



Evaluation of the use of pre-exposure HIV prophylaxis: retrospective cohort *Avaliação do uso da Profilaxia Pré-Exposição ao HIV: coorte retrospectiva* *Evaluación del uso de profilaxis pre-exposición al VIH: cohorte retrospectiva*

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ABSTRACT

Objective: To identify the profile of the population that sought HIV Pre-Exposure Prophylaxis (PrEP) in Paraná; and assess, among PrEP users, changes in risk behaviors for acquiring sexually transmitted infections (STIs) as well as changes in monitoring laboratory tests. **Methods:** Retrospective cohort with secondary data obtained from the Drug Logistics Control System accessed in 2018 and 2019. The sociodemographic profile of the population that sought PrEP was investigated to correlate it with priority segments for the use of prophylactic medication. Among users, behavioral data, diagnostic tests for STIs, kidney, and liver functions were evaluated at different times during use. The results were compared using the Wilcoxon and Fisher's Exact tests. **Results:** 255 people sought PrEP. Males predominated (92.28%), homosexuals (78.04%), from 20 to 39 years old (83.53%), white people (71.76%), with 12 or more years of schooling (74.90%). For the use of PrEP, 188 people were elected. Among them, during the usage, was noticed an increase in sexual practices without a condom ($p=0.012$), a decrease in the number of partners and alcohol consumption ($p=0.001$), an increase in the activity of liver enzymes ALT/AST ($p=0.018$), with no difference in the diagnosis of HIV and other STI's. **Conclusion:** Men who have sex with men predominated in the search for prophylaxis. Among PrEP users, despite the increase in unprotected sexual practices, there was no increase in the diagnosis of STIs during the study period; PrEP drugs showed a good safety profile in follow-up laboratory tests.

Descriptors: Pre-Exposure Prophylaxis; HIV; Anti-HIV Agents; Population Health.

RESUMO

Objetivo: Identificar o perfil da população que buscou a Profilaxia Pré-Exposição ao HIV (PrEP) no Paraná e, entre os usuários da PrEP, avaliar modificações nos comportamentos de risco de adquirir infecções sexualmente transmissíveis (IST's), além de alterações nos exames laboratoriais de monitoramento. **Métodos:** Coorte retrospectiva com dados secundários obtidos do Sistema de Controle Logístico de Medicamentos acessados em 2018 e 2019. Investigou-se o perfil sociodemográfico da população que buscou a PrEP, de forma a correlacioná-lo aos segmentos prioritários para o uso do medicamento profilático. Entre os usuários, avaliaram-se dados comportamentais, testes diagnósticos para IST's, funções renal e hepática referentes a diferentes momentos no decorrer do uso. Os resultados comparados deram-se por meio dos testes Wilcoxon e Exato de Fisher. **Resultados:** 255 pessoas buscaram a PrEP. Predominaram-se o sexo masculino (92,28%), homossexuais (78,04%), de 20 a 39 anos (83,53%), brancos (71,76%), com 12 ou mais anos de estudo (74,90%). Para uso da PrEP elegeram-se 188 pessoas. Entre estas, durante o uso, observou-se aumento de práticas sexuais sem preservativo ($p=0,012$), diminuição no número de parceiros e do consumo de álcool ($p=0,001$), aumento da atividade de enzimas hepáticas ALT/AST ($p=0,018$), sem diferença no



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diagnóstico do HIV e outras IST's. **Conclusão:** Homens que fazem sexo com homens predominaram na busca pela profilaxia. Entre os usuários da PrEP, apesar do aumento de práticas sexuais desprotegidas, não houve aumento do diagnóstico de IST's no período do estudo. O medicamento da PrEP demonstrou bom perfil de segurança nos exames laboratoriais de seguimento.

Descritores: Profilaxia Pré-Exposição; HIV; Fármacos Anti-HIV; Saúde da População.

RESUMEN

Objetivo: Identificar el perfil de la población que fue en busca de la Profilaxis pre-exposición al VIH (PrEP) en Paraná y, de entre los usuarios de la PrEP, evaluar los cambios de conducta de riesgo para tener infecciones de transmisión sexual (ITS) además de las alteraciones de las pruebas de laboratorios para el monitoreo. **Métodos:** Cohorte retrospectiva con datos secundarios del Sistema de Control Logístico de Medicamentos con acceso en 2018 y 2019. Se investigó el perfil sociodemográfico de la población que fue en busca de la PrEP, para correlacionarlo con los segmentos prioritarios para el uso del medicamento profiláctico. De los usuarios se ha evaluado los datos comportamentales, las pruebas de diagnósticos para las ITS, las funciones renales y hepática referente a distintos momentos durante el uso. Los resultados comparados se han dado a través de las pruebas de Wilcoxon y el Exacta de Fisher. **Resultados:** 255 personas han buscado la PrEP. Hubo el predominio para el sexo masculino (92,28%), homosexuales (78,04%), entre los 20 y 39 años (83,53%), blancos (71,76%), con 12 o más años de estudio (74,90%). Se ha elegido 188 personas para el uso de la PrEP. De entre ellas, durante el uso, se observó el aumento de las prácticas sexuales sin condón ($p=0,012$), la disminución del número de compañeros y del consumo del alcohol ($p=0,001$), el aumento de la actividad de enzimas hepáticas ALT/AST ($p=0,018$), sin diferencia en el diagnóstico del VIH y de otras ITS. **Conclusión:** Los hombres que tienen sexo con hombres prevalecieron para la búsqueda de la profilaxis. De entre los usuarios de la PrEP, a pesar del aumento de las prácticas sexuales sin protección no hubo el aumento del diagnóstico de ITS en el período del estudio. El medicamento de la PrEP demostró un perfil bueno de seguridad en las pruebas de laboratorios de seguimento.

Descriptores: Profilaxis Pre-Exposición; VIH; Fármacos Anti-VIH; Salud Poblacional.

INTRODUCTION

Human immunodeficiency virus (HIV) is a retrovirus of the Lentivirinae subfamily that mainly infects CD4-Positive T-Lymphocytes. The reduced count of these cells in the blood causes immunodeficiency and other clinical conditions that characterize the Acquired Immunodeficiency Syndrome - AIDS^(1,2).

In the year 2018, there were about 1.7 million people diagnosed with HIV in the world. In that same year, Brazil presented almost 44,000 new cases of HIV infection and Paraná, 2,352 new diagnoses. HIV infection, when undiagnosed or untreated, evolves into AIDS, the cause of 32 million deaths since the beginning of the epidemic worldwide⁽³⁻⁵⁾.

Recent studies show relevant advances in combating new HIV infections in countries that use the combined prevention strategy, which consists of the use of condoms, encouragement of testing, immediate initiation of antiretroviral therapy in diagnosed individuals, and availability of HIV Pre-Exposure Prophylaxis – PrEP. These associated strategies have shown very satisfactory results in the decline of new HIV diagnoses in the world⁽⁶⁾.

HIV Pre-Exposure Prophylaxis is among the most promising prevention actions among population segments at higher risk of acquiring the infection⁽⁷⁾, such as homosexuals and men who have sex with men (MSM), 22 times higher risk than the general average, sex workers (21 times risk), trans people (12 times) and injecting drug users (22 times more chances)⁽⁸⁾. These key populations account for 65% of new infections in Latin America⁽⁵⁾.

PrEP is a strategy used by uninfected people and practiced by the continuous use of a daily tablet consisting of a combination of tenofovir desoproxil fumarate (300mg) and emtricitabine (200mg), antiretrovirals from the Nucleoside Analog Reverse Transcriptase Inhibitors (NRTIs) class. These conjugated drugs are considered highly effective in preventing HIV infection and have few adverse reactions associated with their use⁽⁹⁾.

In Brazil, in 2018, HIV Pre-Exposure Prophylaxis was incorporated into the Unified Health System (Sistema Único de Saúde – SUS)⁽⁹⁾. In the country, the HIV/AIDS epidemic, as in Latin America, is concentrated mainly in the population segments mentioned above: homosexuals and other MSM, transgender people, and sex workers⁽⁸⁾. In addition to these presenting a higher risk of acquiring HIV, they are often people subject to situations of discrimination, violence, and/or social vulnerability. The implementation of PrEP, due to the need to be linked to the health service, allows these people to be monitored, tested for HIV and other sexual infections, diagnosed and treated early, reducing the transmission of diseases, including HIV, and providing opportunities for care and promotion of individual and collective health^(6,8).

In Paraná, PrEP was made available to the population in early 2018. As a result, there was an academic interest in identifying the population segments that became aware of this prophylaxis, from the access to reference services in HIV/AIDS for the drug use and monitoring, through consultations and laboratory tests standardized by the Ministry of Health, according to a specific protocol⁽⁶⁾. This information allows to identify whether the offer of the service has reached priority population segments and, once PrEP is in use, to identify behavioral changes and problems related to the prophylactic medication use.

In this context, this study aimed to investigate the sociodemographic profile of the population that sought PrEP in the state of Paraná and to monitor, throughout the use of the drug, changes in risk behaviors for acquiring Sexually Transmitted Infections (STIs) and the effects of drug use on laboratory parameters of renal and liver function.

METHODS

It is a retrospective cohort study, which used secondary data from all people who sought PrEP, in the first six months of offering this prophylaxis; in specialized care services for HIV/AIDS in Paraná State. Behavioral and clinical information from people who started using PrEP were followed up for approximately one year to assess changes during prophylaxis.

In these public services of specialized assistance in HIV/AIDS, all those interested in PrEP and those who start using it answer questionnaires prepared and standardized by the Ministry of Health. All this information is filled in online by the health professionals who serve them, then composing the database of the Medicines Logistics Control System (SICLOM) of the Ministry of Health.

The secondary data used in this study, collected from SICLOM, took place between February 2018 and August 2019. Access to the system is restricted, being performed by two authors of the study, also employees of the Medicine Center of Paraná (CEMEPAR), the executing institution of pharmaceutical assistance of the Paraná State Health Department (SESA-PR). SICLOM allowed access to information from all questionnaires completed by health professionals during the care of interested people and PrEP users, enabling follow-up throughout the use of the drug, besides comparisons between the variables of interest at different times.

In the study, the information stored in SICLOM, routinely obtained by the health teams, during four different moments of service to users, was considered:

1) Registration: provides information on the sociodemographic profile of people who sought the health service to apply for the use of prophylaxis after learning about the offer of the drug by the SUS. The variables obtained from this questionnaire were presented by: age, the genital organ at birth, gender identity, sexual orientation, skin color, schooling, and if they were homeless. These interested ones were later referred to a risk management assessment and screening exams.

2) Initial PrEP Consultation (1st Service): the health team fills in a specific questionnaire for this appointment, which seeks information about the behavioral profile, results of the first laboratory tests, and, because of this, the physician assesses the applicant's eligibility to start PrEP. The variables obtained from the records of this appointment were presented by: risk behaviors for contracting HIV from sex without a condom; use of post-exposure HIV prophylaxis (PEP); the number of sexual partners; practices of unprotected sex with HIV-positive partners; sex in exchange for money, valuables, drugs, housing or other services; sharing of instruments for the use of anabolics, hormones, silicone or injectable drugs; alcohol consumption; and, finally, the eligibility or not to use PrEP.

3) 30 day-Return: this step corresponds to the first month of the prophylactic drug use by eligible people in the previous appointment. In this return, the health team routinely fills in a questionnaire to collect information about the results of screening tests for HIV and other STIs, monitoring of kidney and liver functions, and drug safety. The variables obtained from the records were presented as syphilis tests, hepatitis B and C and HIV, proteinuria, liver enzymes AST/ALT, and whether the patient would continue using PrEP or not, as assessed by the physician.

4) Clinical Follow-up: once PrEP is started, clinical and laboratory follow-up should be performed every three months. In this study, we considered the evaluations of the third trimester of drug use results to observe significant differences in the evaluated parameters. In the follow-up appointment, the health team routinely repeats the questions about the users' behavioral profile (as in the Initial appointment), in addition to the results of laboratory tests and drug safety (as in the 30-day appointment). It allows the comparison of information obtained at different times when using PrEP. The variables of interest were presented by: occurrence of STI symptoms, the number of sexual partners, use of condoms, alcohol consumption, injecting drug use, results of diagnostic tests for syphilis, hepatitis B and C, HIV, evaluation of ALT/AST liver enzyme activity, proteinuria, creatinine clearance, and the result of the final decision on whether or not to continue using PrEP, according to medical criteria.

For statistical comparison purposes, the risk behavior variables obtained from the Initial Appointment records were compared to the same variables obtained from the Clinical Follow-up. Similarly, the laboratory test results obtained from the 30-day Return records were compared with the corresponding Clinical Follow-up variables. There were follow-up losses throughout the study. Therefore, only people eligible for PrEP were considered in the comparisons, and, among those eligible, those who attended the Initial Appointment, the 30-day Return, and Clinical Follow-up. Thus, it was possible to verify if there were changes in the variables of interest during the use of PrEP.

Regarding sample loss, of the 255 people registered to use PrEP, 233 attended the 1st Service appointment. Of these, 188 were eligible to use the prophylactic drug according to the criteria proposed by the Ministry of Health. Of these, 162 returned for an appointment after 30 days of using the drugs. Finally, 90 people attended the Clinical Follow-up appointment, the last moment considered in this study.

The data collected on the sociodemographic profile, infection risk behaviors, and laboratory tests were transcribed using SICLOM, besides being processed in Microsoft Excel software. Descriptive statistical tools were used in the analysis, such as absolute and relative frequencies. The results on the frequency of sex without condoms, alcohol use, symptoms and diagnoses of STI's and results of follow-up laboratory tests - creatinine clearance, proteinuria, liver enzymes, HIV, active syphilis, hepatitis B, and hepatitis C - were given through statistical tests in the Stata 14 Software. On the other hand, comparisons of the distribution of continuous variables over time were carried out using the Wilcoxon Paired Test in the periods of Initial Appointment, 30-day Return, and Clinical Follow-up. The proportion tests showed comparisons based on categorical variables. For the analyses, the cut off of 0.05 was used to define significance through Fisher's Exact Test.

The study was approved by the Research Ethics Committee of the Federal University of Paraná - Health Sciences Sector - SCS/UFPR, under Opinion n°. 2.620.673 and by the Ethics Committee of the State of Paraná - Hospital do Trabalhador/ SES/ PR under Opinion n°. 2,674,606.

RESULTS

In the first six months of PrEP's offer in Paraná, 255 people spontaneously sought the SUS specialized care services in HIV/AIDS to start the prophylactic use of the drug. In the sociodemographic profile, predominated males (91.4%), identified as cisgender men (88.6%), homosexuals (78.0%), between 20 and 39 years old (83.5%), white-skinned color (71.8%), with 12 years or more of education (74.9%) (Table I).

The PrEP Initial Appointment was attended by 233 people, 212 males, and 21 females. Among these, 12.74% males and 9.52% females admitted exposure to the risk of contracting HIV through unprotected sex the 72 hours before the appointment. In the previous 12 months, 35.85% of males and 52.38% of females used HIV post-exposure prophylaxis (PEP) at least once. In the six months before the Initial Appointment, 29.25% of males and 57.14% of females acknowledged having had unprotected sex with HIV-positive partners. 13.68% of males and 23.81% of females declared having had sex in exchange for money, valuables, drugs, housing, or other services, totalling 14.6% of the sample. Almost all males (97.17%) and females (95.24%) said they did not share instruments for anabolics, hormones, silicone, or injectable drug use in the three months before the appointment.

In the comparisons between the risk behaviors obtained from the records of the Initial Appointment (before PrEP) and the Clinical Follow-up (three-quarters of PrEP use), it was observed that males remained the most frequent partners for both sexes; however, the number of partners decreased significantly ($p=0.003$; median during the Initial Appointment = 5; $P_{25}=2$ - $P_{75}=15$; median in Clinical Follow-up = 4; $P_{25}=1$ - $P_{75}=10$). There was also an increase in the proportion of sex without condoms ($p=0.012$) among PrEP users, but with no difference in STI symptoms ($p=1,000$). Concerning alcohol consumption, there was a significant reduction ($p=0,001$).

In the comparisons between the results of laboratory tests of PrEP users obtained from the records of the 30-day Return appointments (first month of PrEP use) and of Clinical Follow-up (three-quarters of PrEP use), there were no significant changes in the tests of creatinine, proteinuria, HIV, Syphilis and hepatitis B and C between the evaluated periods ($p=1,000$). However, there was a significant increase ($p=0.018$) in the activity of liver enzymes AST/ALT of PrEP users after three trimesters (nine months) of the prophylactic drug usage.

After the Clinical Follow-up appointment, the last moment considered in this study, it was found that 93.3% of PrEP users continued using the drug. Exceptions occurred in cases where the doctor did not keep the prescription because he believed that there was a reduction in the risk of becoming infected (stable relationship with a single partner), or the user decided to discontinue usage, being this, the most common reason.

Table I - Sociodemographic profile of the 255 people who sought PrEP in specialized HIV/AIDS care services in the state of Paraná in 2018, in the first six months of the drug's offer.

Variables	Number of Individuals	Percentage (%)
Gender		
Male	233	91.4
Female	22	8.6
Gender Identity		
Cisgender man	226	88.6
Cis Woman	22	8.6
Transsexual woman	7	2.7
Transvestite/Transvestite Woman	0	0.0
Transsexual man	0	0.0
Sexual Orientation		
Homosexual	199	78.0
Heterosexual	29	11.4
Bisexual	27	10.6
Homeless person		
No	255	100.00
Age Group		
≤ 19 years old	9	3.5
20 - 29 years old	131	51.4
30 - 39 years old	82	32.2
40 - 49 years old	24	9.4
50 - 59 years old	7	2.7
≥ 60 years old	2	0.8
Skin color		
White	183	71.8
brown	39	15.3
black	30	11.8
Yellow	3	1.8
Indigenous	0	0.0
not informed	0	0.0
Education		
None	0	0.0
From 1 to 3 years old	1	0.4
From 4 to 7 years old	5	2.0
From 8 to 11 years old	58	22.7
12 and over	191	74.9
Not Informed	0	0.0
Total	255	100.0

DISCUSSION

PrEP is a strategy to fight new infections caused by HIV, and its use in the state of Paraná has shown that the population segments of gays and men who have sex with men (MSM) have had access to information and have strongly sought reference services in HIV/AIDS in Paraná to use the prophylactic drug. During the use, PrEP demonstrated a good safety profile, according to laboratory tests for renal and liver monitoring, in addition to protection, since there were no HIV infections, nor an increase in diagnoses of other STIs during the use of PrEP, despite the increase in risk behaviors, such as lesser use of condoms during sexual intercourse.

MSM makes up one of the priority population segments for PrEP use in Brazil and worldwide due to the high risk of becoming HIV infected⁽¹⁰⁻¹³⁾. The predominance of MSM's in the search for PrEP suggests knowledge and interest in the benefits of prophylaxis. Similar results of the search for PrEP came from observation in a national study conducted by the Ministry of Health⁽¹⁴⁾.

Other population segments, such as sex workers, are also priorities for PrEP use⁽⁶⁾. In this study, they corresponded to 14.6% of people who sought prophylaxis in Paraná, a proportion similar to that observed in the study conducted by the Ministry of Health⁽¹⁴⁾.

The PrEP use in the UK has caused a 71% reduction in new HIV infections, the priority population segments⁽⁶⁾. However, studies reveal that knowledge about this prophylaxis is not accessible to everyone, suffering racial, ethnic, educational influences, among other interferences⁽¹⁵⁾. The greater the knowledge about PrEP, the greater its acceptance and adherence to the drug, reflecting a reduction in new infections in population groups known to be at greater risk of acquiring it. In The US, for example, if 80% of MSM at risk of contracting HIV used the therapy, 40% of new infections would be prevented within ten years⁽¹⁶⁻¹⁸⁾.

The search for PrEP in Paraná occurred predominantly by young people (20 to 29 years old), coinciding with the age group with the highest number of new HIV cases in Brazil⁽³⁾ and Paraná⁽⁵⁾. It strengthens the prospect of reducing new HIV infections, fulfilling the purpose of PrEP.

The population that sought PrEP in Paraná was predominantly white, compatible with the general characteristics of the state population⁽¹⁹⁾ and with the study carried out on PrEP by the Ministry of Health⁽¹⁴⁾. However, the new cases of HIV occurred mainly in brown people, followed by white⁽³⁾. This lower demand for PrEP by the brown population, among others, has been observed in different studies and may indicate difficulties in accessing information and/or linking to reference services⁽¹⁹⁾.

The data on schooling obtained in this study were very close to those found in the national study about PrEP conducted by the Ministry of Health. In both, people with an schooling equal to or greater than 12 years of study predominated⁽¹⁴⁾. It is observed that PrEP has been sought mainly by people with incomplete high school or higher education, which corresponds to the most frequent educational level among people recently infected with HIV in Brazil and Paraná^(3,5).

In Paraná, there was a very discreet demand for PrEP by injecting drug users, despite being one of the priority segments for prophylaxis⁽²⁰⁾. In addition to the risk associated with injection, frequent needle-sharing and condomless sex behaviors are common in this segment, increasing the spread of HIV among injecting drug users⁽²¹⁾.

Similarly, alcohol use is also related to the difficulty of adopting preventive measures in sexual practices, increasing the risk of HIV infection⁽²²⁾. Among PrEP users in Paraná, there was a significant reduction in alcohol consumption by people with at least nine months of prophylaxis use. This behavior may be related to the guidance and counseling work performed by the health team during consultations and dispensing of the PrEP drug⁽³⁾.

A significant reduction was also observed in the number of sexual partners over the PrEP use, both in the current study in Paraná and in Brazil⁽¹⁴⁾. On the other hand, there was a significant increase in the proportion of sex without a condom in Paraná and Brazil⁽¹⁴⁾. There is divergence in this issue, showing a reduction, increasing, or maintenance of these practices⁽¹³⁾, with no consensus on these behavioral changes. However, it indicates that PrEP users feel more protected from HIV and start using condoms less, exposing themselves to the risk of acquiring other STIs⁽²³⁾. However, in another study, PrEP users were found to practice risk-reducing behaviors, such as having sex with partners whose medical conditions are monitored and with a smaller number of partners⁽²⁴⁾. These data confirm the findings of the current study.

There was no significant difference in the proportions of symptoms or diagnoses of STIs, HIV, hepatitis B, and C after nine months of PrEP in users in Paraná. It differs from studies carried out in Canada and the USA, where there was an increase in STI diagnoses among PrEP users^(23,25). However, another study confirmed that PrEP users accompanied by health services had reduced the STI diagnoses⁽¹³⁾. This link between users and HIV/AIDS reference

services occurs in the SUS and enables to monitor people most exposed to the risk of contracting STIs during the period. These people are quarterly oriented about symptoms, tested and treated, making it difficult to transmit the infection to other people or complications from infections already acquired⁽²²⁾. In addition, a study carried out in London confirms that having a diagnosis of syphilis in MSM is a risk factor for contracting HIV, in addition to other bacterial STIs. Thus, periodic examinations for STIs are also related to reducing the risk of contracting HIV⁽²⁶⁾.

There was no significant change in the renal function of PrEP users in the current study, despite the possibility of renal damage caused by tenofovir desoproxil fumarate due to its accumulation in the proximal tubule. However, it is a reversible condition with discontinuation of the drug^(8,11). In addition to renal function, the liver function of PrEP users was also monitored, noting liver changes. The decrease in liver function in PrEP users is usually asymptomatic and transitional⁽²⁷⁾. It is noteworthy that a systematic review of thirteen studies, totalling more than fifteen thousand users of PrEP or placebo, did not identify any significant difference in the risks of serious adverse events or renal, liver, or bone alterations concerning the control, corroborating a safety profile of the medicine⁽²⁸⁾. However, there is still little information about the long-term use of PrEP⁽²⁹⁾.

In Paraná, among the 188 people who started using PrEP in the first six months of its offer, 53% discontinued the therapy during the period covered in this study. This proportion is lower than one found in the USA (60%)⁽³⁰⁾ but much higher than the 19% identified in the national study conducted by the Ministry of Health⁽¹⁴⁾. PrEP discontinuation usage occurs for several reasons, such as user decision; reduced exposure to the virus at that time; the HIV test being positive; changes in exams; or for not having returned to the follow-up appointments on the scheduled date⁽¹⁴⁾. Discontinuity is not necessarily bad, as it can mean a modification, even if temporary, of risk behaviors.

The use of PrEP in high vulnerability situations can be a relevant protection tool against HIV infection. Although people recognize that using a condom is the best way to avoid STIs, only half use it, including sexual intercourse with casual partners. Thus, PrEP can be the appropriate method for preventing HIV infection in these people who relate in an unprotected way and in those with difficulties in negotiating other preventive methods, subject to sexual violence, sex workers, or who carry out sexual practices involving alcohol and other drugs^(13,22).

Although PrEP has been significantly accessed by men who have sex with men, as proposed by the Ministry of Health, the availability of this prophylaxis in the state of Paraná is faced with the need to reach transgender people, sex workers, serodiscordant couples (when one of partners has HIV), in addition to populations subject to socioeconomic vulnerabilities, which include those with low schooling and also homeless. These populations were underrepresented among the records consulted in this study, and they deserve attention due to HIV infection history in the state and country and the conditions in which people live and relate⁽⁷⁾.

Access to PrEP requires linking these populations to HIV/AIDS reference services, ensuring the use follow-up. People who use PrEP undergo screening in which the risk of contracting HIV is confirmed. Thus, once PrEP usage starts, there is quarterly monitoring through appointments and clinical examinations, which can detect HIV and STIs. When diagnosed, these people are referred for treatment. In the specific case of HIV, immediate treatment keeps the viral load suppressed and prevents the transmission of the virus to other people, also having a preventive character⁽¹⁰⁾. That is, together, these actions promote individual and collective health, whether through the use of PrEP to minimize the subject risk of contracting HIV or through the early diagnosis and treatment of HIV infection, which minimize the collective risk of transmission.

CONCLUSION

Men who have sex with men predominated in the search for PrEP in the state of Paraná. Monitoring records of appointments and laboratory tests made it possible to identify that PrEP users were more exposed to sexual practices without condoms, but there was no HIV infection or increased diagnosis of other STIs. The prophylactic drug showed only one change in liver function tests, asymptomatic and transient, demonstrating its good safety profile.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

CONTRIBUTIONS

Carolina Hultmann Gonçalves Pereira and **Yanna Dantas Rattmann** contributed to the preparation, study design, acquisition, analysis and interpretation of data, writing and review of the manuscript. **Frederico Alves Dias**

contributed to the preparation and design of the study, acquisition, analysis and interpretation of data. **Gabriela Santos de Miranda** contributed to data acquisition. **Doroteia Aparecida Höfelmann** contributed to the analysis and interpretation of data. All authors have approved the final version to be published and are responsible for its content.

REFERENCES

1. Peçanha EP, Antunes OAC, Tanuri A. Estratégias farmacológicas para a terapia anti-aids. *Quim Nov.* 2002;25(6):1108-16.
2. Souza MVN, Almeida MV, Cruz FO. Drogas anti-HIV: passado, presente e perspectivas futuras. *Quim Nov.* 2003;26(3):366-72.
3. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Boletim Epidemiológico HIV/Aids. Brasília: Ministério da Saúde; 2019.
4. Secretaria de Saúde (PR), Divisão DST/AIDS/Hepatites Virais. Boletim Epidemiológico HIV/Aids [Internet]. Paraná: Secretaria de Saúde; 2015 [accessed on 2020 Fev 02]. Available from: http://www.saude.pr.gov.br/arquivos/File/boletimhivaids2015_1.pdf
5. Joint United Nations Programme on HIV/AIDS. Fact sheet - Latest global and regional statistics on the status of the AIDS epidemic [Internet]. [local desconhecido]: Unaid, [date unknown] [accessed on 2020 Jan 14]. Available from: https://www.unaids.org/en/resources/documents/2019/UNAIDS_FactSheet
6. HIV in the United Kingdom: Towards Zero HIV transmissions by 2019 report About Public Health England [Internet]. Londres: Gov.UK; 2019 [accessed on 2020 Jan 23]. Available from: <https://www.gov.uk/government/publications/hiv-in-the-united-kingdom>
7. Programa Conjunto das Nações Unidas sobre HIV/AIDS. Miles To Go: Closing Gaps Breaking Barriers Righting Injustices [Internet]. Geneva: Unaid, 2018 [accessed on 2020 Jan 10]. Available from: http://www.unaids.org/sites/default/files/media_asset/miles-to-go_en.pdf
8. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/AIDS e das Hepatites Virais. Protocolo clínico e Diretrizes Terapêuticas para profilaxia Pré-Exposição de risco à infecção pelo HIV. Brasília: Ministério da Saúde; 2018.
9. Donnelly JA, Deem TT, Duffy MA, Watkins AK, Al-Tayyib AA, Shodell DJ, et al. Applying national estimates of adults with indications for pre-exposure prophylaxis to populations of men who have sex with men and people who inject drugs in Colorado: modeling study. *JMIR Public Health Surveill.* 2019;21(1):1-13.
10. Long EF, Brandeau ML, Owebs DK. The cost-effectiveness and population outcomes of expanded HIV screening and antiretroviral treatment in the United States. *Ann Intern Med.* 2011;153(12):778-89.
11. Anderson PL, Kiser JJ, Gardner EM, Rower JE, Meditz A, Grant RM. Pharmacological considerations for tenofovir and emtricitabine to prevent HIV infection. *J Antimicrob Chemotherapy.* 2011;66:240-50.
12. Heneine W, Kashuba A. HIV Prevention by Oral Preexposure Prophylaxis. *Cold Spring Harbor Perspect Med.* 2012;2:a007419.
13. Zucchi EM, Grangeiro A, Ferraz D, Pinheiro TF, Alencar T, Ferguson L, et al. From evidence to action: Challenges for the Brazilian unified national health system in offering pre-exposure prophylaxis (prep) for hiv to persons with the greatest vulnerability. *Cad Saude Publica.* 2018;34(7):1-16.
14. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. Relatório de Implantação da Profilaxia Pré-Exposição PrEP - HIV. Brasília: Ministério da Saúde; 2019.
15. Schueler K, Ferreira M, Nikolopoulos G, Skaathun B, Paraskevis D, Hatzakis A, et al. Pre-exposure Prophylaxis (PrEP) Awareness and Use Within High HIV Transmission Networks. *AIDS Behav.* 2019;23(7):1893-903.

16. Algarin AB, Shrader CH, Bhatt C, Hackworth BT, Cook RL, Ibañez GE. The Pre-exposure Prophylaxis (PrEP) Continuum of Care and Correlates to Initiation Among HIV-Negative Men Recruited at Miami Gay Pride 2018. *J Urban Heal*. 2019;96:835-44.
17. Raifman J, Dean LT, Montgomery MC, Almonte A, Arrington-Sanders R, Stein MD, et al. Racial and Ethnic Disparities in HIV Pre-exposure Prophylaxis Awareness Among Men Who have Sex with Men. *AIDS Behav*. 2019;23(10):2706-09.
18. Benzaken AS, Pereira GFM, Costa L, Tanuri A, Santos AF, Soares MA. Antiretroviral treatment, government policy and economy of HIV/AIDS in Brazil: is it time for HIV cure in the country? *AIDS Res Ther*. 2019;16(1):19.
19. Instituto Paranaense de Desenvolvimento Econômico e Social. Caderno estatístico do estado do Paraná [Internet]. 2020 [accessed on 2020 Fev 06]. Available from: <http://www.ipardes.gov.br/cadernos/MontaCadPdf1.php?Municipio=19&btOk=ok>
20. Huang Y-LLA, Zhu W, Smith DK, Harris N, Hoover KW. Hiv preexposure prophylaxis, by race and ethnicity - United States, 2014–2016. *Morb Mortal Wkly Rep*. 2018;67(41):1147-50.
21. Bazzi AR, Biancarelli DL, Childs E, Drainoni M-LML, Edeza A, Salhaney P, et al. Limited Knowledge and Mixed Interest in Pre-Exposure Prophylaxis for HIV Prevention among People Who Inject Drugs. *AIDS Patient Care STDS*. 2018;32(12):529-37.
22. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de DST, AIDS e Hepatites Virais. Diretrizes para a Organização dos Serviços de Saúde que ofertam a Profilaxia Pré-Exposição Sexual ao HIV (PrEP) no Sistema Único de Saúde. Brasília: Ministério da Saúde; 2017.
23. Oldenburg CE, Nunn AS, Montgomery M, Almonte A, Mena L, Patel RR, et al. Behavioral Changes Following Uptake of HIV Pre-exposure Prophylaxis Among Men Who Have Sex with Men in a Clinical Setting. *AIDS Behav*. 2018;22(4):1075-79.
24. Prescott MR, Hern J, Petersen M, Santos G-M. Does HIV Pre-Exposure Prophylaxis Modify the Effect of Partnership Characteristics on Condom Use? A Cross-Sectional Study of Sexual Partnerships among Men Who Have Sex with Men in San Francisco, California. *AIDS Patient Care STDS*. 2019;33(4):167-74.
25. Lachowsky NJ, Tattersall TL, Sereda P, Wang C, Edwards J, Hull M. Community awareness of, use of and attitudes towards HIV pre-exposure prophylaxis (PrEP) among men who have sex with men in Vancouver, Canada: Preparing health promotion for a publicly funded PrEP program. *Sex Health*. 2019;16(2):180-86.
26. Girometti N, Gutierrez A, Nwokolo N, McOwan A, Whitlock G. High HIV incidence in men who have sex with men following an early syphilis diagnosis: Is there room for pre-exposure prophylaxis as a prevention strategy? *Sex Transm Infect*. 2017;93(5):320-2.
27. Fonner VA, Dalglis SL, Kennedy CE, Baggaley R, O'Reilly KR, Koechlin FM, et al. Effectiveness and safety of oral HIV preexposure prophylaxis for all populations. *AIDS*. 2016;30(12):1973-83.
28. Pilkington V, Hill A, Hughes S, Nwokolo N, Pozniak A. How safe is TDF/FTC as PrEP? A systematic review and meta-analysis of the risk of adverse events in 13 randomised trials of PrEP. *J virus Erad*. 2018;4(4):215-24
29. Drak D, Barratt H, Templeton DJ, O'Connor CC, Gracey DM. Renal function and risk factors for renal disease for patients receiving HIV pre-exposure prophylaxis at an inner metropolitan health service. *PLoS One*. 2019;14(1):e0210106.
30. Chang LW, Serwadda D, Quinn TC, Wawer MJ, Gray RH, Reynolds SJ. Combination implementation for HIV prevention : moving from clinical trial evidence to population-level effects. *Lancet Infect Dis*. 2013;13(1):65-76.

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