



Pre-Exposure Prophylaxis Users' Attitudes About Sexually Transmitted Infections and Its Influence on Condom Use: A Mixed-Method Study in Belgium

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Abstract

Incidence rates of sexually transmitted infections (STIs) are rising among men who have sex with men (MSM). Since the rollout of HIV pre-exposure prophylaxis (PrEP), promoting condom use to prevent the spread of STIs has become more challenging. Using a mixed-method design, we explored MSM PrEP users' attitudes toward STIs, condoms, and condom use with nonsteady partners to prevent STIs. We triangulated data from 22 in-depth interviews conducted at a large HIV/STI clinic between August 2021 and January 2022 and an online survey among 326 PrEP users between September 2020 and January 2022. Interviews were analyzed iteratively using a thematic analysis approach. We used bivariate and multi-variate ordered logistic regression to analyze the online survey data. Themes identified in the qualitative data influencing condom use decisions to prevent STIs were as follows: (1) awareness (i.e., perceived severity of and susceptibility to STIs, condom counseling), (2) motivation (i.e., concerns about STIs, sexual pleasure and protection of own health), and (3) perceived social norms and practices (e.g., reduced condom use at community level). Overall, 10.7% of survey respondents consistently used condoms with nonsteady partners. Survey respondents who reported high or moderate levels of willingness to use condoms to prevent acquiring STIs were significantly more likely to use condoms for anal sex with nonsteady partners; those who initiated PrEP 6–12 months ago were less likely to use condoms. We found a wide variation in attitudes toward condom use for the prevention of STIs among MSM using PrEP. We recommend client-centered approaches, taking into account PrEP users' values and priorities toward STI prevention to help reduce the spread of STIs.

Keywords: condom use, PrEP, STIs, STI prevention, counseling, attitudes

Introduction

ORAL HIV PRE-EXPOSURE PROPHYLAXIS (PrEP) is highly effective to prevent HIV, and has contributed to the declining trend of new HIV diagnoses among men who have sex with men (MSM) in Europe.¹ However, PrEP does not protect against other sexually transmitted infections (STIs),

such as gonorrhea, chlamydia, or syphilis. Rising rates of these STIs among MSM are posing a public health concern in many countries.²⁻⁵

Condoms remain one of the most effective tools to prevent STIs.⁶ However, promoting consistent condom use to prevent STI acquisition has become more challenging in the era of “treatment as prevention” and the rollout of PrEP.⁷⁻⁹ It was

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recommended that PrEP should be provided as part of a combination prevention strategy, that is, complementary and not as a replacement to condoms.¹⁰ However, various PrEP implementation studies among MSM have demonstrated reduced condom use for anal sex with nonsteady partners among their participants.^{11–13} An Australian study also demonstrated a community-level decrease in consistent condom use among MSM, alongside an increase in PrEP use.¹³ Hence, it remains unclear to what extent PrEP users are willing to combine condoms with PrEP for the prevention of STIs other than HIV and how they take these decisions.

Several studies assessed the knowledge of MSM concerning STIs.^{14,15} However, few studies explored their attitudes toward such STIs. HIV is generally considered the most severe STI.¹⁶ Recent qualitative research demonstrated that MSM also have concerns toward hepatitis C and antibiotic-resistant STIs.^{17,18} However, another study reported that many PrEP users have become indifferent toward STIs.¹⁹ A latent class analysis study among gay and bisexual men using PrEP indicated a high proportion of PrEP users being highly concerned and at higher risk considered STIs to be a serious health issue.²⁰ As condom use among PrEP users is likely to be influenced by how they perceive STIs,^{20,21} it is important to better understand these heterogeneous perceptions toward STIs.

In this complex prevention context, our objective was to explore their attitudes toward STIs and condoms and how these attitudes influence their condom use with nonsteady sexual partners as a method to prevent STIs. These insights may help to improve and tailor STI prevention counseling for PrEP users.

Methods

Study design

We adopted a convergent, parallel mixed-method study design.²² The qualitative strand included in-depth interviews among PrEP users of a large Belgian HIV/STI clinic between August 2021 and January 2022. For the quantitative strand, we collected data through an online longitudinal survey among PrEP users living in Belgium between September 2020 and January 2022. We simultaneously developed the baseline questionnaire and interview topic guide, ensuring that they addressed the same concepts. Insights from one strand led to new or refined questions in the other strand in subsequent data collections, and vice versa. We combined both data sources for a complete understanding of the research question, and jointly interpreted the results to compare and contrast the findings.²²

Data collection

Qualitative data collection. We conducted 22 in-depth interviews with PrEP users. We purposively selected potential interviewees based on their answers in a routine follow-up questionnaire for PrEP users at the HIV/STI clinic. To maximize variation in perceptions and experiences, we purposively selected them based on self-reported PrEP use (i.e., daily, intermittent for long periods, intermittent for events, interrupted use), and condom use with nonsteady partners (i.e., never, sometimes, always). The topic guide included questions on PrEP and condom use, sexual behavior, STI

prevention strategies, and attitudes toward condoms and STIs. Upon verbal consent, interviews were either conducted online, or in-person by researchers (A.R. or T.R.) trained in qualitative research. All interviews were audio-recorded and transcribed verbatim, except one interview as the interviewee refused audio-recording.

Quantitative data collection. We recruited participants for the online longitudinal survey through social media channels of MSM community organizations, HIV/STI clinics, and social and sexual networking apps such as Grindr. Participants had to be 16 years of age or older, have a self-reported HIV-negative or unknown serostatus, live in Belgium, and have used PrEP in the 6 months before filling in the baseline questionnaire. Eligible participants were instructed to complete the questionnaire using questionnaire logics. We invited those who consented to be contacted to complete two online follow-up questionnaires at 6-month intervals. Questionnaires were available in Dutch, French, and English.

We collected sociodemographic information on age (year of birth), sex assigned at birth (male or female), nationality (born in Belgium), education [none, primary, secondary, or higher (<3 or more than 3 years)], relationship status (having a steady partner), and sexual attraction (men, women, trans men, trans women, none of these, or other). For this analysis, we only assessed baseline data regarding condom use in the preceding 3 months (never, sometimes, or always) during anal sex with anonymous and casual partners, STI acquisition in the preceding 6 months (yes/no), PrEP regimen in the preceding 3 months (daily, on demand, or none), and PrEP start (less than 6 months, 6–12 months, 12–24 months, and more than 24 months ago).

An anonymous sex partner was defined as a person who “you do not know or you just got to know.” A casual sex partner was described as a person with whom “you have regular sex but not a steady relationship, but who is not anonymous.” We further refer to both partner types as nonsteady partners. In the baseline questionnaire, five 11-point Likert items assessed participants’ attitudes toward condoms and STIs. The second follow-up questionnaire included one 11-point Likert item to rate concerns about acquiring resistant STIs (Appendix Table A1). Further, we assessed their strategies for avoiding STIs in the first follow-up questionnaire. Research on PrEP and sexual health guided the composition of questions and the Likert items.^{11,23} The questionnaires were pilot tested within the research team and volunteering MSM community representatives.

Data analysis

Qualitative data analysis. Qualitative data were collected and analyzed iteratively using a thematic analysis approach²⁴ and Nvivo12.²⁵ We inductively developed an initial coding scheme. Subsequently, we re-analyzed all interviews with the focus on finding patterns for using condoms with nonsteady partners to avoid STI acquisition. In correspondence with the online survey, we divided interviewees into three groups based on their reported condom use with nonsteady partners, respectively, “never,” “sometimes,” and “always.” We re-read all interviews to identify factors influencing these condom use patterns. Next, these factors were refined, and themes were combined into an explanatory

framework through discussion with members of the research team. We compared the qualitative results with the findings from the quantitative data analysis to seek similarities or contradictions.

Quantitative data analysis. We included 326 fully completed baseline questionnaires in the analysis. Respectively, 208 and 187 respondents completed the first and second follow-up questionnaire. We recoded the 11-point Likert items exploring attitudes toward condoms and STIs at baseline as follows, so that 0–3 denotes “no/low”; 4–6 “medium/neutral”; and 7–10 “high.” We recoded baseline condom use with anonymous partners and condom use with casual partners as condom use with nonsteady partners into three categories, that is, “never,” “sometimes,” or “always.” We examined associations between condom use for anal sex with nonsteady sex partners (i.e., outcome), STI acquisition, PrEP regimen, PrEP start, and attitudes toward STIs and condoms assessed at baseline, using bivariate and multi-variate ordered logistic regression analyses. The reference category in the analysis was never using a condom. We used R statistical software version 4.0.2.²⁶

Ethical approval

The study received ethical approval through the Institutional Review Board of the Institute of Tropical Medicine, Antwerp (IRB 1380/20 and IRB 1352/20).

Results

Sociodemographic profiles and reported condom use

Interviewees and survey respondents were comparable in terms of sociodemographic factors (Table 1). At the time of interview, 12 interviewees were taking PrEP on demand and 10 daily. At baseline, about half the survey respondents (50.6%) had used on-demand PrEP in the preceding 3 months. Less than half the respondents (45.6%) had started taking PrEP more than 2 years ago. In the preceding 6

TABLE 1. BASELINE CHARACTERISTICS OF IN-DEPTH INTERVIEW AND ONLINE SURVEY PARTICIPANTS, STUDY ON PRE-EXPOSURE PROPHYLAXIS USERS' ATTITUDES ABOUT SEXUALLY TRANSMITTED INFECTIONS AND CONDOMS, BELGIUM, 2020–2022

	<i>In-depth interviews</i> n = 22 n (%)	<i>Online longitudinal survey</i> n = 326 n (%)
Age in years, median (IQR)	43 (39–49)	42 (34–50)
Male	22 (100.0)	323 (99.1)
Born in Belgium	15 (83.3)	279 (85.6)
Higher education ^a	15 (83.3)	266 (81.6)
Having a steady partner	11 (50.0)	164 (50.3)
Sexually attracted to men	22 (100.0)	322 (98.8)

Data missing in born in Belgium ($n=4$) and education ($n=4$).

^aHigher education includes higher education long type (i.e., more than 3 years) and short type (i.e., 3 years or less).

IQR, interquartile range.

months, 30.1% ($n=98$) reported having had an STI (Appendix Table A2).

Most interviewees reported less condom use with steady partners than with nonsteady partners. Nine interviewees reported to have completely abandoned condom use. Two always combined PrEP with condoms for sex with nonsteady partners and 11 reported to occasionally use condoms and PrEP concurrently. The proportion of survey respondents at baseline indicating never having used a condom during anal sex in the preceding 3 months varied from 87.6% with steady partners to 46.4% for casual partners and 43.6% for anonymous partners.

Qualitative results

We identified three themes of factors influencing condom use to prevent STI acquisition, presented as an explanatory framework (Fig. 1): (1) awareness, (2) motivation, and (3) perceived social norms and practices. Where appropriate, we refer to the quantitative findings for comparison.

Awareness

Perceived severity of STI. Interviewees perceived STIs, particularly asymptomatic STIs, as causing little to no discomfort or harm, and thus as less severe. A few interviewees explained that they found STIs less severe for men, compared to women as they could become infertile when infected. All interviewees made a major distinction between HIV and the “other STIs,” since HIV can cause irreversible harm and is not curable. Some interviewees were primarily concerned about HIV and therefore considered condoms as a redundant prevention option when using PrEP, making condoms superfluous.

A number of interviewees considered hepatitis C the most serious compared to other STIs, because they perceived it to be a chronic disease more difficult and expensive to treat. Some interviewees also reported concerns regarding the emergence of resistant, nontreatable STIs such as gonorrhoea, which was corroborated by the quantitative findings (*See below: quantitative finding A*). However, they did not perceive this resistance as an immediate threat.

“With the resistant gonorrhoea that is coming, I also have [...] the idea: ‘Yes, we may have to start doing it a bit more carefully again’, with what we do and condom use’. But is that something that keeps me awake? No, not so much. Certainly not compared to HIV in the past.”

(never uses condom)

Perceived susceptibility to STIs. In general, interviewees believed that their susceptibility to STIs had increased since PrEP due to the overall reduced use of condoms (*See below: quantitative finding B*).

Reported strategies for reducing susceptibility. Interviewees who used condoms sometimes explained that their use depended on the situation: for example, if the setting did not allow discussing HIV or PrEP status (e.g., in saunas or sex clubs), they would opt for condoms. Likewise, they used condoms more often with anonymous sex partners due to a lack of trust (*See below: quantitative finding C*).

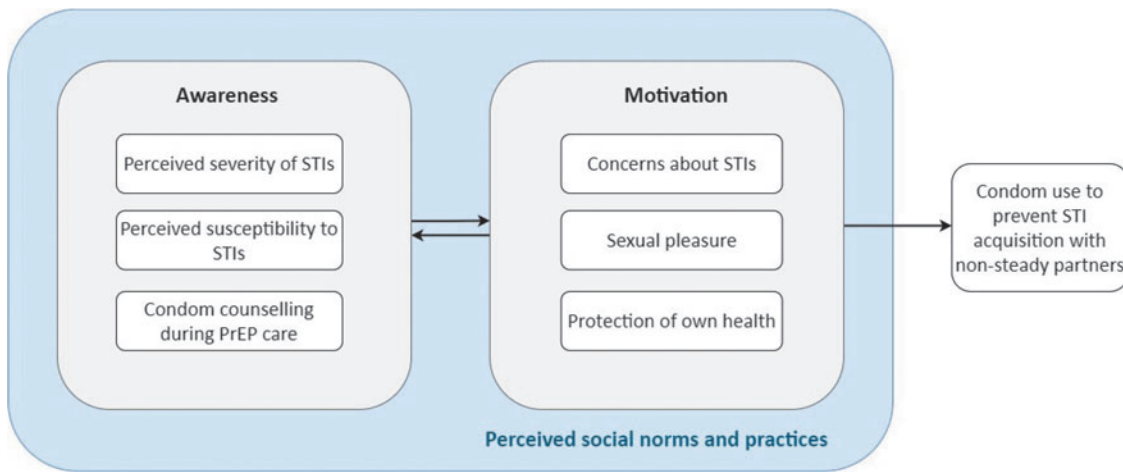


FIG. 1. Explanatory framework: factors influencing condom use behavior with nonsteady partners to prevent STI acquisition among PrEP users. PrEP, pre-exposure prophylaxis; STI, sexually transmitted infection.

“That [condom use] is so dependent on trust, the sex partner on that front. Even though that is just a ridiculous, utopian reasoning, but yes, if I don’t feel 100% confident about it I’m going to ask [to use a condom].”

(sometimes uses condom)

Interviewees reported various strategies for deciding to use a condom, such as self-defined criteria (e.g., physical appearance of a person or their anticipated sexual behavior), visually checking for clues that may indicate the presence of STIs, and asking about PrEP use. For example, they considered PrEP users to be safer due to regular HIV and STI testing.

“But I do want to know a little bit who that person is. And you can immediately, if you are a bit smart, figure out what kind of person that is. And also of course ask, ‘Are you taking PrEP?’ And then if we’re both on it [...] I also know that the person knows roughly what STIs they might contract or have. So they get screened. Then I dare to say: ‘Okay, we’ll do it without [condoms].’”

(sometimes uses condom)

Some interviewees, irrespective of their condom use, avoided certain sexual activities (e.g., no oral or anal sex when they did not trust their partner) or settings (e.g., sex clubs, saunas) or type of partners (e.g., only having sex with casual partners and not with anonymous partners) as they associated these practices with increased STI risk.

“I’m pretty picky anyway. I’m really not going to have sex with anyone and everyone. That might be much easier, but then I think the chances would be much higher for acquiring STIs.”

(sometimes uses condom)

Nonuse of condoms for oral sex increases susceptibility. Although oral sex was recognized as an STI transmission mode, none of the interviewees, except for one, used condoms during oral sex. They reported that condom use for oral sex was not practiced among MSM. Interviewees who never or only sometimes used condoms explained that because STIs can also be transmitted through oral sex, they were less eager to also use them for anal sex.

“Yes, it [a condom] will save a lot, but it doesn’t stop everything. People also need to know that if they use a condom, they shouldn’t think of it as: ‘No problem, because I used a condom.’ That’s definitely not the case. I think that’s in most people’s mind: ‘Condom, no problem.’ But then they don’t use it for oral sex, for example. I think they really assume, only condom for penetration and then they’re protected for other STIs, they’re going to be very deceived.”

(sometimes uses condom)

Perceived susceptibility based on STI diagnoses. While some interviewees reported regular STI diagnoses, others reported having never or rarely been diagnosed, despite never using condoms. They alluded this to being lucky, or considered the risk to acquire an STI to be low. Interviewees never using condoms and regularly diagnosed with an STI considered themselves highly susceptible, but it did not motivate them to change their condom prevention behavior permanently.

“Yes, then [after STI diagnosis] you notice that there is a dip in sexual activities. But at some point, that first date takes place again and then that is all forgotten rather quickly. People forget rather quickly.”

(never uses condom)

Counseling on condom use as part of PrEP follow-up. Interviewees reported different experiences with counseling on condom use during their PrEP visits, ranging from no counseling to discussing its frequency for reinforcing that PrEP should be combined with condoms. Although some interviewees personally did not feel the necessity to receive such counseling, the majority agreed that it remained important to create awareness of the presence and risks of STIs and how condoms can prevent them. However in general, interviewees agreed that regular condom counseling would not change their own condom use. Some suggested that counseling should be targeted to the younger generation, should only be given at PrEP initiation or to individuals with a higher sexual risk behavior or STI history.

“Does that [condom counselling] have to be said? Yes, I do think that people who are often the receptive sexual partner [...] can get a lot of virus or infections. They have a higher risk. They might think to themselves: ‘Sorry, I don’t feel like overloading the system, making myself resistant to that one antibiotic [...]’ So then I think you have to do it [condom counselling]. But it depends: ‘What does your history look like?’”

(sometimes uses condom)

Motivation

Concerns toward STIs. Overall, interviewees generally perceived STIs as unpleasant and undesirable. The degree of concern regarding acquiring an STI varied among the interviewees, which was corroborated by the quantitative findings, but in general, they were not worried about it (See below: quantitative finding D).

“Just to avoid confusion: I absolutely do not like having an STI. It is a hassle and a very painful hassle sometimes. [...] Do I worry about that? Yes and no.”

(sometimes uses condom)

Sexual pleasure. Interviewees considered condoms as useful, providing safety, and effective to protect against STIs and valued their existence in that regard. However, they also considered using condoms to be a hassle and impractical (See below: quantitative finding E). All interviewees experienced sex without a condom as more pleasurable. Many saw putting on a condom as a barrier for intimacy between sexual partners. Moreover, for some, condom use resulted in losing an erection. Another frequently reported disadvantage of condoms was the potential of condom failure (e.g., breaking or sliding), while PrEP offered reassurance in such situations. Those never or sometimes using condoms, while being on PrEP, felt that the risks of acquiring STIs did not outweigh the sexual pleasure and convenience of condomless sex.

“A condom is still the best tool to prevent STI. I am convinced of that, but it is an inconvenient means. It is a means that is not pleasant to use, so if possible I don’t use it.”

(never uses condom)

Protection of own health. While all interviewees were aware that PrEP does only protect against HIV, only interviewees highly motivated to avoid STI acquisition always used a condom combined with PrEP (See below: quantitative finding F).

“Continuing with a condom. PrEP still doesn’t protect against STIs. [...] I think [condom use] is still 100% part of the sex life [...] also with PrEP.”

(always uses condom)

Interviewees often mentioned the responsibility to decide for themselves how safely their sex should be. Some interviewees stated that taking PrEP and putting on a condom ensures that they are independently protected from STIs.

“But since I take PrEP and always use a condom, I don’t need to have any confidence in the other one. So in that sense, maybe the comfort is there. That you shouldn’t trust anyone blindly when that person says: ‘I’m okay.’”

(always uses condom)

In contrast, several interviewees never or sometimes using a condom perceived STIs as part of their sexual lifestyle, which included dating multiple partners or having condomless sex, thus leading to a decreased motivation to use condoms.

“That [STIs] is simply an effect of life. Those STIs are out there. You can contract them and then you try to factor that into your condom use. But then in the end you don’t.”

(never uses condom)

Perceived social norms and practices

Interviewees reported that they knew many MSM who had abandoned condom use. Moreover, they explained that discussing safe sex among sexual partners no longer entailed asking about condom use, but had now shifted to asking about PrEP use. If someone uses PrEP, it is often automatically assumed that sex will be condomless. Many interviewees explained that this implicit norm also decreased the likelihood of using condoms.

“And the thing is, the perception is there: if you use PrEP, you don’t have to use a condom anymore.” (never uses condom)

This trend did not influence interviewees who always used a condom. One of them talked about even refusing to have sex with a partner who rejected to use a condom. In contrast, if a sex partner requested a condom, interviewees in general would agree on using one.

Quantitative results

In accordance with the qualitative data, concerns toward STIs and self-perceived risk of acquiring STIs varied also among survey respondents. Nearly half of them reported to be highly concerned ($n = 157$, 48.2%) to acquire an STI, whereas 18.7% were not or slightly concerned (See above: qualitative finding D). During the third survey, 78 respondents (41.7%) reported to be highly concerned to acquire a resistant STI (See above: qualitative finding A).

At baseline, half the survey respondents ($n = 162$, 49.7%) perceived themselves at high risk to acquire an STI (See above: qualitative finding B). Condoms were considered highly burdensome among 60.7% ($n = 198$) of the respondents (See above: qualitative finding E). While 212 (65.0%) respondents found it highly important to protect themselves against STIs, 14 (4.3%) indicated they did not find this important. Respectively, 39.9% ($n = 130$) and 34.0% ($n = 111$) reported high to medium degrees of willingness to use a condom to limit the risks of getting an STI (See above: qualitative finding F) (Fig. 2).

The main reported strategies to avoid STIs in the first follow-up questionnaire ($n = 208$) were either asking their sex partner when they were last tested for STIs ($n = 89$, 42.8%) and whether they had an STI ($n = 77$, 37.0%). Almost 23% ($n = 47$) used a condom to prevent STIs during anal sex and 26.0% ($n = 54$) used a condom with sex partners of whose STI status they were not sure. One-third of the first follow-up survey respondents indicated they were not consciously avoiding an STI ($n = 69$, 33.2%) (See above: qualitative finding C).

At baseline, 272 (83.4%) survey respondents reported they had anal sex with nonsteady partners in the preceding 3 months. Among these, 113 (41.5%) reported never using a condom, 130 (47.8%) sometimes, and 29 (10.7%) always.

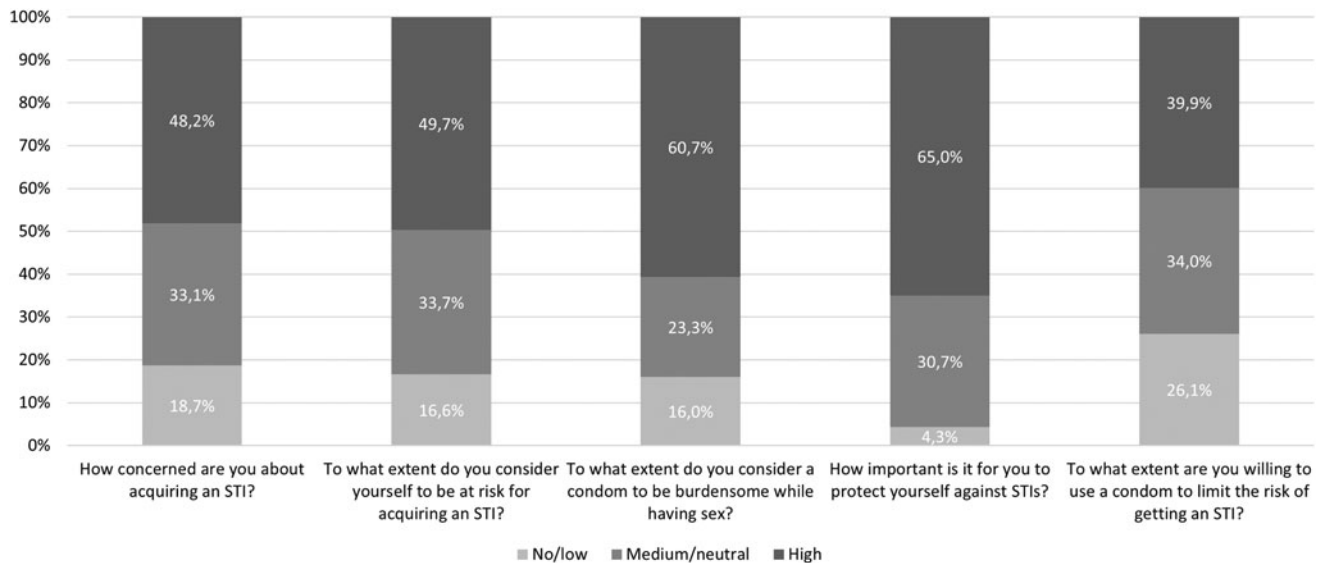


FIG. 2. Attitudes toward STIs and condoms among baseline online survey respondents ($n=326$), study on PrEP users' attitudes about STIs and condoms, Belgium, 2020–2022.

In the multi-variate ordered logistic regression analysis, those who reported high [adjusted odds ratio (aOR)=10.85, 95% confidence interval (CI) (4.73–25.94), $p<0.001$] or moderate [aOR=3.21, 95% CI (4.73–6.56), $p=0.001$] levels of willingness to use a condom to prevent acquiring STIs were significantly more likely to use condoms for anal sex with nonsteady partners compared with their counterparts. Those who initiated PrEP 6–12 months ago [aOR=0.29, 95% CI (0.09–0.94), $p<0.05$] were less likely to use a condom compared with those who initiated PrEP <6 months ago, when holding constant all other variables (Appendix Table A2).

Discussion

The PrEP users in our study varied in their concern toward STIs, motivation and willingness to use a condom to prevent them. Most study participants perceived the need for condoms to be lower due to PrEP use, resulting in no or casual condom use for anal sex with nonsteady partners. This low perceived need resulted from balancing perceived severity of, susceptibility to, and concerns toward STIs against sexual pleasure of condomless sex, protective benefits of condoms, and perceived social norms and practices.

Condoms were considered an important strategy to avoid STIs during anal sex with nonsteady partners among participants who were highly motivated to prevent STIs other than HIV, when a sexual partner or venue was associated with a higher HIV or STI risk, or when a sexual partner insisted to use a condom. Educational condom counseling was perceived as having minimal impact on own condom use, yet considered necessary for some people and sexual practices.

Concerns to acquire STIs varied both among online survey participants and interviewees. This is in contrast to a study among male couples living in the United States, which reported general indifference toward STIs.¹⁹ Our findings are in line with previous studies among MSM PrEP users and nonusers where concerns toward STIs were nuanced.^{16–18,20,27} For example, some less concerned participants were nevertheless worried about particular STIs such as hepatitis C or resistant gonorrhoea.

The qualitative data showed that, while interviewees were somewhat concerned about STIs, they were balancing their decision to use a condom against sexual pleasure of condomless sex, seeing HIV as the primary STI to be protected against, the low harm caused by STIs, and the transmission risk during condomless oral sex. This is consistent with literature on the impact of PrEP on sexual behavior.^{21,28,29} Caution should be raised regarding the fact that many interviewees perceived all STIs as causing little harm. Research showed that ambivalence toward STIs is often based on the knowledge individuals have about STIs' health effects, while correct knowledge was often lacking.¹⁶ Integrating opportunities to share such information in risk reduction discussions could enable PrEP users to better understand the benefits of adopting risk reduction strategies.

Among the online survey respondents, 10.7% always used a condom during anal sex with nonsteady partners. This is in line with a cross-sectional study among German MSM, where 8.2% of the PrEP users had sex with a condom in the preceding 6 months.³⁰ A Dutch PrEP demonstration project showed that 18.3% of anal sex acts with nonsteady partners were covered by concomitant PrEP and condom use.²⁹ A longitudinal exposure-matched study in The Netherlands showed that, 2 years after PrEP initiation, PrEP initiators had a higher number of casual partners, and a higher proportion reported condomless anal sex with casual partners and had more diagnosed anal STIs compared with matched controls who did not initiate PrEP.³¹

Despite the low consistent condom use found in our study, participants acknowledged condoms as an effective STI protection tool. However, two main factors affected their decision to not use a condom: a perceived reduced condom use in their social/sexual networks, and a perceived reduced susceptibility due to other reported STI prevention strategies (e.g., avoiding certain sexual activities). These findings suggest and reaffirm the evolving shift in PrEP users' social norms regarding the notion of "safe sex."^{32,33} Subsequently, these changing norms and practices challenge the combination prevention recommendations, which underline PrEP as an additional prevention option.

Interviewees in our study felt that the condom counseling they had received minimally impacted on their condom use. As such, our study findings have important implications for STI prevention counseling among PrEP users. While PrEP care offers many opportunities to discuss sexual health protection strategies beyond PrEP,³⁴ we conclude that the focus should not solely be on consistent and concurrent condom use. Instead, providers should explore and understand an individual's STI prevention practices, STI risk perceptions, and values. Such a client-centered approach would allow to consider individual, interpersonal, and situational factors, which have been demonstrated to influence STI prevention behavior. This would allow PrEP users to make informed choices and feel supported in those choices. Such patient-centered discussions about sexual health protection,³⁵ and motivational preventive HIV/STI counseling on condom use³⁶ appeared to be feasible to be integrated into clinical care visits.

One of the limitations of our study is that the study populations of the qualitative and quantitative strand were recruited differently. For pragmatic reasons, we could not sample interviewees among the online survey participants. However, both study populations had comparable socio-demographic characteristics. As interviewees were recruited through and interviewed in an HIV/STI clinic, we cannot exclude a social desirability bias, for example, overreporting of safe sexual behavior. We mitigated this bias by using interviewers who were not involved in interviewees' PrEP care.

Inherent to online surveys, a self-selection bias could have occurred, which may limit the generalizability of our findings. Finally, a randomized clinical trial regarding resistant STIs was ongoing at the HIV/STI clinic at the time of our interviews, which could have made our interviewees more aware and knowledgeable about the topic compared to Belgian PrEP users in general. This study started during the COVID-19 pandemic, and its related restrictions. These restrictions could have impacted our study population's sexual behavior, which might have affected our results.

In conclusion, perceptions about STIs and condoms among PrEP users in this study varied, influencing their condom use behavior for STI prevention. A minority consistently used condoms and PrEP concurrently; for others, condoms remained a valuable additional STI prevention option in certain situations and settings. PrEP presents both opportunities and challenges for STI prevention. Taking into account PrEP users' values and priorities regarding STI prevention will be essential to reduce the spread of STIs.

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Authors' Contributions

A.R., T.R., B.V., E.V.L., C.N., and T.V. contributed to study concept and design. A.R. and T.R. collected the data. A.R. performed data analyses and C.N., E.V.L., and T.R. contributed to interpretation of the data. A.R. drafted the article. All authors critically revised and approved the final version for publication.

Availability of Data and Material

The datasets generated and/or analyzed during this study are not publicly available, but are available upon reasonable

request and if approved by the Institutional Review Board of the Institute of Tropical Medicine (Antwerp).

Author Disclosure Statement

M.S.V.D.L. participated in Advisory Boards of MSD. All other authors have no competing interests, which are relevant to the content of this article, to declare.

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(Appendix follows →)

Appendix

APPENDIX TABLE A1. ELEVEN-POINT LIKERT ITEMS USED IN THE ONLINE SURVEY TO ASSESS ATTITUDES TOWARD SEXUALLY TRANSMITTED INFECTIONS AND CONDOMS

Baseline questionnaire (*n* = 326)

To what extent do you consider yourself to be at risk for acquiring an STI (such as syphilis or chlamydia)?

Very low risk 0 1 2 3 4 5 6 7 8 9 10 very high risk

How unconcerned or concerned are you about acquiring an STI?

Very unconcerned 0 1 2 3 4 5 6 7 8 9 10 very concerned

How unimportant or important is it for you to protect yourself against STIs?

Very unimportant 0 1 2 3 4 5 6 7 8 9 10 very important

To what extent do you consider a condom to be burdensome while having sex?

Not burdensome at all 0 1 2 3 4 5 6 7 8 9 10 very burdensome

To what extent are you willing to use a condom to limit the risk of getting an STI?

Not willing at all 0 1 2 3 4 5 6 7 8 9 10 very willing

Second follow-up questionnaire (*n* = 187)

How concerned are you about acquiring a resistant STI, such as gonorrhea?

With a resistant STI, we mean an STI that is more difficult or no longer treatable with antibiotics.

Not concerned at all 0 1 2 3 4 5 6 7 8 9 10 very concerned

STI, sexually transmitted infection.

APPENDIX TABLE A2. BIVARIATE AND MULTI-VARIATE ORDERED LOGISTIC REGRESSION ANALYSES ASSESSING ASSOCIATIONS BETWEEN FREQUENCY OF CONDOM USE DURING ANAL SEX WITH NONSTEADY PARTNERS (OUTCOME) AND ATTITUDES TOWARD CONDOMS AND SEXUALLY TRANSMITTED INFECTIONS (STIs), HAVING ACQUIRED AN STI, PRE-EXPOSURE PROPHYLAXIS (PrEP) USE REGIMEN, AND REGENCY OF PrEP START, STUDY ON PrEP USERS' ATTITUDES ABOUT STIs AND CONDOMS, BELGIUM 2020–2022

	Condom use during anal sex with nonsteady partners			Bivariate analysis			Multi-variate analysis		
	Total sample n (%)	Never n=113 n (%)	Sometimes n=130 n (%)	Always n=29 n (%)	OR (95% CI)	p	aOR (95% CI)	p	
Attitudes toward STIs and condoms									
Concerned about STI acquisition									
No/low	54 (19.9)	32 (28.3)	17 (13.1)	5 (17.2)	Ref	0.133	Ref	0.325	
Medium/neutral	92 (33.8)	40 (35.4)	46 (35.4)	6 (20.7)	1.67 (0.86–3.28)	0.133	1.50 (0.67–3.39)	0.325	
High	126 (46.3)	41 (36.3)	67 (51.5)	18 (62.1)	2.83 (1.50–5.44)	0.002	1.57 (0.71–3.51)	0.267	
Being at risk for STI acquisition									
No/low	36 (13.2)	12 (10.6)	16 (12.3)	8 (27.6)	Ref	0.167	Ref	0.460	
Medium/neutral	94 (34.6)	37 (32.7)	49 (37.7)	8 (27.6)	0.59 (0.27–1.25)	0.167	0.73 (0.31–1.70)	0.460	
High	142 (52.2)	64 (56.6)	65 (50.0)	13 (44.8)	0.49 (0.24–1.01)	0.067	0.69 (0.29–1.62)	0.392	
Consider condom burdensome									
No/low	44 (16.2)	9 (8.0)	26 (20.0)	9 (31.0)	Ref	0.522	Ref	0.564	
Medium/neutral	61 (22.4)	15 (13.3)	36 (27.7)	10 (34.5)	0.78 (0.36–1.67)	0.522	1.29 (0.55–3.05)	0.564	
High	167 (61.4)	89 (78.8)	68 (52.3)	10 (34.5)	0.23 (0.12–0.45)	<0.001	0.70 (0.31–1.57)	0.382	
Importance to protect against STIs									
No/low	12 (4.4)	9 (8.0)	3 (2.3)	0 (0.0)	Ref	0.271	Ref	0.947	
Medium/neutral	89 (32.7)	52 (46.0)	34 (26.2)	3 (10.3)	2.14 (0.60–10.10)	0.271	0.95 (0.23–5.08)	0.947	
High	171 (62.9)	52 (46.0)	93 (71.5)	26 (89.7)	7.29 (2.12–33.64)	0.004	1.83 (0.44–9.79)	0.433	
Willingness to use a condom to limit risk of STI acquisition									
No/low	75 (27.6)	56 (49.6)	18 (13.8)	1 (3.4)	Ref	<0.001	Ref	0.001	
Medium/neutral	98 (36.0)	42 (37.2)	52 (40.0)	4 (13.8)	3.79 (2.01–7.37)	<0.001	3.21 (4.73–6.56)	0.001	
High	99 (36.4)	15 (13.3)	60 (46.2)	24 (82.8)	18.79 (9.30–39.81)	<0.001	10.85 (4.73–25.94)	<0.001	
Acquired an STI in the preceding 6 months									
No	179 (65.8)	71 (62.8)	89 (68.5)	19 (65.5)	Ref	0.468	Ref	0.849	
Yes	93 (34.2)	42 (37.2)	41 (31.5)	10 (34.5)	0.84 (0.52–1.35)	0.468	1.06 (0.60–1.85)	0.849	
PrEP regimen in the preceding 3 months^a									
Daily	140 (51.5)	57 (50.4)	68 (52.3)	15 (51.7)	Ref	0.827	Ref	0.227	
On-demand	130 (47.8)	55 (48.7)	61 (46.9)	14 (48.3)	0.95 (0.60–1.50)	0.827	0.72 (0.42–1.22)	0.227	
PrEP start									
<6 months ago	19 (7.0)	3 (2.7)	9 (6.9)	7 (24.1)	Ref	0.002	Ref	0.039	
6–12 months ago	39 (14.3)	17 (15.0)	19 (14.6)	3 (10.3)	0.18 (0.06–0.54)	0.002	0.29 (0.09–0.94)	0.039	
12–24 months ago	90 (33.1)	34 (30.1)	49 (37.7)	7 (24.1)	0.22 (0.08–0.59)	0.003	0.36 (0.12–1.03)	0.055	
>24 months ago	124 (45.6)	59 (52.2)	53 (40.8)	12 (41.4)	0.16 (0.06–0.44)	<0.001	0.37 (0.13–1.02)	0.054	

Values in bold indicate statistically significant results, at $p < 0.05$.

^aTwo PrEP users reported no PrEP use in preceding 3 months, results are not in the table.

aOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; PrEP, pre-exposure prophylaxis; STI, sexually transmitted infection.