

Preplanned Studies

Analysis of Knowledge Level and Use of Antiretroviral Pre-Exposure and Post-Exposure Prophylaxis Among MSM — China, 2019–2022

Jiahuan Guo¹; Wenting Kang²; Tongtong Liu³; Jie Xu¹; Houlin Tang¹; Fan Lyu¹; Guang Zhang^{1,†}

Summary

What is already known on this topic?

Men who have sex with men (MSM) in China have a high rate of human immunodeficiency virus (HIV) infection. Pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP) have been shown to be effective in preventing HIV, which may help to contain the HIV epidemic among MSM.

What is added by this report?

This study found that knowledge and usage of PrEP were low among MSM, indicating that this population is at high risk for HIV infection. Promotion of PrEP and PEP among MSM is necessary to reduce the risk of HIV infection in this population.

What are the implications for public health practice?

PrEP and PEP are novel HIV prevention strategies that have been demonstrated to be effective and safe. To further reduce HIV transmission among MSM in China, it is necessary to promote the use of PrEP and PEP.

Men who have sex with men (MSM) have a high HIV infection rate, with more than one-fifth of newly infected people having sex with men (1). The overall national prevalence of HIV among MSM during the period of 2001 to 2008 was estimated to be 5.7% (2). Prevention and control of HIV epidemics among MSM are challenging. Pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP) can effectively prevent HIV infection among MSM, and have been promoted and implemented in many countries with guidelines developed by the World Health Organization (WHO) (3). To learn about the cognition and use of PrEP and PEP among MSM in China, we conducted cross-sectional surveys in 2019, 2021, and 2022, respectively.

This study revealed that knowledge and utilization of PrEP and PEP among MSM were relatively low. To

reduce the risk of HIV infection among MSM, more publicity and education should be employed to increase awareness of PrEP and PEP and to promote their use.

This study was conducted by MSM community organizations in the survey areas from March to April 2019 in Beijing Municipality and Shenzhen and Kunming cities; January to March 2021 in Beijing Municipality and Shenzhen, Chengdu, Jinan, and Nanjing cities; and April to June 2022 in 22 cities and municipalities, including Tianjin, Chengdu, and Hangzhou. The cross-sectional studies of 3 years were approved by the Ethics Committee of the National Center for AIDS/STD and Prevention, China CDC. An anonymous WeChat-based questionnaire was distributed and accessed by respondents via a code scan. Each internet protocol (IP) address was only allowed for one enrollment. The local survey leader sent the questionnaire to eligible MSM as a seed, and then used an online snowballing method to invite them to answer the questionnaire and share it with their eligible peers.

The questionnaire included sociodemographic information, behavioral information, basic knowledge and use of PrEP and PEP for participants who met the inclusion criteria of being biological males aged 18 or older, having had sex with a male at least once in the past 12 months, and being HIV negative. Over the three-year period, 3,337, 5,313, and 15,758 MSM were enrolled, respectively.

Awareness of PrEP knowledge is defined as understanding the role of PrEP, the population for whom PrEP is intended, the methods of taking PrEP medications, and that PrEP does not replace condom use (4). Answering correctly the role and methods of taking PrEP, as well as the fact that PrEP does not replace condom use, is considered evidence of PrEP knowledge (5).

SAS (version 9.4, SAS Institute Inc., Cary, NC, USA) was used for statistical analysis. Spearman rank

correlation was used to analyze the correlation between variables, with correlation coefficients (R) representing positive and negative correlations between variables. *P*-value of <0.05 (two-tailed) was considered statistically significant.

In this study, most of the participants were over 25 years old; this age group accounted for 73.6% (2,457/3,337), 78.5% (4,175/5,313), and 62.4% (9,835/15,758) of the total participants in 2019, 2021, and 2022, respectively. Most of the participants had college education or above, accounting for 73.1% (2,439/3,337), 69.2% (3,676/5,313), and 76.4% (12,036/15,758), respectively.

In the survey of the three years, the proportion of MSM who had sex in the past 6 months was higher than 60%, indicating that MSM had active sexual behaviors. More than 5% of MSM in the 3 years survey had HIV-positive sexual partners, and about 10% of MSM in the 3 years had concurrent sexual partners. On average, more than 25% of MSM used new drugs to increase sexual pleasure (Table 1). In

general, MSM have a high risk of HIV infection, making them a key group in AIDS prevention and control. PrEP and PEP as new biotechnological means of AIDS prevention, have great significance in controlling the spread of AIDS in MSM.

The three-year survey found that the proportion of MSM who had heard of PrEP was high, all exceeding 70%. Over 60% of MSM had correct knowledge of the role of PrEP in preventing HIV, that PrEP is applicable to high-risk populations such as MSM, female sex workers (FSW), and intravenous drug users (IDU), and that condoms should be used simultaneously while taking PrEP.

The overall level of basic knowledge of PrEP among respondents was relatively low, with 10.2% (340/3,337), 17.8% (948/5,313), and 26.5% (4,179/15,758) in 3 years, respectively.

Results from the PrEP survey were similar to those of the three-year survey of MSM regarding knowledge of PEP. Over 70% of respondents correctly answered 3 questions related to PEP: its role in preventing HIV, its

TABLE 1. Behavioral characteristics among MSM in 2019, 2021, and 2022 in selected cities in China.

Variable	2019 (N=3,337)	2021 (N=5,313)	2022 (N=15,758)
	N (%)	N (%)	N (%)
Had homosexual sex with men in the past 6 months			
Yes	2,652 (79.5)	3,405 (64.1)	9,859 (62.6)
No	685 (20.5)	1,908 (35.9)	5,899 (37.4)
Used condoms in sexual behaviors in the past 6 months			
Yes	3,137 (94.0)	5,057 (95.2)	14,834 (94.1)
No	200 (6.0)	256 (4.8)	924 (5.9)
Had group sex in the past 6 months			
Yes	372 (11.1)	521 (9.8)	1,692 (10.7)
No	2,965 (88.9)	4,792 (90.2)	14,066 (89.3)
HIV infection status of sexual partners in the past 6 months			
negative or unclear	2,959 (88.7)	4,889 (92.0)	14,905 (94.6)
Positive	378 (11.3)	424 (8.0)	853 (5.4)
Rush use during sexual behaviors in the past 6 months			
Yes	1,148 (34.4)	1,555 (29.3)	2,568 (16.3)
No	2,189 (65.6)	3,758 (70.7)	13,190 (83.7)
Had infected with STD in the past 6 months			
Yes	484 (14.5)	267 (5.0)	1,348 (8.6)
No	2,853 (85.5)	5,046 (95.0)	14,410 (91.4)
Tested for HIV in the past 6 months			
Yes	2,680 (80.4)	4,664 (87.7)	10,748 (68.2)
No	657 (19.6)	649 (12.3)	5,010 (31.8)

Abbreviation: HIV=human immunodeficiency virus; MSM=men who have sex with men; STD=sexually transmitted disease.

applicability to those who have engaged in high-risk sexual behaviors within 72 hours, and the need to use condoms while taking PEP. The overall level of knowledge of PEP was 35.7% (1,190/3,337), 34.0% (1,807/5,313), and 42.2% (6,657/15,758) in the three-year period, respectively.

In the 3 cross-sectional surveys, the proportion of MSM using PrEP was 6.0%, 14.4%, and 27.2%, respectively. The proportion of MSM using PEP was 11.2%, 14.4%, and 24.6%, respectively (Table 2).

According to the correlation analysis, there was a positive correlation between PrEP use and PrEP awareness, as well as between PEP use and PrEP knowledge awareness, and between PEP use and PrEP use (Table 3).

DISCUSSION

A three-year cross-sectional study found that the proportion of MSM who had heard of PrEP and PEP was relatively high, but the proportion of MSM who could correctly identify the specific knowledge of PrEP and PEP was relatively low. This suggests that simply having heard of PrEP and PEP is not equivalent to understanding them, so multiple methods should be used to promote and educate MSM on relevant knowledge of PrEP and PEP in order to improve their cognition and understanding of these topics.

The study found that MSM had active sexual behavior over the three-year survey period, and that they had sexual partners who used drugs, had multiple partners, and were HIV positive, which greatly increased the risk of HIV infection in MSM, consistent with the findings of Beyrer et al. (6). To reduce the prevalence of AIDS in MSM, comprehensive interventions such as health education, active testing, partner promotion, and peer education should be strengthened.

Surveys conducted in 2022 revealed that the level of PrEP knowledge ranged from 10.2% to 26.5%, and the percentage of PrEP use was 6.0% to 27.2%, which was lower than the results of a study conducted in Shanghai (7). The level of PEP knowledge ranged from 57.8% to 66.0%, and the percentage of use was 11.2% to 24.6%, which was slightly higher than the results of a study on PEP among MSM in 2019 (8). Overall, the level of knowledge and utilization percentage of PrEP were at a low level. The survey results in 2022 showed that the percentage of PrEP use was slightly higher

than the level of knowledge, suggesting that MSM took drugs without fully understanding PrEP. If the use methods and conditions of PrEP, and matters needing attention were not correctly understood, it could affect the prevention effect of drugs and the compliance of taking drugs, resulting in adverse consequences, such as failure to effectively prevent HIV infection and resistance to antiviral drugs.

It is essential to promote and publicize PrEP and PEP in multiple forms. To do this, clinical and public health experts should first unify the most important information about PrEP and PEP to create a clear core message, and then leverage community involvement and peer education. Additionally, the role of networks, media, and other publicity channels should be utilized to educate the public about PrEP and PEP. With friends providing education about PrEP and PEP, MSM will be more likely to trust the content and understand the effects and methods of use of the drugs. Utilizing networks, media, and other convenient information dissemination channels will improve the dissemination and coverage of PrEP and PEP, thus increasing the likelihood of MSM's acceptance of PrEP and PEP.

This survey indicates that knowledge of PrEP and use of PEP are positively correlated with the use of PrEP, suggesting that knowledge of PrEP and the use of PEP are promoting factors of PrEP use, consistent with relevant research results (9). Increasing PrEP knowledge publicity may be an effective way to promote PrEP use among MSM populations. PEP is recognized and accepted by MSM as a 'regret drug' after high-risk sexual behaviors, due to awareness of the high risk of HIV infection. Thus, MSM are also a potential target population for PrEP services. After evaluating risk, MSM who have taken PEP should be referred in a timely manner to receive PrEP services, which is important to prevent HIV transmission among key populations from a public health perspective.

doi: [10.46234/ccdcw2023.053](https://doi.org/10.46234/ccdcw2023.053)

Corresponding author: Guang Zhang, zhangguang2000@chinaaids.cn.

¹ National Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, China; ² Chinese Association of STD & AIDS Prevention and Control, Beijing, China; ³ Chinese Center for Health Education, Beijing, China.

Submitted: November 21, 2022; Accepted: March 22, 2023

TABLE 2. Knowledge and use of PrEP and PEP among MSM in parts of the city of China in 2019, 2021, and 2022.

Variable	2019 (N=3,337)	2021 (N=5,313)	2022 (N=15,758)
	N (%)	N (%)	N (%)
Ever heard of PrEP of HIV			
Yes	2,401 (72.0)	4,223 (79.5)	12,028 (76.3)
No	936 (28.0)	1,090 (20.5)	3,730 (23.7)
PrEP can be taken daily			
Yes	1,158 (34.8)	2,114 (39.8)	7,520 (47.7)
No	2,179 (65.2)	3,199 (60.2)	8,238 (52.3)
PrEP can be taken as needed			
Yes	1,484 (44.5)	3,022 (56.9)	8,971 (56.9)
No	1,853 (55.5)	2,291 (43.1)	6,787 (43.1)
Do not know how to take PrEP			
Yes	1,091 (32.6)	1,414 (26.6)	4,662 (29.6)
No	2,246 (67.3)	3,899 (73.4)	11,096 (70.4)
The role of PrEP to prevent HIV			
Yes	2,247 (67.3)	3,924 (73.9)	10,083 (63.9)
No	1,090 (32.7)	1,389 (26.1)	5,675 (36.1)
PrEP is applicable to people with high risk of HIV infection			
Yes	2,228 (66.8)	3,725 (70.1)	9,786 (62.1)
No	1,109 (33.2)	1,588 (29.9)	5,972 (37.9)
Condoms are required during the use of PrEP			
Yes	2,316 (69.5)	3,951 (74.4)	11,223 (71.2)
No	1,021 (30.5)	1,362 (25.6)	4,535 (28.8)
Ever consulted for PrEP?			
Yes	654 (19.6)	1,951 (36.7)	7,004 (44.4)
No	2,683 (80.4)	3,362 (63.3)	8,754 (55.6)
Ever used PrEP?			
Yes	199 (6.0)	767 (14.4)	4,291 (27.2)
No	3,138 (94.0)	4,546 (85.6)	11,467 (72.8)
Ever heard about PEP of HIV			
Yes	2,616 (78.4)	4,069 (76.6)	12,068 (76.6)
No	721 (21.6)	1,244 (23.4)	3,690 (23.4)
Role of PEP in preventing HIV			
Yes	2,254 (67.5)	3,424 (64.5)	9,816 (62.2)
No	1,083 (32.5)	1,889 (35.5)	5,942 (37.8)
PEP is applicable to those who had high-risk sexual behaviors within 72 hours			
Yes	2,445 (73.3)	3,662 (68.9)	10,985 (69.7)
No	892 (26.7)	1,651 (31.1)	4,773 (30.3)
Condoms are required during the use of PEP			
Yes	2,566 (76.9)	3,890 (73.2)	11,470 (72.8)
No	771 (23.1)	1,423 (26.8)	4,288 (27.2)
Ever consulted for PEP?			
Yes	820 (24.6)	1,951 (36.7)	7,294 (46.3)
No	2,517 (75.4)	3,362 (63.3)	8,464 (53.7)
Ever used PEP?			
Yes	377 (11.2)	767 (14.4)	3,884 (24.6)
No	2,960 (88.8)	4,546 (85.6)	11,874 (75.4)

Abbreviation: PrEP=pre-exposure prophylaxis; PEP=post-exposure prophylaxis; HIV=human immunodeficiency virus; MSM=men who have sex with men.

TABLE 3. Correlation analysis between knowledge and use of PrEP and PEP among MSM in parts of the city of China.

Variable	Level of PrEP knowledge	Rate of using PrEP	Level of PEP knowledge	Rate of using PEP
Level of PrEP knowledge	-	-	-	-
Rate of using PrEP	R=1.000*	-	-	-
Level of PEP knowledge	R=-0.500	R=-0.500	-	-
Rate of using PEP	R=1.000*	R=1.000*	R=-0.500	-

Note: “-” means that the correlation between the corresponding two variables has been analyzed and will not be repeated here.

Abbreviations: PrEP=pre-exposure prophylaxis; PEP=post-exposure prophylaxis; MSM=men who have sex with men.

*P value of less than 0.05.

REFERENCES

- Chen J, Huang YL, Chen HL, Xia J. Nitrite inhalants use, sexual behaviors and HIV/syphilis infection among men who have sex with men in Chongqing, China. *Infect Dis Poverty* 2020;9(1):127. <http://dx.doi.org/10.1186/s40249-020-00748-6>.
- He N. Research progress in the epidemiology of HIV/AIDS in China. *China CDC Wkly* 2021;3(48):1022 – 30. <http://dx.doi.org/10.46234/ccdcw2021.249>.
- Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med* 2010;363(27):2587 – 99. <http://dx.doi.org/10.1056/NEJMoa1011205>.
- Przybyla S, Fillo J, Kamper-DeMarco K, Bleasdale J, Parks K, Klasko-Foster L, et al. HIV pre-exposure prophylaxis (PrEP) knowledge, familiarity, and attitudes among United States healthcare professional students: a cross-sectional study. *Prev Med Rep* 2021;22:101334. <http://dx.doi.org/10.1016/j.pmedr.2021.101334>.
- Shao Y, Li J, Liu A, Yu YP, Chen ZL, Jiang TJ, et al. Analysis of knowledge awareness and service acceptance of HIV non-occupational post-exposure prophylaxis (nPEP) among students in three cities of China. *Chin J AIDS STD* 2020;26(3):259 – 63,272. <http://dx.doi.org/10.13419/j.cnki.aids.2020.03.09>. (In Chinese).
- Beyrer C, Sullivan P, Sanchez J, Baral SD, Collins C, Wirtz AL, et al. The increase in global HIV epidemics in MSM. *AIDS* 2013;27(17):2665 – 78. <http://dx.doi.org/10.1097/01.aids.0000432449.30239.fe>.
- Zheng YH, Xie Y, Wei W. Awareness, willingness to use and influencing factors of HIV pre-exposure prophylaxis amongst men who have sex with men in Shanghai. *Prac Prev Med* 2021;28(7):802 – 6. <http://dx.doi.org/10.3969/j.issn.1006-3110.2021.07.008>. (In Chinese).
- Han J, Li J, Wang KR, Jiang TJ, Song B, Wang H, et al. Status and influencing factors of knowledge awareness and service acceptance of HIV non-occupational post-exposure prophylaxis of men who have sex with men among college students among three cities of China, 2019. *Chin J Prev Med* 2020;54(11):1220 – 6. <http://dx.doi.org/10.3760/cma.j.cn112150-20200310-00302>. (In Chinese).
- Siemieniuk RAC, Sivachandran N, Murphy P, Sharp A, Walach C, Placido T, et al. Transitioning to HIV pre-exposure prophylaxis (PrEP) from non-occupational post-exposure prophylaxis (nPEP) in a comprehensive HIV prevention clinic: a prospective cohort study. *AIDS Patient Care STDs* 2015;29(8):431 – 6. <http://dx.doi.org/10.1089/apc.2015.0014>.