

ORIGINAL RESEARCH

A theoretical model influencing the use of pre-exposure prophylaxis in MSM population: a qualitative study from Beijing

Yongbing Sun^{1,†}, Bing Song^{1,†}, Chengqi Liu^{2,†}, Ziyi Lu^{3,†}, Juan Cheng¹, Tianjun Jiang^{1,*}

¹Senior Department of Infectious Diseases, the Fifth Medical Center of Chinese PLA General Hospital, 100039 Beijing, China

²College of Information and Communication Engineering NUC, 030051 Taiyuan, Shanxi, China

³Capital Medical University Eighth Clinical School, 100069 Beijing, China

***Correspondence**

15510193244@163.com;

aba302@163.com

(Tianjun Jiang)

[†] These authors contributed equally.

Abstract

Background: Men who have sex with men (MSM) represent a key population in China's efforts to reduce the spread of Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS). Despite the effectiveness of pre-exposure prophylaxis (PrEP) as a preventive measure, its utilization rate among MSM in China remains notably low. **Methods:** This qualitative study investigated factors influencing PrEP usage among MSM in Beijing following the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines. A total of 10 MSM participants were included based on the principle of information saturation. The data were analyzed using Nvivo 10 software based on the Grounded Theory approach, with a coding process consisting of first-level, second-level and third-level coding. **Results:** Several key factors were identified as influencing the adoption of PrEP, including medication side effects, dosing frequency, co-existing sexually transmitted infections, participation in high-risk sexual behaviors and partner attitudes. Additionally, factors such as sexual impulses, understanding of PrEP, economic considerations, and accessibility to purchasing locations also played significant roles. These factors were categorized into three main groups: individual factors, sexual factors and social environmental factors. Based on these findings, a theoretical model was developed to depict the interconnected pathways that influence PrEP utilization among MSM. **Conclusions:** The findings suggest that social workers can play an important role in addressing the barriers to PrEP adoption identified in the model and recommend enhancing the involvement of community workers to facilitate the promotion and uptake of PrEP among MSM.

Keywords

MSM; Qualitative research; Pre-exposure prophylaxis

1. Introduction

Currently, the prevention and control of human immunodeficiency virus (HIV) in China continue to face significant challenges. The Joint United Nations Programme on HIV and AIDS (UNAIDS) established the "95-95-95" treatment targets, which aim to ensure that 95% of individuals living with HIV are aware of their HIV status 95% of those diagnosed with HIV are receiving treatment, and 95% of those on treatment achieve viral suppression [1]. After making significant progress toward the initial "95-95-95" treatment targets, China has proposed an enhanced version, known as "95-95-95-95", which was introduced by various institutions and experts. This updated target adds a fourth component, namely the "comprehensive preventive measures", to achieve 95% coverage across all four targets [2]. These efforts are aligned with the global objective to end the AIDS epidemic by 2030, encapsulated in the slogan "End AIDS by 2030".

As of the end of 2022, there were still 1.223 million People

Living with HIV (PLWH) in mainland China, excluding Hong Kong, Macao and Taiwan. During the same year, approximately 107,000 new HIV cases were reported, with a male-to-female ratio of 3.6:1. Sexual transmission remained the predominant mode of infection, accounting for 97.6% of cases and among these, 72.0% were attributed to heterosexual transmission, while 25.6% were due to homosexual transmission [3]. The report further indicates that the HIV prevalence among men who have sex with men (MSM) is significantly higher than in other populations, with the proportion of heterosexual transmission increased slightly from 71.5% to 72% between 2018 and 2022, while the proportion of homosexual transmission rose from 23.3% to 25.6%. The MSM population in China is characterized by concealment, social sensitivity and limited access to healthcare services, creating ongoing challenges for the Chinese Center for Disease Control and Prevention (CCDC) and other health authorities in obtaining comprehensive epidemiological data and implementing effective interventions [4]. Given these challenges, the MSM

population has become one of the key target groups for the CCDC in efforts to prevent HIV transmission and improve health outcomes.

Pre-exposure prophylaxis (PrEP) is an evidence-based strategy for HIV prevention that involves the use of combined tenofovir disoproxil fumarate and emtricitabine in HIV-seronegative individuals, administered before and during potential HIV exposure to reduce the risk of HIV acquisition [5]. Early feasibility studies in China have consistently highlighted MSM as a high-priority population requiring urgent PrEP intervention [6]. In response, the CCDC initiated research and pilot programs targeting MSM populations in 2018, and a related multi-city study conducted across seven urban areas found that medication costs and safety concerns were significant barriers to PrEP implementation, with a majority of participants recruited from Beijing [7].

Despite these efforts and the international recognition of PrEP as an effective HIV prevention method, its adoption remains low among MSM in China. A recent multicenter cross-sectional study involving 1,800 MSM participants found that, while 91.4% were aware of PrEP, only 8.8% had ever used it [8]. This disparity between awareness and actual utilization suggests that knowledge alone is insufficient to drive widespread adoption. Based on these, several potential factors contributing to this gap have been proposed, including a limited understanding of PrEP among the MSM population and other contextual barriers to access and implementation [9].

Building on these findings, the current study aims to investigate the key determinants influencing PrEP adoption among MSM in China. Through the development of a theoretical model, this study seeks to identify the factors that most significantly affect PrEP utilization, providing evidence-based insights that can inform the development of targeted strategies to increase PrEP uptake among MSM populations in China.

2. Subject and methods

2.1 Design

A descriptive qualitative study was conducted, characterized by its focus on providing a detailed understanding of participants' experiences, with a direct approach to analyzing data without the use of complex abstractions [10]. The study was grounded in the principles of naturalistic research, which emphasizes the importance of describing phenomena based on how participants perceive, interpret and experience them in their natural context [11], following the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines [12].

2.2 Participant recruitment and data collection

The study was conducted from April 2023 to August 2023 at a hospital in Beijing. Given the distribution characteristics of the MSM population in China, a typical case sampling method was used for participant selection [13]. Participants were recruited through a social welfare organization in collaboration with the hospital's HIV outpatient clinic. The inclusion criteria were as follows: (1) Chinese nationality; (2) biological male; (3) lifetime sexual experience with another man; and (4) a negative

HIV antigen test result within the past month. In line with the principle of theoretical saturation, participant recruitment continued until no new information or themes emerged from the data. Based on these criteria, a total of 10 MSM participants were included in the analysis.

YBS was primarily responsible for all data collection and analysis activities. Other team members actively participated in the study's conceptualization and data collection process, providing continuous feedback on data analysis through regular team meetings. YBS, a Chinese male citizen and a master's student specializing in psychology, has worked in the HIV outpatient clinic of the hospital for over three years and has substantial experience in providing psychological counseling to PLWH. Importantly, his professional role did not involve direct interaction with the study participants. The other team members brought diverse experiences related to HIV health, whether through professional work or personal life experiences in China. For data collection, YBS conducted one-on-one, semi-structured in-depth interviews with ten participants, each lasting between 30 to 60 minutes. Before the interviews, all participants provided informed consent, acknowledging their understanding of the study's purpose, potential risks, confidentiality measures, and the voluntary nature of participation. The demographic characteristics of the participants are summarized in Table 1.

TABLE 1. Demographic data of participants.

Participants' demographics	Subgroups	Data, %
Age	<20	0
	20–30	40
	30–40	30
	40–50	20
	>50	10
Education	Junior high school	20
	High school	20
	Junior college	30
	University degree	20
	Master's degree	10
Income (Renminbi)	<5000	30
	5000–10,000	60
	>10,000	10
Acceptable drug prices (Renminbi)	<50	60
	100	10
	200	10
	Free	20

At the beginning of each interview, YBS introduced himself as a cisgender Chinese male psychotherapist conducting research on the use of PrEP among MSM. For participants

who were previously unaware of PrEP, a brief, standardized introduction was provided. The interviews were structured around two main sections. The first section collected basic demographic information, including age, occupation, income, educational background, number of sexual partners and frequency of sexual activity. The second section explored the participants' knowledge, attitudes and intentions regarding PrEP use, as well as the barriers, facilitators and pathways to accessing PrEP services. During this section, YBS asked fixed questions and after each participant's response, he encouraged further elaboration based on their answers. Each participant who completed the interview was compensated with 50 RMB. The information was recorded both audibly and in writing, with the completed data securely stored by the team members. Data collection was concluded when no new information emerged from the interviews.

2.3 Data analysis

The Nvivo 10 software (QSR International, Melbourne, Australia) was used to store and manage the transcribed text data. Team members compared the transcribed audio recordings with the written records to ensure that no information was omitted. Data analysis followed the Grounded Theory method, which involved three stages of coding: first-level coding, second-level coding and third-level coding. In the first-level coding stage, the data were categorized into subcategories. In the second-level coding stage, these subcategories were grouped into main categories. For the third-level coding stage, the main categories were analyzed to derive the research findings and develop the theoretical framework.

2.4 Rigour

To maintain the rigor of the study, the following quality criteria were applied: (1) Credibility: Data analysis was conducted independently by three researchers, and researcher triangulation was performed. Subsequently, two researchers with expertise in qualitative research reviewed the data analysis. (2) Transferability: The study method, location, participant characteristics, and context were thoroughly described to allow for potential transferability of the findings to other contexts. (3) Reliability: An expert in qualitative research, who was not involved in the study, reviewed and confirmed the data

analysis process. (4) Confirmability: After independently reading the transcripts, the researchers reached a consensus on the themes, sub-themes and units of meaning. Additionally, study participants were given the opportunity to review and clarify the interpretation of their transcripts.

Reflexivity was a key consideration throughout the study. Although reflexivity is an inherent part of qualitative research, we took proactive steps to minimize its potential impact by following the guidelines proposed by Virginia Braun and colleagues [10]. Before the study began, team members participated in relevant training. Additionally, regular team meetings were held to share experiences and backgrounds, which contributed to the development of the interview guide. These discussions included considerations on the study's design, methodology and other relevant aspects. The interview guide is presented in Table 2.

3. Results

After organizing the collected data, 13 first-level codes were identified. After grouping similar first-level codes, 9 second-level codes were generated. Subsequently, the analysis of the second-level codes led to the derivation of 3 third-level codes, which formed the basis for the development of a theoretical model.

3.1 First level codes

The first-level codes, derived through detailed conversation and data organization, are summarized in Table 3. These codes represent the key factors influencing the use of PrEP as identified through participant responses.

3.2 Second-level codes

Based on the 13 first-level subcategories, further analysis and synthesis resulted in the identification of 9 second-level codes, classified as second-level codes, namely Health Damage, Frequency of Medication, Other Sexually Transmitted Diseases, Promotion of High-Risk Sexual Behavior, Attitude of Sexual Partners, Sexual Impulse, Economic Factors, Knowledge and Understanding and Place to Receive Medication. These codes are summarized in Table 3.

TABLE 2. Interview guide outline.

	Age
Basic information	Occupation Income Education Acceptable drug prices
	How did you learn about PrEP related information?
	Are you willing to use PrEP?
Factors influencing the decision to use PrEP	What do you think is hindering the use of PrEP?
	How do you think PrEP should be better popularized?
	How do you think we can better provide these services?

United Nations Programme on HIV and AIDS. PrEP: pre-exposure prophylaxis.

TABLE 3. Three-level encoding subcategory diagram.

Third level code	Second level code	First level code
Individual factors	Health Damage	Side effects are unsafe
	Frequency of medication	It requires continuous adherence
	Other sexually transmitted diseases	Get other venereal diseases
	Promote high-risk sexual behavior	Can you prevent other sexually transmitted diseases
Sexual factors	Attitude of sexual partners Sex impulse	Even less with condoms
		Attitude of sexual partners
		Impulse
		I haven't heard of this
Social and environmental factors	Knowing and understanding Economic factors Place to receive medication	Need advertising
		Free
		Medical expenses economic grant
		Subsidies or gifts
		Unwilling to collect medications at the hospital

3.2.1 Health damage (Drug side effects)

Several participants expressed concerns about the side effects of PrEP, which they believed could influence their decision to use the medication. Participant A4 stated, "I will be worried about the negative impact; my liver is not good". A5 commented, "That medicine will definitely harm the body". A7 mentioned, "It seems that it is said that medicine is three parts toxic, and there will always be some small negative effects on the body, so if you can avoid it, you should avoid it". A8 also expressed hesitation, saying, "Perhaps it's because I don't know much about this thing, but I think it's better to eat less medicine".

3.2.2 Frequency of medication

The frequency of taking PrEP was also identified as a barrier to its use. Participant A2 noted, "This thing is actually difficult to say, because everyone is different, and some may forget to take it when they are busy with work". A3 similarly shared, "Maybe I could still remember at that time, but in a day or two, I probably forgot about it". Participant A8 added, "It requires continuous adherence", indicating that the issue of consistent medication adherence remained a concern.

3.2.3 Other sexually transmitted diseases

Participants also pointed out that PrEP does not protect against other sexually transmitted infections (STIs) compared to condoms. Participant A9 explained, "Compared with wearing condoms, condoms can actually prevent a variety of sexually transmitted diseases, including AIDS. But although you can say that you don't have to wear condoms, this drug only blocks the spread of AIDS, but it will not affect other diseases".

3.2.4 Promotion of high-risk sexual behavior

Participants also expressed concerns regarding the potential for PrEP to promote high-risk sexual behavior. Participant A2 commented, "People may become more reckless in engaging with high-risk individuals. Its increased use might also put more people at risk of participating in high-risk sexual behavior".

3.2.5 Attitude of sexual partners

Most participants indicated that their sexual partner's attitude towards PrEP use could significantly influence their own decision to use it. Participant A2 shared, "If he asked me to use it, I'll use it", highlighting the influence of a partner's encouragement.

3.2.6 Impulse

Participants noted that taking medication during periods of impulsive behavior could be challenging. Participant A5 explained, "If it's a courier delivery, the waiting time is too long, even those in a hurry can't wait". Similarly, A6 stated, "Many times, when two people are together, they might wear a condom or take the medicine as you suggested. But when people are caught up in the moment, they don't even care". Participant A7 added, "If two people are fixed companions, they may not even consider it".

3.2.7 Knowing and understanding

Understanding what PrEP is and how it works is crucial. In the interviews, participants expressed varying levels of knowledge. A1 and A9 believed that PrEP is a form of post-exposure prevention. A5 had heard of it from friends, and A7 had some understanding of it. Other participants mentioned that they had not heard of it before. Participant A8 learned about PrEP from volunteers. A1 explained, "I know, every time they go, they talk a lot and I can't remember clearly. I just remember some key points, like taking the medication within three days is effective". Participant A5 shared, "I've heard about it from a friend, but I'm not sure about the specifics". A7 stated, "I've learned more about it from product promotions on official accounts, Xiaolan, or some detail pages, or personal media like TikTok". Participant A8 noted, "There are some so-called volunteers who mention it on certain occasions". Participant A9 commented, "I haven't heard of this". Participant A6 suggested, "There needs to be more publicity, such as on BlueD or TikTok, so it becomes more famous".

3.2.8 Economic factors

The cost of PrEP was a significant consideration for many participants. Participant A1 mentioned, “If it costs under 200 yuan for a session, it would be acceptable”. A3 added, “If it costs more than buying a box of condoms and lubricant, why should I buy the medicine?”. A4 suggested, “If there were subsidies, such as for phone bills, APP memberships or gifts, it would attract many people”. Participant A5 commented, “If it’s free, I’d still consider it”. A6 stated, “50–100 yuan per session seems reasonable”. A7 reflected, “It feels more expensive than a set, but it’s still cost-effective if it’s under 250 yuan per session”. Participant A8 remarked, “30 times, please”. A9 mentioned, “A total of 20 yuan for these”.

3.2.9 Location to obtain medication

The participants expressed varying opinions about where it would be acceptable to receive PrEP. Many participants agreed that receiving it from WeChat groups, Taobao, pharmacies, express delivery services, vending machines or inspection points would be acceptable. However, opinions were divided when it came to receiving PrEP at hospitals. Participant A1 stated, “WeChat, Taobao and pharmacies are all fine, but the hospital makes me feel a bit embarrassed”. Participant A4 shared, “Express delivery and vending machines are acceptable, but hospital sales are not”. A6 remarked, “I would prefer to pick it up at the hospital or testing point”. In contrast, A8 said, “Hospitals are quite troublesome”.

3.3 Theoretical model

For the MSM population, factors influencing the use of PrEP can be categorized into three main components: Individual factors, Sexual factors and Social and Environmental factors. Each of these components independently affects PrEP usage, while there is also an interrelationship among them. The

theoretical model illustrating these factors is shown in Fig. 1.

4. Discussion

This study highlights that the popularization and adoption of PrEP in Beijing continue to face significant challenges. While awareness of PrEP is widespread among the MSM population, only a small proportion have adopted it as a preventive measure. This trend is consistent within the Beijing MSM community and aligns with findings from previous studies [13]. Most studies on PrEP use among Chinese MSM have been quantitative, with limited qualitative research in this area. In contrast, this study employs a qualitative approach and is the first to develop a model incorporating individual, sexual and social environmental factors to explain this phenomenon.

The results of this study demonstrate that individual factors, sexual factors, and social environmental factors all play a role in influencing an individual’s decision to use PrEP. Among the individual factors, concerns about the potential side effects of the medication on health emerged as a primary deterrent, a finding consistent with existing literature [14]. Additionally, the frequency of medication intake was identified as another significant factor. Previous studies have shown that many MSM prefer more convenient preventive options [15, 16], such as on-demand or injectable regimens, which have become increasingly popular [17, 18].

Sexual factors, including sexual partners’ attitude, also emerged as a key influence on PrEP adoption. The MSM population and individuals living with HIV/AIDS in China experience considerable psychological stress [19], which promotes closer relationships within peer groups. Therefore, the MSM population tends to place greater trust in advice from individuals with similar sexual preferences. These findings are consistent with previous research, which suggests that trust between sexual partners can enhance adherence to

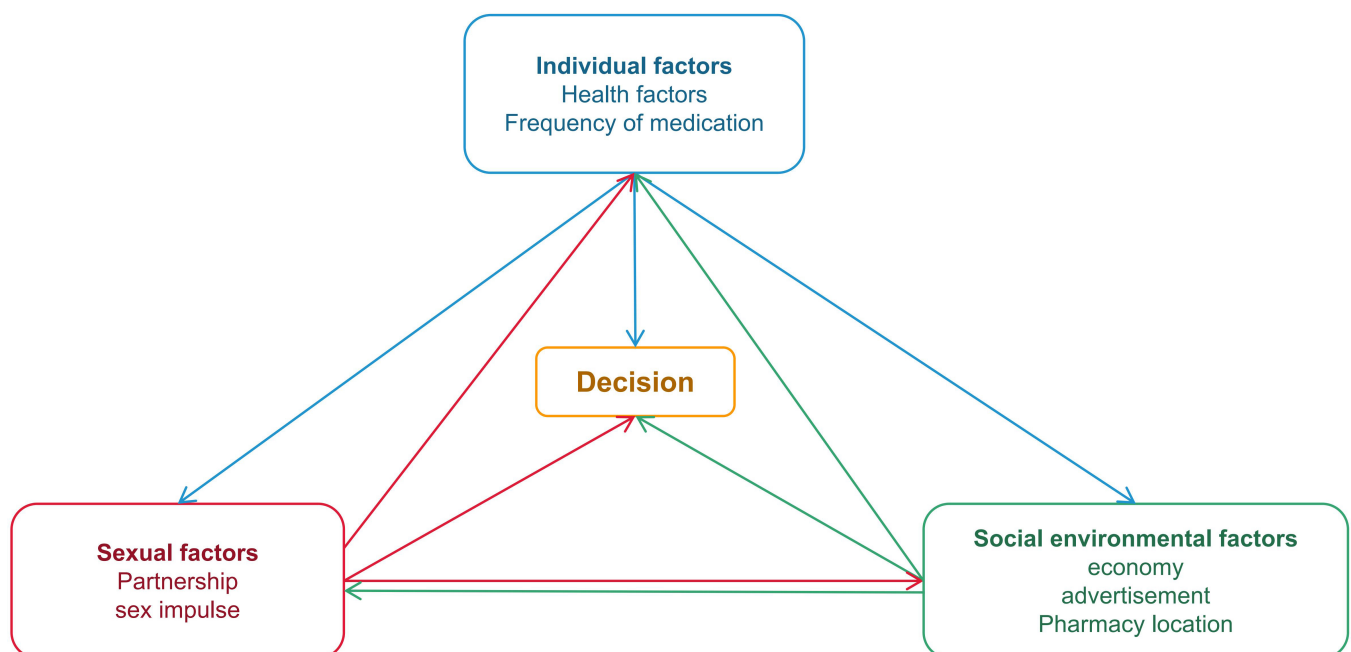


FIGURE 1. Theoretical model diagram showing factors affecting PrEP usage.

PrEP [20, 21]. Therefore, strategies aimed at strengthening partner education and fostering peer support may enhance PrEP compliance within the MSM community.

The third major factor influencing PrEP use is social environmental factors, with economic considerations being a key component. Previous research has identified the cost of medication as a critical barrier to both the intention to use and adherence to preventive drugs. Most participants in this study indicated that the cost of PrEP should not be excessively high [22]. To address this challenge, introducing commercial insurance options could help alleviate the financial burden associated with PrEP use [23].

In terms of providing pharmaceutical services, the current situation in China suggests that relying on testing points for the distribution of PrEP can increase the willingness of MSM to use the medication [24]. Some participants expressed resistance to obtaining medication from hospitals, which may be related to stigma. On the other hand, testing points operated by public welfare organizations and community centers were seen as more acceptable by MSM participants [25].

Moreover, while the majority of MSM are aware of PrEP, their understanding of the medication remains limited. This finding is consistent with previous research [26]. The reasons for this limited understanding are multifaceted. A study conducted in the US found that public health information dissemination tends to be slower within minority groups compared to the general population [27]. To address this issue and accelerate the dissemination of information, it is essential to diversify public health communication methods, expand communication channels and increase investment in outreach efforts. Additionally, improving the appeal of advertising content and providing clear information about drug side effects are important strategies to enhance communication effectiveness [28].

5. Limitations

Several limitations should be considered when interpreting the findings of this study. First, the research exclusively recruited MSM from Beijing, which may limit the generalizability of the results. As the capital of China, Beijing has significant economic, cultural, and social welfare differences compared to other regions in the country. These regional variations may lead to subtle differences in the study outcomes. For example, MSM residing in Beijing tend to have higher incomes than those in other regions, which suggests a greater capacity to tolerate certain costs within this demographic.

6. Conclusions

In conclusion, individual factors, sexual factors, and social environmental factors have been found to play significant roles in the decision-making process regarding PrEP use among MSM in Beijing. This study highlights the important role that community workers play in addressing these diverse factors. Considering that they are at the forefront of HIV prevention efforts, community workers can provide a range of services, including promotion, education, data collection, information monitoring and health surveillance [26, 29]. They can im-

prove MSM engagement by offering comprehensive information about PrEP to enhance understanding, providing peer education, organizing relevant activities, and establishing accessible venues for testing and medication distribution to facilitate the wider adoption of PrEP among MSM populations. Moreover, we recommend that healthcare professionals, including doctors, nurses and physicians, prioritize HIV prevention education during interactions with MSM who engage in high-risk behaviors but are HIV-negative. Emphasizing the importance of PrEP as a critical preventive measure should be part of these discussions. Finally, to further substantiate and extend the findings of this study, we propose the establishment of a larger MSM cohort study, incorporating quantitative methods, controlled trials, or other appropriate research approaches.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTIONS

YBS, CQL, ZYL and TJJ—designed the research study. YBS, BS and JC—performed the research. TJJ—provided help and advice on the all parts. YBS—analyzed the data. YBS, CQL and ZYL—wrote the manuscript. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. This study was reviewed and approved by the Ethics Committee of The Fifth Medical Center of Chinese PLA General Hospital (KY-2023-6-41). Informed consent was obtained from all individual participants included in the study.

ACKNOWLEDGMENT

Authors thank the Ministry of science and technology of China for supporting this study.

FUNDING

This study was funded by the (National Key R&D Plan) (2022YFC2305004).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Yongbing Sun, Bing Song, Chengqi Liu, Ziyi Lu, Juan Cheng, Tianjun Jiang. A theoretical model influencing the use of pre-exposure prophylaxis in MSM population: a qualitative study from Beijing. *Journal of Men's Health*. 2025; 21(6): 117-123. doi: 10.22514/jomh.2025.087.