.239(0.075~0.762)
Do you mind multiple sexual partners?	Mind					1.000
	Not	2.419	0.510	22.500	<0.001	11.240(4.136~30.544)
	Doesn't matter	2.231	0.914	5.959	0.015	9.311(1.552~55.850)
Do you mind having premarital sex?	Mind					1.000
	Not	1.933	0.695	7.726	0.005	6.911(1.768~27.009)
	Doesn't matter	1.500	1.409	1.133	0.287	4.483(0.283~70.990)
Major	Science					1.000
	Literature	1.649	0.601	7.529	0.006	5.199(1.602~16.879)
	Medical	0.300	0.520	0.333	0.564	1.350(0.487~3.742)
	Eurhythmics	1.492	0.759	3.869	0.049	4.447(1.005~19.669)
Can homosexuals marry the opposite sex?	Yes					1.000
	No	-1.814	0.449	16.316	<0.001	0.163(0.068~0.393)
	Doesn't matter	1.633	1.241	1.732	0.188	5.121(0.450~58.323)

students have a greater risk of high-risk sexual behavior, 5.199 and 4.447 times, respectively. HIV-related people had 0.239 times the risk of having sex than unknown people. Higher risk of having premarital sex and multiple sexual partners. There is a lower risk of not having sex with the opposite sex. See Table 6 for details.

Discussion

The survey results indicate that the awareness rate of HIV/AIDS knowledge among the MSM population of college students is 69.1%, which is lower than the findings reported by Zhong Shiyu *et al*.[10] The incidence of high-risk sexual behavior is85.9%, slightly higher than the data reported by Wang Yaqi et al.[11]The reporting rate of romantic love behavior is 65.2%. Although the awareness rates are relatively high for the questions "Can correct use of condoms reduce the transmission of HIV/AIDS?" and "Can having sex with only one partner reduce the transmission of HIV/AIDS?" (86.4% and87.5%, respectively), the reporting rates of unprotected sex, multiple sexual partners, and hookup or one-night stand behaviors in actual sexual practices are 61.0%, 39.4%, and 48.5%, respectively. This phenomenon may be attributed to several factors. Firstly, college students are in a

unique stage of psychological and physiological development.[12] They are curious about new experiences, socially active, and have relatively open attitudes toward sex, making them more inclined to seek thrilling and adventurous experiences, including sexual activities.[13] Male college students, in particular, exhibit stronger sexual desires compared to their female counterparts.[14] Secondly, sexual behaviors within the MSM community are often perceived as non-traditional, and they tend to pursue more stimulating and pleasurable experiences, which may increase the risk of unsafe sexual practices. Secondly, sexual behaviors within the MSM community are often perceived as non-traditional, and they tend to pursue more stimulating and pleasurable experiences, which may increase the risk of unsafe sexual practices.[15] Even when the MSM population is well aware of the risks associated with sexual behaviors, they may still prioritize the pursuit of thrilling experiences.[16] Thirdly, there is a certain stigma associated with condom use within the MSM community. Individuals who propose using condoms may be mistakenly perceived as being HIV-positive or having a history of unsafe sexual behaviors. Additionally, if they perceive their sexual partners as low-risk, they may deem condom use unnecessary, making it difficult for the MSM population to proactively suggest condom use.[17] These findings suggest that HIV/AIDS knowledge dissemination alone is not sufficient to reduce the occurrence of high-risk sexual behaviors among the MSM population. Therefore, future sexual education efforts should place greater emphasis on cultivating correct sexual attitudes among adolescents to promote the formation of healthy and safe sexual behavior habits.

Based on the analysis of sexual orientation and attitudes toward HIV/AIDS, we observed that even within the MSM community, there is internalized homophobia, which may stem from the denial of one's own sexual orientation and the internalization of mainstream societal values.[18] Furthermore, since the behavioral characteristics of the MSM population are widely regarded as high-risk factors for HIV transmission,[19] they are more likely to come into contact with HIV/AIDS patients, leading to a deeper understanding and awareness of the disease. Due to shared experiences and knowledge, the MSM community exhibits greater sympathy and tolerance toward HIV/AIDS patients. However, this sympathetic and tolerant attitude does not directly translate into the adoption of adequate protective measures in their actual sexual behaviors. Therefore, public health education must continue to emphasize the importance of safe sexual practices, striving to enhance HIV/AIDS prevention awareness among the MSM population and promoting a shift toward healthier and safer sexual behavior patterns.

The regression analysis revealed several key factors influencing high-risk sexual behaviors among male students who have sex with men, including academic background, awareness of HIV/AIDS knowledge, attitudes toward multiple sexual partners and premarital sex, and views on same-sex individuals marrying heterosexual partners. The study found that students in humanities, arts, and physical education (HAPE) majors exhibited a higher risk of engaging in high-risk sexual behaviors compared to those in science, technology, engineering, and mathematics (STEM) fields. This disparity may be attributed to differences in curriculum content, social environments, and peer influences. HAPE disciplines often emphasize personal expression and creative thinking, fostering broader social interactions and diverse lifestyles, which may encourage a pursuit of personal freedom and self-actualization, leading to greater openness and exploration in sexual behaviors. Additionally, due to the nature of their disciplines, HAPE students may engage more frequently in social interactions and be exposed to diverse cultural perspectives, including Western sexual norms, which could increase their acceptance of high-risk sexual behaviors within their social circles[8]Although the MSM population demonstrates a relatively high awareness of HIV/AIDS knowledge, the study highlights a significant correlation between this awareness and a reduced risk of high-risk sexual behaviors, underscoring the necessity of comprehensive sexual education. Educational campaigns and public health initiatives play a crucial role in preventing HIV transmission among MSM populations. Educators and health departments should prioritize the prevention of

high-risk sexual behaviors among college students and strengthen sexual health education for MSM groups. Over half of the MSM participants held open attitudes toward multiple sexual partners and premarital sex, with these attitudes positively correlated with the incidence of high-risk sexual behaviors. This phenomenon may be explained by three factors: First, the liberal sexual attitudes within the MSM community may reflect a broader trend toward sexual freedom among younger generations, coupled with potential insufficient awareness of the consequences of sexual behaviors.[21] As societal norms around sexual morality become more permissive, sexual diversity and individual freedom in sexual choices have become increasingly prevalent among college students. Second, MSM individuals may face societal pressures and discrimination related to their sexual orientation,[22] which could drive them to seek greater exploration and freedom in their sexual behaviors as a means of self-identification and belonging.[23] This psychological need may reduce their vigilance toward potential risks.[24] Furthermore, previous research has shown that notions of sexual autonomy and liberation are more prevalent among MSM populations, potentially contributing to the formation and normalization of specific behavioral patterns, such as frequent social interactions, experimentation with diverse sexual practices, and partner switching.[25] The tolerance of these behaviors within the MSM community may normalize and even encourage their practice. Therefore, college sexual education should extend beyond basic sexual health knowledge to include the cultivation of healthy sexual attitudes as part of a broader strategy to promote safer sexual behaviors. Educators and public health professionals should adopt a more comprehensive and in-depth approach to sexual education, addressing not only knowledge dissemination but also attitude and behavioral changes to foster healthier, safer, and more responsible sexual practices.[26]

This study also identified an association between the acceptance of same-sex individuals marrying heterosexual partners and an increased risk of high-risk sexual behaviors. This link may be driven by several factors: First, individuals who accept the idea of same-sex individuals marrying heterosexual partners often exhibit more open attitudes toward sexual orientation and behaviors, which may increase their likelihood of engaging in high-risk sexual activities.[27] Second, traditional norms and moral disengagement: In the sociocultural context of China, marrying a heterosexual partner is viewed as a significant milestone in adult life and a societal expectation.[28] Under this cultural influence, some MSM individuals may perceive same-sex individuals marrying heterosexual partners as a way to conform to societal norms and fulfill family expectations. This adaptation may lead to a unique cognitive and evaluative framework regarding sexual behavior risks.[29] They may believe that as long as they ultimately marry a heterosexual partner, their sexual behaviors will not be questioned or deemed immoral, potentially increasing the likelihood of engaging in high-risk behaviors. Third, compensation and exploration of sexual orientation: This perception may prompt MSM individuals to seek same-sex relationships more frequently as a form of compensation or exploration of their sexual orientation, often accompanied by high-risk behaviors such as having multiple sexual partners.[30] Thus, the acceptance of same-sex individuals marrying heterosexual partners may be linked to open sexual attitudes and reduced risk perception, highlighting the need for attention to this issue in sexual education and public health interventions.

In conclusion, our findings provide compelling evidence that addressing high-risk sexual behaviors among MSM college students requires a holistic approach that considers individual, community, and societal factors. Future efforts should shift focus from "teaching them what to do" to "empowering them with the skills to make informed choices," while fostering supportive environments to drive sustainable behavioral changes.

Limitations

There are some limitations, and this study used a cross-sectional survey design, which was unable to establish a causal relationship between various factors and high-risk sexual behaviors. In addition, snowball sampling was used to explore the HIV knowledge, attitude and sexual characteristics of

college students. Although this method can effectively reach marginalized groups, sample selection may have a risk of bias given the high homogeneity of the MSM population.31 Therefore, future studies should expand the sample size and conduct a more thorough analysis of the impact mechanisms

Conclusion

The high incidence of high-risk sexual behaviors among MSM college students in Jiangxi Province indicates that universities urgently need to strengthen sexual health education and improve the effectiveness of behavioral interventions. Prevention work should not be limited to the popularization of HIV knowledge, but should also include targeted cultivation of correct sexual values and sexual guidance. The implementation of prevention-oriented comprehensive intervention strategies to carry out targeted sexual health education for key subgroups and enhance their risk awareness is of great significance for reducing high-risk sexual behavior and reducing the risk of AIDSinfection

Data availability

Due to sensitivity of the subject matter, the dataset for this project is not publicity available. Access to the data can be arranged on request to the corresponding author, subject to appropriate ethics committee approval.

Funding

Jiangqing Chen reports financial support was provided by Jiangxi Students' Platform for innovation and entrepreneurship training program (S202410413030).

Authors contributions

Xi Gong and Duoqin Huang conceived and designed the study and performed data analyses. Duoqin Huang, Jiangqing Chen, Hong Wang, Yan Liu and Xi Gong performed the literature review and wrote the first draft of the manuscript. All authors provided data interpretation, revised the manuscriptfor intellectual content, and approved the final version of the manuscript. The corresponding author had full accessto all the data in the study and had final responsibility for the decision to submit for publication

References

1. Yan X, Ni Y, Lu Y, Wang Q, Tang W, Tan R K J, Tucker J D, Hall B J, Baral S, Song H, Zhou Y and Wu D, Homoprejudiced Violence Experiences and High-Risk Sexual Behaviors among Chinese Men Who Have Sex with Men: Depression Severity and Recreational Drug Usage as Potential Mediators, Arch Sex Behav, 2024, 53(4):1265-1276.
2.He J J, Ju H and Wu C, Incidence of new HIV infection and its influencing factors among men who have sex with men in China: a meta-analysis. Preventive Medicine, 2022, 34(1): 70-77.
3. Fan S, Li P, Hu Y, Gong H, Yu M, Ding Y, Luo Z, Wu G, Ouyang L and Zou H, Geosocial Networking Smartphone App Use and High-Risk Sexual Behaviors Among Men Who Have Sex With Men Attending University in China: Cross-sectional Study. JMIR public health and surveillance, 2022(No.3):e31033.
4. Xie L, Mo P, Wang Z, Tian X and Lau J, Men who have sex with men were more depressed than their counterparts because of lower social support and higher loneliness: A comparative survey among Chinese university students. J Affect Disord,, 2024, 353:11-18.
5. Mwaniki S W, Kaberia P M, Mugo P M and Palanee-Phillips T, HIV prevalence and associated risk factors among young tertiary student men who have sex with men (MSM) in Nairobi, Kenya: a respondent-driven sampling survey AIDS Res Ther. 2023;20(1):7.
6. Liu Y, Xian Y, Liu X, Cheng Z, Wei S, Wang J, Chen J, Li C, Ma J, Yang J, Liu F, Yu M, Chen Z and Cui Z, Significant insights from a National survey in China: PrEP awareness, willingness, uptake, and adherence among YMSM students, BMC Public Health, 2024, 24(1):1009.
7. Sun J, Li FJ, Yang BS, He J and Wang X, Sexual behaviors and AIDS－related attitude among college students, Henan. Modern Preventive Medicine, 2017,44(15):2788-2791.
8. Wang Y, Wang HJ, Peng C, Cheng JH, Rong FJ and Yu YZ, Association between sexual orientation and high-risk sexual behaviors among college students in Hubei Province.Chin J Sch Health, 2023,44(06):840-844.
9. Madigan S, Ly A, Rash C L, Van Ouytsel J and Temple J R, Prevalence of Multiple Forms of Sexting Behavior Among Youth: A Systematic Review and Meta-analysis, JAMA Pediatrics, 2018, 172(4):327-335.
10. Zhong SY, Tang JY, Ye ST, Zhang GJ, Liang HY, Jia ML and Zhang LY, Analysis of HIV/AIDS Related Health Risk Factors Among MSM College Students in Chengdu. J Prev Med Inf, 2021(12):1680-1685.
11.Wang YQ, Liu YF and Ge L, AIDS knowledge and sexual behavior among 493 male male college students in Lanzhou. Pract Prev Med, 2023(5):604-607.

12. Huang YY, Ma YH, Hu YF, Peng HS, Wang XY, Zhou J and Li TJ, Characteristics of the age at first intercourse and associated risk factors among college students in 15 provinces of China. Capital Journal of Public Health, 2017,11(03):99-102.
13. Guo PP, Jiang MM, Yu HY and Ye J, Impact of Fear of Missing Out on High-Risk Sexual Behaviors among College Students in Shanghai. Chin J Derm Venereol 2020; 34: 1044-1049.
14. Grubbs J B, Kraus, S W and Perry S L, Self-reported addiction to pornography in a nationally representative sample: The roles of use habits, religiousness, and moral incongruence. J Behav Addict, 2019, 8(1):88-93.
15.Yang YJ, Wang YX, Liu H, Dai J, Ma T,Chang LT and Li PL, The epidemic status for the non-marital and multiple sexual partners' sex behavior among Yunnan university students. Chin J Sch Health, 2016,37(10):1464-1466.
16. Chen W, Ma Q, Pan X, Chen L, Wang H, Zhou X, Jiang T and Chen W, Characteristics of men who have casual sex with men among Chinese university students: A cross-sectional study. PLoS One, 2024, 19(4):e301817.
17. Shen Y, Zhang C, Mohammadi L and Li X, Condom stigma among men who have sex with men population: Concept synthesis. Zhong Nan Da Xue Xue Bao Yi Xue Ban, 2022, 47(6):771-779.
18. Huang MF, Chang YP, Chou WJ and Yen CF, A 4-year prospective investigation of predictive effects of prepandemic sexual stigma, affective symptoms, and family support on fear of COVID-19 among lesbian, gay, and bisexual individuals.Frontiers in Public Health, 2023, 11:1297042.
19. Zhou J, Yang L, Ma J, Jiang S, Liu Y and Sun Z, Factors Associated With HIV Testing Among MSM in Guilin, China: Results From a Cross-Sectional Study. Int J Public Health, 2022, 67:1604612.
20.Zhao JS,He JM,ChenX,Zhen J,Tan BY and Chen J, Current status of HIV/AIDS ─ related high ─ risk behavior among college students in Changsha City. Pract Prev Med, 2018,25(06):673-676.
21. Lyu Z and Chai X, Media Influence on Intergenerational Attitudes toward Non-Conventional Sexual Behaviors in Contemporary China: Evidence from Chinese General Social Survey. Int J Sex Health, 2024, 36(1):77-99.
22. Wen L, Yang K, Chen J, He L, Xiu M and Qu M, Associations between resilience and symptoms of depression and anxiety among adolescents: Examining the moderating effects of family environment. J Affect Disord, 2023, 340:703-710.
23. Nicholson A A, Siegel M, Wolf J, Narikuzhy S, Roth S L, Hatchard T, Lanius R A, Schneider M, Lloyd C S, McKinnon M C, Heber A, Smith P, and Lueger-Schuster B ,A systematic review of the neural correlates of sexual minority stress: towards an intersectional minority mosaic framework with implications for a future research agenda. European Journal of Psychotraumatology, 2022, 13(1):2002572.
24. Hawkins S S, Expansion of Comprehensive Sexuality Education. J Obstet Gynecol Neonatal Nurs, 2024, 53(1):14-25.
25. Mo P K H, Xin M, Wang Z, Lau J T F, Ye X, Hui K H, Yu F Y and Lee H H, Patterns of sex behaviors and factors associated with condomless anal intercourse during the COVID-19 pandemic among men who have sex with men in Hong Kong: A cross-sectional study. PLoS One, 2024, 19(4):e300988.
26. Mbarushimana V, Goldstein S and Conco D N, "Not just the consequences, but also the pleasurable sex": a review of the content of comprehensive sexuality education for early adolescents in Rwanda. BMC Public Health, 2023, 23(1):49.
27. Wang Y, Wilson A, Chen R, Hu Z, Peng K and Xu S, Behind the Rainbow, "Tongqi" Wives of Men Who Have Sex With Men in China: A Systematic Review. Front Psychol, 2019, 10:2929.
28. Cao H, Zhou N, Fang X and Fine M, Marital well-being and depression in Chinese marriage: Going beyond satisfaction and ruling out critical confounders. J Fam Psychol, 2017, 31(6):775-784.
29. Li L, Zhu X, Yang C, Hu T, Zhao X, Li C, Wu M, Qiao G and Yang F, Social support and coping style of Tongqi in China: A cross-sectional study.Arch Psychiatr Nurs, 2021,35(3):317-322.
30. Yan F, Shi C X, Zhang Y, Chen J, Williams A B and Li X, "I'll Change His Sexual Orientation, I Don't Think About HIV": A Qualitative Study to Explore Attitudes, Behaviors, and Experiences Among Wives of Men Who Have Sex With Men in Mainland China. J Assoc Nurses AIDS Care, 2020,31(4):428-438.
31. Wohl A R, Ludwig-Barron N, Dierst-Davies R, Kulkarni S, Bendetson J, Jordan W, Bolan R, Smith T, Cunningham W and Pérez M J, Project Engage: Snowball Sampling and Direct Recruitment to Identify and Link Hard-to-Reach HIV-Infected Persons Who Are Out of Care. J Acquir Immune Defic Syndr, 2017,75(2):190-197.