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# Self-reported Infection Status, Knowledge and Associated Factors of Monkeypox Among Men Who Have Sex with Men in Jiaxing, China

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## Abstract

**Background** As of September 2023, more than 1,000 cases of monkeypox (mpox) have been reported in China. Based on the available evidence, men who have sex with men (MSM) are at high risk for mpox infection. This study aimed to analyse the self-reported infection status, knowledge, attitude and influencing factors of monkeypox among MSM in Jiaxing City, China.

**Methods** A web-based cross-sectional survey was conducted in September 2023 to gather data on participants' socio-demographic profiles, mpox-related knowledge, sexual behavior characteristics, and other potentially related information to mpox knowledge. Multivariate regression modeling was employed to analyze the factors influencing the level of mpox-related knowledge.

**Results** A total of 562 MSM were recruited; 4.3% self-reported being HIV-positive, 83.3% of respondents had heard of mpox, and 2.3% of them reported having suspected symptoms. 89.7% of respondents were willing to be vaccinated against mpox, but only 24.8% had a high level of knowledge about mpox. The main factors influencing knowledge of mpox were education level, household registration, homosexual anal intercourse in the past 6 months, and taking the HIV pre-exposure prophylaxis (PrEP).

**Conclusions** Knowledge of mpox among MSM living in the Jiaxing area needs to be enhanced, but willingness to get vaccinated is high. Educational level, household location, sexual behavior and PrEP use have important effects on knowledge of mpox. Individuals exhibiting symptoms indicative of suspected mpox had a diminutive consultation frequency, and it is imperative to augment screening efforts for mpox symptoms within specific demographic groups to prevent the underreporting of mpox cases.

**Keywords** Mpox, MSM, Knowledge of mpox, Vaccination, Survey

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## Introduction

The monkeypox (mpox) virus, a member of the orthopoxvirus family, has been gradually gaining public attention since the first case outside Africa was reported in the United Kingdom in May 2022 [1, 2]. From January 1, 2022 to September 26, 2023, a total of 90,618 confirmed and 663 suspected cases of mpox were reported in 115 countries worldwide [3]. The disease resulted in 157 deaths, with the majority of cases coming from countries that had not previously recorded any cases of mpox [3]. In May 2023, the World Health Organization declared that the mpox epidemic no longer posed a public health emergency of international concern due to its declining trend [4]. However, as of September 26, a total of 1,484 cases of mpox infection have been reported in China, and the increase in cases over the past three weeks has reached 1,500%, making it one of the countries with the fastest-growing mpox epidemic in recent times [3]. Due to the epidemiological trend of mpox in China over the past three months and the discontinuation of smallpox vaccination, mpox will be classified as a legally infectious disease under category B as of September 20, 2023, according to the announcement by China [5]. It is essential to maintain constant vigilance on the state of the mpox epidemic.

As a zoonotic infectious disease, mpox, has very similar symptoms to smallpox, but the severity of the lesions is milder. The main manifestations include: fever, swollen lymph nodes, and rash [6–8]. Mpox virus spreads from person to person mainly through contact with body fluids of infected persons, broken skin and mucous membranes at the site of lesions, contaminated objects, etc., while sexual transmission is a highly important modality, especially among men who have sex with men (MSM) [9–11]. Based on the global published epidemic data, MSM are the most affected group in the current mpox epidemic. Among those with known sexual orientation, 83.2% of cases were identified as MSM [3]. Relevant studies from the United States and Europe indicate percentages of 94% and 96%, respectively [12, 13]. Studies conducted in June 2023 in Beijing and Guangzhou, the two Chinese cities where the first indigenous mpox outbreaks occurred, it was indicated that the proportion of MSM among the initial batch of validated indigenous mpox cases in these two cities was 97% and 96%, respectively [14, 15]. Therefore, MSM groups are at a heightened risk of contracting mpox [11, 16].

The Baidu Index on China's top search engine reveals a 463% surge in daily searches for "mpox" in Jiaxing, Zhejiang Province between June 2023 and August 2023, following the emergence of indigenous outbreaks in several provinces nationwide [17]. This indicates the high level of interest among Jiaxing residents in acquiring knowledge on mpox. However, limited background information

is available on previous studies regarding the willingness to be vaccinated against mpox among MSM or the general population. Given the large MSM population base, it is necessary to understand the level of knowledge about mpox and the willingness to be vaccinated for the preventing and controlling mpox outbreaks in this population. Additionally, the current outbreak has a higher prevalence in the MSM population, thus deepening social discrimination against sexual minorities such as MSM, and some people are more reluctant to seek medical attention after experiencing milder symptoms, which may lead to a lack of testing and detection capacity [18–20].

Therefore, understanding the current self-reported mpox outbreaks in the MSM population can provide us with a better understanding of case detection for mpox in our region. Located in the core region of the Yangtze River Delta in China, Jiaxing is a medium-sized, second-tier city. Investigating the knowledge and infection status of the MSM population in this city is of great importance to most small and medium-sized cities in China.

## Method

### Overview

This study focuses on Jiaxing, an eastern coastal city in Zhejiang Province, located in the heart of China's Yangtze River Delta, close to Shanghai and Hangzhou. With a population of 5.55 million, Jiaxing is a second-tier city in China, according to the latest data from the Jiaxing Municipal Bureau of Statistics.

### Research design, population, and sampling

The study commenced on September 4, 2023, and concluded on September 20, 2023. It was carried out among MSM in Jiaxing City utilizing a convenience sampling method. In brief, the online sample population was recruited for the survey by posting a recruitment notice and a link to the electronic questionnaire through the official public account of Zhejiang Firefly Public Welfare Organization (This organization is dedicated to providing health counseling and AIDS comprehensive prevention services to the local MSM groups). Concurrently, our research team visited locations frequented by the MSM groups, as well as the studios of the aforementioned social organizations, to extend invitations to the target population to participate in the study. Participants were asked to complete a pre-set questionnaire on the Wenjuanxing (an electronic questionnaire platform, Changsha Ranxing Information Technology Co., Ltd., Hunan, China). The recruitment criteria were as follows: (1) knowledge of the purpose of this study and willingness to participate in this survey; (2) age  $\geq 16$  years old; (3) currently reside in Jiaxing; and (4) have engaged in MSM sexual activity within the past year. To calculate the sample size, we

assumed that 50% of MSM groups had good knowledge about mpox. With the parameter, it was necessary to obtain 384 questionnaires to yield an improved outcome. A total of 571 questionnaires were gathered during this period to meet the requirements.

### Variables

Data on MSM was collected via a self-administered survey, covering aspects such as socio-demographic variables, sexual orientation, awareness of mpox, exposure history, symptoms and medical consultation, sex-behavioral characteristics, HIV prevention and infection, sexually transmitted diseases (STD) history, and vaccination preferences for mpox. Invalid questionnaires were excluded manually if they did not meet the required criteria, such as the participant's age or if they exhibited inattentive responses. Prior to formal release, a pilot survey involving 66 MSM participants was conducted. In this study, the level of mpox knowledge of respondents was evaluated through the questionnaire of Min Zheng et al. [21]. The researchers evaluated their understanding of mpox using four criteria: infection sources, transmission routes, susceptible populations, and clinical symptoms. For each correct answer, one point was awarded, with a maximum score of 16. Scoring between 0 and 5 was classified as low, 6–11 as moderate, and 12–16 as high. We evaluated sociodemographic data, sexual orientation, sexual behaviors, self-reported HIV status and history of sexually transmitted disease infections that could impact variables. We also investigated participants' self-reported mpox infection status, exposure history, symptoms and medical visits. Additionally, we gauged the willingness of participants to receive the mpox vaccine to determine its acceptance rate.

### Quality control

Questionnaire completion required logging in with a WeChat account. Each account was only permitted to complete the questionnaire once to avoid duplication. To eliminate those questionnaires that were not answered seriously, a general knowledge question, asking for the capital city of China from options of Shanghai, Beijing, and Nanjing, was assigned.

### Statistical analysis

Continuous variables were described using the median, interquartile range (IQR), mean, and standard deviation (SD). Categorical variables were presented as frequencies and proportions. Chi-square tests were used to analyze differences between groups of categorical variables. Variables that differed in the aforementioned analyses were included in binary logistic regression analyses, which were used to explore factors associated with awareness and knowledge of mpox, and odds ratios (OR) and 95%

confidence intervals (CI) were calculated. All statistical analysis was performed by SPSS 23.0, and only results with a two-sided  $P < 0.05$  were regarded as statistically significant.

### Results

A total of 571 individuals participated, with 219 recruited through offline channels and 352 recruited via online platforms. Furthermore, 9 participants were excluded for not meeting the inclusion criteria (Fig. 1). The study comprised of 562 participants with a median age of 27 years (IQR 23–35). Among them, 71.2% were unmarried, 65.5% had completed tertiary education. Additionally, 63.3% had household registration outside Zhejiang Province, 67.4% had lived in the area for 2 years or more, and 55.0% reported a monthly incomes of at least 5,000 RMB (equivalent to approximately 685 USD). Forty-one individuals self-reported having been diagnosed with an STD, of whom 61.0% had syphilis. Additionally, 24 participants self-reported a positive HIV status, while 13 (2.3%) self-reported experiencing symptoms suggestive of mpox.

### Characteristics of self-reported cases of mpox

Out of the individuals surveyed, a total of 13 reported presenting symptoms consistent with mpox, such as enlarged lymph nodes, unexplained rashes, and fever (Fig. 2), with a median age of 27 years (IQR 22.5–33). Within this group, 9 (69.2%) were unmarried, 7 (53.8%) had achieved higher education, 7 (53.8%) held household registration in Zhejiang Province, and 7 (53.8%) reported a monthly income of at least 5,000 RMB. Additionally, 12 (92.3%) were homosexual or bisexual, and 8 (61.5%) primarily engaged in anal sex as the inserting partner. Only 3 (23.1%) demonstrated a high level of knowledge regarding mpox. 7 (53.8%) suspected they had encountered a suspected or confirmed case of mpox, presenting with symptoms such as swollen lymph nodes, rash, and fever (Fig. 2). It is noteworthy that only 5 of these individuals sought medical attention for their mpox-like symptoms, with only 1 receiving a confirmed mpox diagnosis. Out of 13 individuals, 2 had a verified diagnosis of HIV, while 2 took post-exposure prophylaxis (PEP), and 5 took pre-exposure prophylaxis (PrEP). Additionally, 12 participants were willing to be vaccinated for mpox.

### Knowledge of mpox

Of the respondents, 471 (83.8%) had heard of mpox, while 91 (16.2%) had not. The results indicated significant differences between the two groups in terms of marital status, household registration, occupation, sexual orientation, role of sexual behavior, history of anal sex with men in the past 6 months, awareness of PEP and PrEP, and vaccination intention. Further analysis revealed that

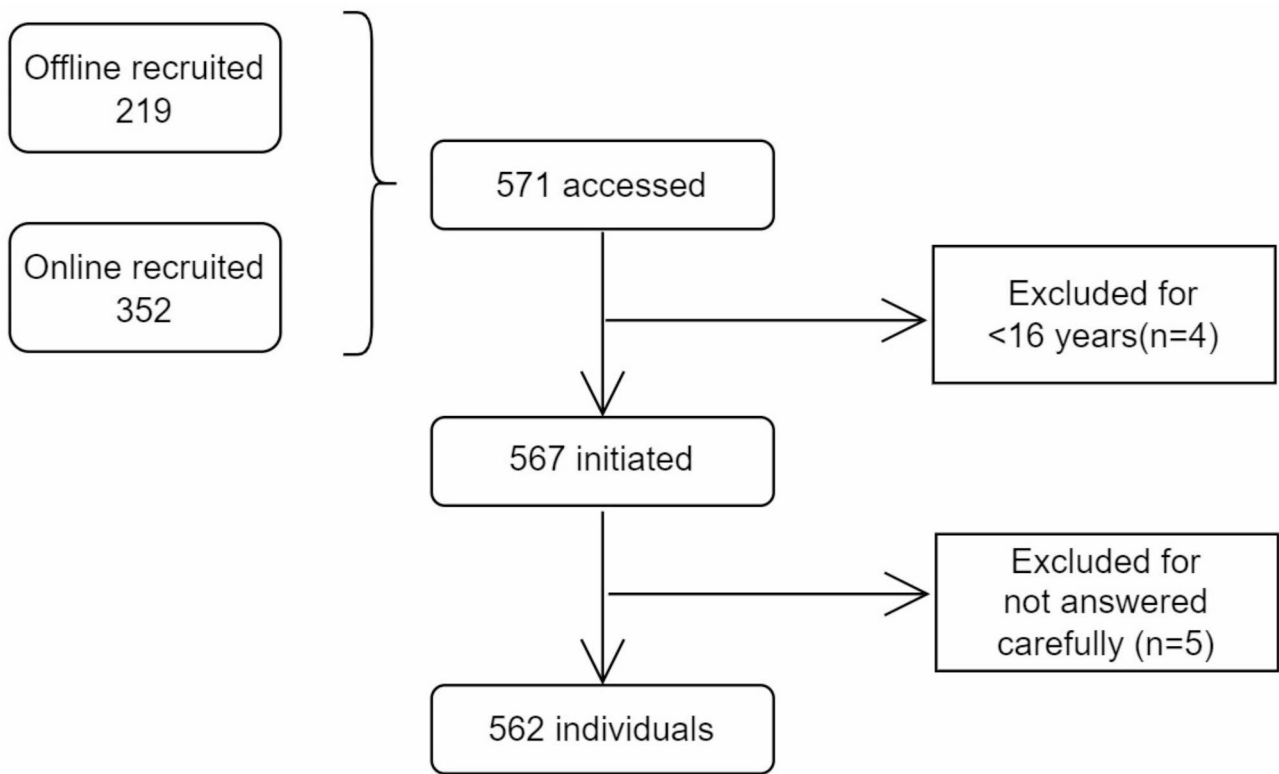


Fig. 1 Study flowchart

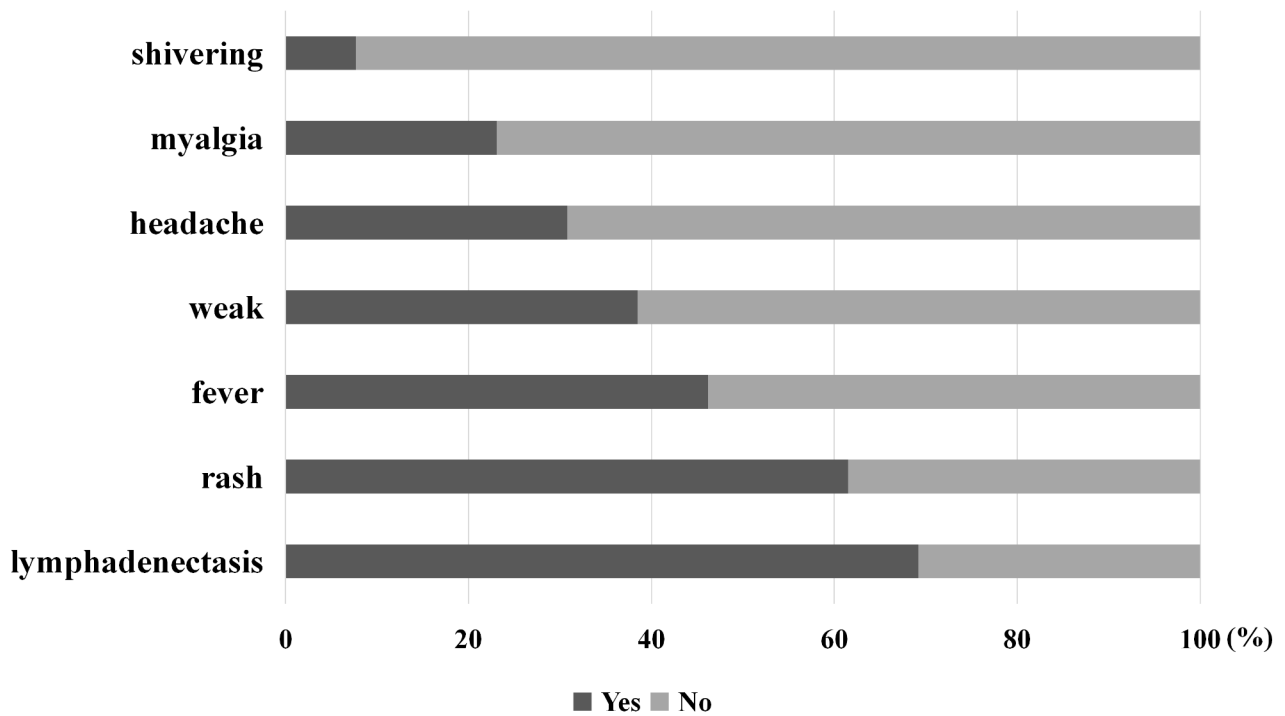


Fig. 2 Self-reported major symptoms in persons presenting with suspected symptoms of mpox

individuals with household registration in other provinces were significantly less likely to be aware of mpox compared to those within Zhejiang province (other province household registration: OR=0.49, 95% CI: 0.24–0.99). Additionally, heterosexuals and sexually ambiguous individuals exhibited lower likelihood of having heard of mpox compared to homosexual individuals (heterosexuals: OR=0.15, 95% CI: 0.06–0.37; sexual orientation undetermined: OR=0.20, 95% CI: 0.08–0.51). Conversely, participants who had knowledge of PrEP demonstrated a higher likelihood of being aware of mpox (heard of PrEP: OR=2.79, 95% CI: 1.22–6.38). (Table 1).

Of the 471 investigators familiar with mpox, the median knowledge score for mpox was 9 (IQR 6–11). Among them, 117 (24.8%) demonstrated a high levels of knowledge, 255 (54.1%) exhibited moderate knowledge, and 99 (21.0%) showed low levels of understanding. The results revealed significant disparities in education, household registration, history of anal sex with men in the past 6 months, awareness of PEP/PrEP, utilization of PEP/PrEP, and timing of last HIV test between individuals with a high awareness of mpox and those with moderate/low levels. Subsequent research revealed that: individuals with higher levels of educational attainment were more likely to possess a greater understanding of mpox in comparison to those with lower levels of education (college and above education level: OR=6.11; 95% CI: 1.36–27.35). Furthermore, respondents with household registration in other provinces were found to have a decreased awareness of mpox compared to those within Zhejiang Province (household registration of outside Zhejiang province: OR=0.58; 95% CI: 0.35–0.95). Additionally, individuals who engaged in receptive anal intercourse with men within the past 6 months demonstrated a greater understanding of mpox compared to those who had not (same-sex anal sex in the last 6 months: OR: 1.81; 95% CI: 1.05–3.13). Conversely, those had taken PrEP were less likely to have comprehensive knowledge about mpox than non-users (those who had taken PrEP: OR=0.29; 95% CI: 0.10–0.87). (Table 2).

#### Attitudes towards the mpox vaccine

Out of 562 respondents, a total of 504 (89.7%) expressed willingness to receive the mpox vaccine, while 58 (10.3%) remained hesitant. Notably, among the hesitant respondents, 55.2% cited concerns about the vaccine's safety and 37.9% indicated that they perceived receiving the vaccine as unnecessary due to their good health status (Fig. 3).

#### Discussion

The current study presents the results of a questionnaire survey carried out in Jiaxing City, Zhejiang Province, China in 2023, following the emergence of a local mpox epidemic. The study concentrated on the MSM

population, particularly mpox knowledge, self-reported mpox infection, willingness to vaccinate, and the potential factors influencing these. The findings showed that the majority of participants were aware of the existence of mpox, although less than a third demonstrated proficient knowledge of this subject. This phenomenon was also observed in a study involving the general population [22], indicating that during outbreaks of mpox, while most individuals may take note of related occurrences, only a minority are inclined to dedicate time to furthering their understanding. It is conceivable that certain individuals may also face barriers in accessing pertinent information. Furthermore, the majority voiced their willingness to accept the vaccine if it were to be promoted in China. This finding is consistent with a separate survey conducted among MSM [21], providing strong support for advocating the adoption of the mpox vaccine. It was also found that individuals with higher education, local residential registration, and MSM who had participated in male-to-male anal intercourse within the last 6 months had a greater likelihood of possessing substantial understanding of mpox. Interestingly, respondents who used taken PrEP had lower levels of knowledge. This may be because non-PrEP users are more concerned about contracting mpox than PrEP users [23], leading to a greater tendency to learn more about it. On the other hand, after using PrEP without the risk of contracting HIV [24], awareness of mpox risk may be lower. This phenomenon produces similar outcomes in studies concerning the assessment of the gravity of transmitted infections of STD [24, 25].

In this survey, 16.2% of the respondents had not heard about mpox, and 21.0% of those familiar with mpox had limited knowledge on the subject, which is lower than the 31.6% in the January 2022 survey by Min Zheng's team [21], as well as lower than the 50% of the general population in Shenzhen [26], but higher than the 8.9% observed among medical professionals [27]. The observed changes might be attributed to several factors: firstly, the local outbreaks of mpox in China over the past six months have heightened public awareness of the disease; secondly, the MSM groups may exhibit greater concern regarding the mpox outbreak compared to the general public, given that most reported cases originate from this group [3, 12, 13], moreover, considering their professional sensitivity and expertise level, it is imperative for doctors to possess a comprehensive understanding of mpox. However, Xin Peng's study revealed that only 91.1% of doctors demonstrated a high level of awareness [27]. Therefore, there is an urgent need for extensive publicity and educational initiatives related to mpox. Amongst those participants who were aware of mpox, only 24.8% possessed a substantial level of knowledge about the subject. This figure is marginally lower than the results of a similar

**Table 1** Sociodemographic, sexual behavior, HIV-Related characteristics of the study population according to whether or not they have heard of mpxv

Characteristics	Yes (n = 471)	Total (n = 562)	Chi-square tests		Binary logistic regression analyses	
			$\chi^2$	P value	OR	P value
<b>Age (years)</b>			0.275	0.872		
≤ 20	50(10.6)	58(10.3)			-	-
21–30	244(51.8)	292(52.0)			-	-
≥ 31	177(37.6)	212(37.7)			-	-
<b>Marital Status</b>			17.392	< 0.001*		
Never married/Never married/Widowed	379(80.5)	434(77.2)			1(reference)	
Currently married/cohabit	92(19.5)	128(22.8)			0.49(0.24–0.99)	0.046*
<b>Education</b>			0.829	0.661		
Junior high school and below	52(11.0)	65(11.6)			-	-
High school or technical secondary school	108(22.9)	129(23.0)			-	-
College or above	311(66.0)	368(65.5)			-	-
<b>Census register</b>			19.027	< 0.001*		
Zhejiang Province	191(40.6)	206(36.7)			-	-
Other provinces	280(59.4)	356(63.3)			-	-
<b>Duration of local residence</b>			1.429	0.699*		
< 6 months	57(12.1)	72(12.8)			-	-
6–12 months	40(8.5)	48(8.5)			-	-
12–24 months	54(11.5)	63(11.2)			-	-
> 24 months	320(67.9)	379(67.4)			-	-
<b>Occupation</b>			13.552	0.009*		
Student/Household management service / Job seeker	82(17.4)	100(17.8)			-	-
Employees of enterprises and public institutions	152(32.3)	166(29.5)			-	-
Service workers	68(14.4)	87(15.5)			-	-
Freelancer	92(19.5)	119(21.2)			-	-
Workers/Farmers/Herders/Fishermen	77(16.3)	90(16.0)			-	-
<b>Monthly income (RMB)</b>			14.568	0.002*		
< 2500	79(16.8)	94(16.7)			-	-
2500–4999	127(27.2)	159(28.3)			-	-
5000–9999	193(41.0)	213(37.9)			-	-
> 10,000	72(15.3)	96(17.1)			-	-
<b>Sexual orientation</b>			105.857	< 0.001*		
Homosexual	256(54.4)	269(47.9)			1(reference)	
Heterosexuality	63(13.4)	116(20.6)			0.15(0.06–0.38)	< 0.001*
Bisexual	105(22.3)	116(20.6)			0.52(0.21–1.32)	0.17
Uncertain	47(10.0)	61(10.9)			0.20(0.08–0.51)	0.001*
<b>Roles when engaging in male-to-male anal sex acts</b>			19.402	< 0.001*		
0	108(22.9)	149(26.5)			-	-
1	152(32.3)	175(31.1)			-	-
Both	211(44.8)	238(42.3)			-	-
<b>History of anal sex with men in the past 6 months</b>			25.395	< 0.001*		
Yes	228(48.4)	246(43.8)			-	-
No	243(51.6)	316(56.2)			-	-
<b>Condom use for anal sex with men in the last 6 months</b>			3.671	0.055		
Yes	183(80.3)	194(78.9)			-	-
No	45(19.7)	52(21.1)			-	-
<b>Ever heard of PEP</b>			96.427	< 0.001*		
Yes	387(82.2)	417(74.2)			-	-
No	84(17.8)	145(25.8)			-	-
<b>Ever heard of PrEP</b>			89.906	< 0.001*		

**Table 1** (continued)

Characteristics	Yes (n = 471)	Total (n = 562)	Chi-square tests		Binary logistic regression analyses	
			$\chi^2$	P value	OR	P value
Yes	358(76.0)	381(67.8)	93.234	<0.001*	2.79(1.22–6.38)	0.015*
No	113(24.0)	181(32.2)			1(reference)	
<b>Date of last HIV test</b>						
< 6 months	255(54.1)	272(48.4)			-	-
3–6 months	61(13.0)	69(12.3)			-	-
6–12 months	41(8.7)	46(8.2)			-	-
> 12 months	41(8.7)	46(8.2)			-	-
Never detected	73(15.5)	129(23.0)			-	-
<b>Have been diagnosed with an STD</b>			4.172	0.41		
Yes	39(8.3)	41(7.3)			-	-
No	432(91.7)	521(92.7)			-	-
<b>HIV status</b>			0.186	0.666		
Self-testing/confirmation of positive diagnosis	21(5.3)	24(5.5)			-	-
Negatives	377(94.7)	409(94.5)			-	-
<b>Willingness to be vaccinated against mpox</b>			6.187	0.013*		
Yes	429(91.1)	504(89.7)			-	-
No	42(8.9)	58(10.3)			-	-

Notes: \*:  $P < 0.05$ 

Australian study, in which at least one-third of participants were reported to possess a strong grasp of mpox-related knowledge [28]. Furthermore, a lower proportion of the population in the present survey demonstrated a comparable level of knowledge about mpox when compared with a survey conducted in China in 2022 [21]. As previously stated, even though the occurrence of the local outbreak has caused a surge in public concern towards mpox, it is shown by the data obtained from this survey that only a small percentage of respondents have a high level of knowledge regarding mpox. This indicates the necessity to enhance the promotion of knowledge about mpox among specific populations.

In the study, the proportion of self-reported mpox cases with suspected symptoms was 2.3%, which is lower than the 5.6% reported in a study involving sexual minorities in Brazil [29]. Such discrepancy might be attributed to the varying severity of the epidemic across diverse regions. This survey identified enlarged lymph nodes, rash, and fever as the primary symptoms self-reported by respondents diagnosed with mpox-symptoms consistent with those of numerous confirmed cases [6, 25, 30]. Interestingly, 61.5% (8 out of 13) of respondents who self-reported symptoms of suspected mpox did not seek medical attention a similar phenomenon was observed in a Brazilian survey [29]. This behavior could be linked to the discrimination experienced by this group [31–33]. The occurrence of such a phenomenon may lead to an underreporting of mpox cases, which could have adverse effects on the management of the epidemic. Hence, it is essential to implement an effective public education

campaign aimed at reducing social prejudice and to diligently monitor suspicious symptoms of mpox. Additionally, promoting early detection by advising individuals to seek immediate medical consultation is crucial.

Furthermore, 89.7% of survey respondents expressed their willingness to be vaccinated, which is consistent with the findings of a 2022 survey conducted in China [21]. The majority of participants indicated a readiness to receive the vaccine, with only a minority expressing concerns about its safety and effectiveness. Therefore, to satisfy the requirements of particular populations and halt the spread of mpox epidemics, it is imperative to escalate the research and development of mpox-related vaccines in China.

Nevertheless, there are some limitations to this study. To start with, our sampling approach employed convenience sampling due to the unique characteristics of the MSM population. This may result in our sample being less representative and may hinder the generalization of our findings to the entire MSM population. Additionally, self-reported responses and the sensitive nature of some questions may lead to information bias. This study serves as an initial exploration of the MSM populace in Jiaying City, with several factors having limited investigation. Future research will focus on increasing the sample size, considering additional factors to investigate, and conducting more extensive analysis.

**Table 2** Sociodemographic, sexual behavior, HIV-Related characteristics of the study population according to their level of mpox knowledge awareness

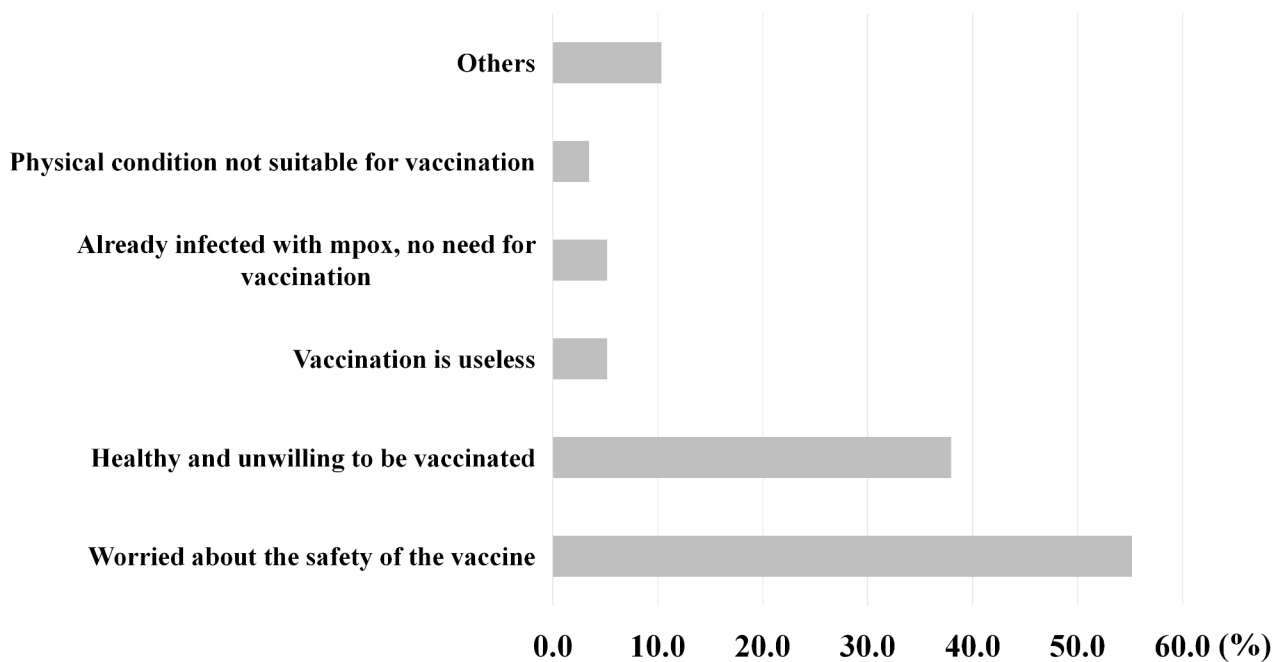
Characteristics	Good Knowledge (N = 117)	Total (n = 562)	Chi-square tests		binary logistic regression analyses	
			$\chi^2$	P value	OR	P value
<b>Age (years)</b>			0.753	0.686		
≤ 20	10(8.5)	50(10.6)			-	-
21–30	63(53.8)	244(51.8)			-	-
≥ 31	44(37.6)	177(37.6)			-	-
<b>Marital Status</b>			1.074	0.300		
Never married/Never married/Widowed	98(83.8)	379(80.5)			-	-
Currently married/cohabit	19(16.2)	92(19.5)			-	-
<b>Education</b>			15.0311	0.001*		
Junior high school and below	3(2.6)	52(11.0)			1(reference)	
High school or technical secondary school	22(18.8)	108(22.9)			3.13(0.64–14.99)	0.153
College or above	92(78.6)	311(66.0)			6.11(1.36–27.35)	0.018*
<b>Census register</b>			7.435	0.006*		
Zhejiang Province	60(51.3)	191(40.6)			1(reference)	
Other provinces	57(48.7)	280(59.4)			0.58(0.35–0.95)	0.03*
<b>Duration of local residence</b>			1.212	0.750		
< 6 months	11(9.4)	57(12.1)			-	-
6–12 months	11(9.4)	40(8.5)			-	-
12–24 months	13(11.1)	54(11.5)			-	-
> 24 months	82(70.1)	320(67.9)			-	-
<b>Occupation</b>			5.046	0.283		
Student/Household management service / Job seeker	17(14.5)	82(17.4)			-	-
Employees of enterprises and public institutions	46(39.3)	152(32.3)			-	-
Service workers	13(11.1)	68(14.4)			-	-
Freelancer	20(17.1)	92(19.5)			-	-
Workers/Farmers/Herders/Fishermen	21(17.9)	77(16.3)			-	-
<b>Monthly income (RMB)</b>			6.001	0.112		
< 2500	17(14.5)	79(16.8)			-	-
2500–4999	28(23.9)	127(27.0)			-	-
5000–9999	46(39.3)	193(41.0)			-	-
> 10,000	26(22.2)	72(15.3)			-	-
<b>Sexual orientation</b>			5.428	0.143		
Homosexual	73(62.4)	256(54.4)			-	-
Heterosexuality	10(8.5)	63(13.4)			-	-
Bisexual	22(18.8)	105(22.3)			-	-
Uncertain	12(10.3)	47(10.0)			-	-
<b>Roles when engaging in male-to-male anal sex acts</b>			0.093	0.955		
0	26(22.2)	108(22.9)			-	-
1	39(33.3)	152(32.3)			-	-
Both	52(44.4)	211(44.8)			-	-
<b>History of anal sex with men in the past 6 months</b>			6.960	0.008*		
Yes	69(59.0)	228(48.4)			1.81(1.05–3.1)	0.033*
No	48(41.0)	243(51.6)			1(reference)	
<b>Condom use for anal sex with men in the last 6 months</b>			0.050	0.823		
Yes	56(81.2)	183(80.3)			-	-
No	13(18.8)	45(19.7)			-	-
<b>Ever heard of PEP</b>			17.151	< 0.001*		
Yes	111(94.9)	387(82.2)			-	-
No	6(5.1)	84(17.8)			-	-



**Table 2** (continued)

Characteristics	Good Knowledge (N= 117)	Toatal (n= 562)	Chi-square tests		binary logistic regression analyses	
			$\chi^2$	P value	OR	P value
<b>Ever taken PEP</b>			3.973	0.046*		
Yes	14(12.6)	73(18.9)				
No	97(87.4)	314(81.1)				
<b>Ever heard of PrEP</b>			7.642	0.006*		
Yes	100(85.5)	358(76.0)			-	-
No	17(14.5)	113(24.0)			-	-
<b>Ever taken PrEP</b>			8.449	0.004*	0.29(0.10–0.87)	0.028*
Yes	5(5.0)	48(13.4)			1(reference)	
No	95(95.0)	310(86.6)				
<b>Date of last HIV test</b>			13.384	0.010*		
< 6 months	59(50.4)	255(54.1)			-	-
3–6 months	21(17.9)	61(13.0)			-	-
6–12 months	17(14.5)	41(8.7)			-	-
> 12 months	9(7.7)	41(8.7)			-	-
Never detected	11(9.4)	73(15.5)			-	-
<b>Have been diagnosed with an STD</b>			0.258	0.612		
Yes	11(9.4)	39(8.3)			-	-
No	106(90.6)	432(91.7)			-	-
<b>HIV status</b>			0.043	0.836		
Self-testing/confirmation of positive diagnosis	6(5.7)	21(5.3)			-	-
Negatives	100(94.3)	377(94.7)			-	-
<b>Willingness to be vaccinated against mpox</b>			0.045	0.832		
Yes	106(90.6)	429(91.1)			-	-
No	11(9.4)	42(8.9)			-	-

Notes: \*: P<0.05



**Fig. 3** Reasons for respondents' reluctance to receive the mpox vaccine

## Conclusions

In summary, there is a need to enhance the knowledge of MSM residing in the Jiaying region concerning mpox, although their willingness to receive vaccination is high. The level of knowledge about mpox is significantly influenced by educational level, household location, sexual behavior and PrEP use. Respondents with suspected mpox symptoms had a low rate of consultation, and screening for suspected mpox symptoms in special populations should be strengthened to avoid mpox underreporting.

## Abbreviations

MSM	Men who have sex with men
Mpox	Monkeypox
STD	Sexually transmitted diseases
IQR	Interquartile range
SD	Standard deviation
OR	Odds ratios
CI	Confidence intervals
PEP	Post-exposure prophylaxis
PrEP	Pre-exposure prophylaxis

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## Author contributions

Y. T. and Z. H.: Conceptualization, Writing the original draft. Q. Z.: Methodology. G. Z., Q. L., and W. Z.: Investigation. H. F. and W. P.: Writing – review & editing. R. G. and Z. C.: Supervision. All authors reviewed the manuscript.

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## Data availability

All data generated or used during the study are shown to be available through the corresponding author.

## Declarations

### Ethics approval and consent to participate

This study relied solely on an Internet survey that did not require the collection of personal information or biological samples, and all participants were completely anonymous and exempt from ethical review. This study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Ethics Committee of the Jiaying Center for Disease Control and Prevention (approval no. 2023-03). Informed consent was obtained from all study participants (including minors and their legal guardians), who signed electronic consent forms on their cellphones on enrollment.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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