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Nonoccupational post-exposure prophylaxis for HIV after sexual intercourse among women in Brazil: Risk profiles and predictors of loss to follow-up

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Abstract

Access to antiretroviral-based HIV prevention has been marked by sex asymmetries, and its effectiveness has been compromised by low clinical follow-up rates. We investigated risk profiles of women who received nonoccupational post-exposure prophylaxis (nPEP), as well as the rates and predictive factors of loss to follow-up after nPEP initiation.

Retrospective study evaluating 501 women who received nPEP between 2014 and 2015 at 5 HIV centers (testing centers-VCT, outpatient clinics, and infectious diseases hospital). Risk profiles were drawn based on the characteristics of the women and their sexual partners, and then stratified by sociodemographic indicators and previous use of HIV prevention services. Loss to follow-up (LTFU) was defined as not presenting for follow-up visits or for HIV testing after nPEP initiation. Predictors of LTFU were analyzed by calculating adjusted prevalence ratios (aPRs).

Approximately 90% of women had sexual encounters that met the criteria established in the Brazilian guidelines for nPEP. Those who declared to be sex workers (26.5%) or drug users (19.2%) had the highest social vulnerability indicators. In contrast, women who had intercourse with casual partners of unknown HIV risk (42.7%) had higher education and less experience with previous HIV testing (89.3%) or nPEP use (98.6%). Of the women who received nPEP after sexual intercourse with stable partners, 75.8% had HIV-infected partners. LTFU rate was 72.8% and predictors included being Black (aPR = 1.15, 95% confidence interval [CI]: 1.03–1.30), using drugs/alcohol (aPR = 1.15, 95% CI: 1.01–1.32) and having received nPEP at an HIV outpatient clinic (aPR = 1.35, 95% CI: 1.20–1.51) or at an infectious diseases hospital (aPR = 1.37, 95% CI: 1.11–1.69) compared with a VCT. The risk of LTFU declined as age increased (aPR 41–59 years = 0.80, 95% CI: 0.68–0.96).

Most women who used nPEP had higher socioeconomic status and were not part of populations most affected by HIV. In contrast, factors that contribute to loss to follow-up were: having increased social vulnerability; increased vulnerability to HIV infection; and seeking nPEP at HIV treatment services as opposed to at a VCT.

Abbreviations: aPRs = adjusted prevalence ratios, ART = antiretroviral therapy, HDI = Human Development Index, MSM = men who have sex with men, nPEP = nonoccupational post-exposure prophylaxis, PrEP = preexposure prophylaxis, VCT = HIV voluntary counseling and testing, Zres = standardized residual.

Keywords: combination prevention, HIV, post-exposure prophylaxis after sexual exposure, women

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1. Introduction

In recent years, there has been a resurgence of the HIV epidemic in Brazil.[1] The main characteristics are the increases in the incidence of HIV infection among young men who have sex with men (MSM) and the fact that cases among women persist, accounting for approximately one-third of all cases in the country.[2] Nevertheless, antiretroviral therapy (ART)-based preventive measures are underutilized, for reasons that include a lack of knowledge on the part of users and health care professionals, as well as limitations in access to health care facilities and a low perception of risk.[3–5]

For women, nonoccupational post-exposure prophylaxis (nPEP) could play a strategic role in preventing sexual transmission of HIV,[6,7] given that sex asymmetries make condom use problematic for many of them.[8,9] However, in various settings, such as in the American cities of Boston and San Francisco,[10,11] as well as in Australia,[12] women account for <10% of nPEP users, the female/male ratio being lower among individuals who receive nPEP than in the population of HIV-infected individuals.

Adherence to nPEP can be another challenge for women.[13] Among female sex workers, the rates of nPEP completion have been low,[14] typically trending lower than those reported for MSM.[15] Studies of women in general have analyzed small numbers of individuals, making it difficult to identify differences in comparison with men.[16,17] One exception was a study in Boston, which showed that the rates of adherence to nPEP were lower among women than among men.[18] In general, the reasons for discontinuation of prophylactic treatment include adverse effects, changes in the perception of risk after nPEP, belief that a sufficient number of tablets have been taken, and loss of interest in the prophylaxis.[5,10,11,19] In a systematic review,[20] adverse effects were found to be more common among individuals treated with triple-therapy regimens, those based on tenofovir and emtricitabine being more well tolerated than those based on zidovudine and lamivudine.

The few studies that have evaluated the use of nPEP in women have prioritized victims of sexual violence and sex workers,[21,22] leaving gaps in knowledge about the characteristics of women who seek treatment and use nPEP after sexual encounters. That hampers the rational, informed provision of nPEP to women, not only to those belonging to the most vulnerable groups (eg, sex workers) but also to those who are less often exposed to the risk of HIV infection.

This study aims to contribute to overcoming the aforementioned knowledge gap by studying the risk profiles of women who receive nPEP at health care facilities, as well as by analyzing the rates and predictors of loss to follow-up (LTFU) after nPEP initiation. We thus seek to contribute to improve the understanding of the effectiveness of HIV prevention policies for women, considering their specificities.

2. Methods

Retrospective study of data collected in the ongoing Combine! Study,[23] which investigates the effectiveness of nPEP at 5 centers for HIV infection, with different contextual and organizational characteristics, in Brazil. Participating centers were: 2 HIV outpatient clinics in the cities of Porto Alegre (Human Development Index [HDI] 0.805) and Ribeirão Preto (HDI 0.802); 2 HIV voluntary counseling and testing (VCT) centers, located in Curitiba (HDI 0.820) and São Paulo (HDI 0.805); and a general infectious diseases hospital, located in the city of Fortaleza (HDI 0.754). The characteristics of the centers and cities are detailed elsewhere.[23]

In Brazil, nPEP is indicated for individuals who have been exposed to HIV in the past 72 hours. Exposure is defined in the national guidelines as condomless sex in which potentially contaminated body fluids come into contact with the mucosa. The guidelines recommend clinical follow-up visits, with testing, at 30 and 90 days after nPEP initiation. Until 2015, the preferred regimen was zidovudine, lamivudine, and tenofovir, which was then replaced with the combination of tenofovir, lamivudine, and atazanavir/ritonavir.[24]

For the purposes of this study, we analyzed data on all women ≥16 years of age who started nPEP after sexual contact between 2014 and 2015. Cases of sexual assault were not considered. For those who received nPEP ≥2 times during the study period, only data from the first use were included in the analysis.

Data were extracted from clinical records onto standardized forms, structured according to the Brazilian national nPEP guidelines.[24] Information was extracted from the records of the initial and follow-up consultations and included: sociodemographic characteristics, level of risk, type of sexual intercourse that led to the exposure, laboratory tests results, and the occurrence of adverse events. Data were stored in a Research Electronic Data Capture (REDCap) database.[25]

For this study we analyzed: sociodemographic information; previous experiences of using HIV services (testing and nPEP); and risk of HIV infection in the sexual intercourse that led to nPEP. For this last information, we considered particular features of women's sexual behavior and lifestyle (being a sex worker, using drugs/alcohol, being in a stable or casual partnership and not being aware of the risk of a given casual partner) as well as particular features of their partners' sexual behavior and lifestyle (having a partner who is bisexual, homosexual, or transgender, who is infected with HIV, or who engages in "other risky sexual activities"). "Other risky sexual activities" were defined as being in a partnership with a sex worker, drug user, pornographic film actor, or a man with multiple partners. These "other risky sexual activities" were identified in 20 of the women evaluated. Two women reported having sex both with a stable and a casual partner in the last 72 hours and were classified as having a casual partner.

The analysis of the LTFU after nPEP initiation considered information on attending the follow-up visits and HIV testing. Women who underwent both after the end of the ART period (28 days) were classified as having achieved "completion of nPEP clinical follow-up" and those who did not undergo at least one of the follow-up procedures (follow-up visit to the clinic or HIV testing) after the end of the ART period were classified as "LTFU after nPEP." Four women who were transferred to another health care facility or who discontinued the prophylaxis use were not included in this analysis. Within the group of women classified as "completion of nPEP clinical follow-up," we analyzed the proportion of those who had follow-up visits and HIV testing up until the 45th day after ART period. We analyzed that information to know the number of women who concluded their follow-up timely. The 45-day period was adopted with the aim of initiating ART early in cases of seroconversion.

In studying the risk profiles for infection, we stratified the risk of the women and their sexual partners by the following factors: sociodemographic indicators; previous HIV testing and nPEP; and type of partnership at exposure (casual or stable).

Associations were studied using a χ^2 test and the standardized residual (Zres) analysis, with a significance level of 0.05. Values <-1.96 or >1.96 were considered to indicate a deficit or excess frequency of occurrence, respectively.[26]

For the analysis of the factors predictive of LTFU after nPEP, we calculated adjusted prevalence ratios (aPRs), which were calculated in 2 steps. In the first step, we classified the predictive factors in 3 dimensions: sociodemographic; risk related to the sexual partner; and contextual factors that affect (positively or negatively) the immediate conditions for taking nPEP and adhering to follow-up (previous experiences of using HIV services—HIV testing and nPEP— drugs and alcohol use, and sex work). Predictors were then analyzed using 3 different logistic regression models so as to provide a more specific understanding of what aspects determine LTFU after nPEP initiation. We classified predictors based on the assumption that sociodemographic conditions affect the way women are exposed to HIV infection and also how they acknowledge such exposure. Similarly, we assumed that contextual factors that predict clinical follow-up are informed by the way women were exposed and their sociodemographic conditions.

In the second step, we sought to analyze the effect of each predictor among all variables in the study. To do so, data with a level of significance $<.05$ in the 3 previous regression models were analyzed collectively, retaining in the final model only those information that also presented a level of significance $<.05$.

For the calculation of aPRs, we performed Poisson regression with robust variance, using the SPSS Statistics software package, version 21.0 (IBM Corporation, Armonk, NY). For these analyses, the type of health care facility was categorized as: HIV outpatient clinics (clustering the facilities located in Porto Alegre and Ribeirão Preto), VCT Centers (clustering São Paulo e Curitiba) and general infectious diseases hospital (Fortaleza).

The study was approved by the Research Ethics Committee of the University of São Paulo School of Medicine (no. 34145314.5.0000.0065). Because of the retrospective nature of the study, the need for written informed consent was waived.

3. Results

Between 2014 and 2015, a total of 501 women received nPEP at the 5 health care facilities analyzed, representing 20% of all nPEP users at those facilities. Of those, 340 (67.9%) reported ≥1 risk factors intrinsic to their sexual behavior/lifestyle, 99 (19.8%) reported ≥1 risk factors intrinsic to their partner's sexual behavior/lifestyle; and 21 (4.2%) reported risk factors intrinsic to both (their own and their partner's sexual behavior/lifestyle). A total of 41 (8.2%) women did not report risk factors that justified the use of nPEP. The main risks that led to nPEP (Table 1) included having had unprotected sexual intercourse with a casual partner of unknown HIV risk, in 214 (42.7%); being a sex worker, in 133 (26.5%); or having an HIV-positive partner, in 92 (18.4%).

The risk profile varied according to the type of partner with whom women were when they had the sexual intercourse that led to nPEP (Table 2). Among those who had sexual intercourse with a casual partner (74.5%) the risk was defined by characteristics intrinsic to the women, such as: having unprotected sex with a casual partner of unknown HIV risk (in 57.4%; Zres = 11.3), being a sex worker (in 34.3%; Zres = 6.7), and using drugs or alcohol (in 23.1%; Zres = 3.8). Among those who had sexual intercourse with a stable partner (19.8%), the risk was defined by characteristics intrinsic to the partner, namely being with an HIV-positive partner (in 75.8%; Zres = 16.5).

Table 1

Characteristics of women who have used nPEP in Brazil.

Characteristics	N	%
Total	501	100.0
City (HDI; health care facility type)		
Curitiba (0.820; VCT*)	80	16.0
Porto Alegre (0.805; outpatient clinic)	68	13.6
São Paulo (0.805; VCT*)	246	49.1
Ribeirão Preto (0.802; outpatient clinic)	74	14.8
Fortaleza (0.754; infectious diseases hospital)	33	6.6
Level of education		
≤9 y of schooling	39	7.8
9–12 y of schooling	172	34.3
Some college or college degree	200	39.9
No data	90	18.0
Self-reported skin color		
White	276	55.1
Black	141	28.1
Other	16	3.2
No data	68	13.6
Age group, y		
16–25	163	32.5
26–40	243	48.5
41–60	89	17.8
No data	6	1.2
Prior HIV testing (yes)	90	18.0
Previous nPEP (yes)	16	3.2
Risks intrinsic to the woman†		
Sex worker (yes)	133	26.5
Alcohol/drug user‡ (yes)	96	19.2
Casual partner of unknown HIV risk (yes)	214	42.7
No intrinsic risk (yes)	140	27.9
Characteristics intrinsic to the partner§		
Bisexual, homosexual, or transgender partner (yes)	13	2.6
HIV-infected partner (yes)	92	18.4
Partner with another risk factor‖ (yes)	20	4.0
No known risk intrinsic to the partner (yes)	381	76.0
No risks intrinsic to the woman or her partner	41	8.2

HDI = Human Development Index, nPEP = nonoccupational post-exposure prophylaxis, VCT = HIV voluntary counseling and testing.

* Voluntary counseling and testing center.

† 82 women reported >1 risk factor.

‡ Excluding those who used only marijuana.

§ 5 Women reported >1 risk factor.

‖ In a sexual relationship with a sex worker, drug user, pornographic film actor, or man with multiple partners.

The risk profile also varied according to sociodemographic indicators, the healthcare facility where women accessed nPEP and previous experiences of HIV testing or nPEP use (Table 3). Having sex work as an occupation and using drug/alcohol were more prevalent among the women attending the VCT center in São Paulo—75.2% (Zres = 7.0) and 84.4% (Zres = 7.7), respectively. They were also more frequent among younger women and among those in situations of greater social vulnerability due to lower level of education or to racial disparity: 13.5% of the sex workers had ≤9 years of schooling; 45.8% of the drug users had 9 to 12 years of schooling (Zres = 2.9 and 2.6, respectively); and 41.4% of the sex workers and 39.6% of the drug/alcohol users self-reported having Black skin color (Zres = 4.0 and 2.8, respectively). Among sex workers, most (43.6%) were 16–25 years of age (Zres = 3.2) and a considerable proportion (30.1%)

Table 2

Risk profile of HIV infection among women receiving nPEP in Brazil, by characteristics intrinsic to the women, to their sexual partners, and to the type of relationship they have with those partners.

	Type of Relationship with the Partner									
	Stable (n = 99)			Casual (n = 373)			No data (n = 29)			
Characteristic	n	% Total*	Zres	N	% Total*	Zres	n	% Total*	Zres	*P*
Characteristics intrinsic to the woman†										
Sex worker	2	2.0	−6.0	128	34.3	6.7	3	10.3	−2.0	<.001
Alcohol/drug user‡	8	8.1	−3.1	86	23.1	3.8	2	6.9	−1.7	.001
Casual partner of unknown HIV risk	0	0	4.8	214	57.4	11.3	0	0	−4.8	<.001
No intrinsic risk	90	90.9	6.3	25	6.7	−18.1	25	86.2	2.6	<.001
Characteristics intrinsic to the partner§										
Bisexual, homosexual, or transgender partner	1	1.0	−1.1	12	3.2	1.5	0	0	−0.9	.312
HIV-infected partner	75	75.8	16.5	13	3.5	−14.7	4	13.8	−0.7	<.001
Partner with another risk factor‖	1	1.0	−1.7	19	5.1	2.2	0	0	−1.1	.096
No known risk	24	24.2	−2.1	332	89.0	11.6	25	86.2	6.2	<.001
No risks intrinsic to the woman or her partner	20	20.2	4.9	0	0	−11.4	21	72.4	13.0	<.001

nPEP = nonoccupational post-exposure prophylaxis.

* Proportions calculated on the basis of the total numbers of partners, by category: "Stable" (N = 99); "Casual" (N = 373); and "No Data" (N = 29).

† More than one risk intrinsic to the woman was reported by 1 woman in a stable partnership, by 80 women in casual partnerships, and by 1 woman in a partnership of unknown nature.

‡ Excluding those who used only marijuana.

§ More than one risk intrinsic to the partnership was reported by 2 women in stable partnerships and 3 women in casual partnerships.

‖ In a sexual relationship with a sex worker, drug user, pornographic film actor, or man with multiple partners.

had previously undergone HIV testing (Zres = 4.2). Among women using drug/alcohol the proportion between 16 and 25 years of age was 43.8% (Zres = 2.6). In contrast, women who had casual sex with a partner with unknown HIV risk factors had a higher socioeconomic level and had less previous experience of using HIV services: −45.8% had college education (Zres = 2.3), 89.3% had never undergone HIV testing (Zres = 3.6), and 98.6% had never received nPEP (Zres = 2.0).

Women with HIV-infected partners (Table 3) were distinguished for being older, 34.8% having between 41 and 60 years of age (Zres = 4.7). Among these women, 6.5% had previously received nPEP (Zres = 2.0), 22.8% were treated at the VCT center in Curitiba (Zres = 2.0), and 12.0% were treated at the hospital in Fortaleza (Zres = 2.3).

Concerning the analysis of clinical follow-up, four women who initiated nPEP were transferred to other health care facilities or interrupted the use of the medication and were, thereby, excluded from this analysis. Of the remaining 497 women, 362 (72.8%) had a status of "LTFU after nPEP" and 135 (27.2%) had status of "completion of nPEP clinical follow-up" (Table 4). A total of 120 women (24.1% of total) concluded the follow-up timely (up until the 45th day after ART period). All 135 women who underwent HIV testing in the follow-up visits tested negative for anti-HIV antibodies.

LTFU rates >80% were observed among women aged between 16 and 25 years (80.9%), who had partners regarded as homossexual, bisexual, or transgender (84.6%), and who initiated the prophilaxis at HIV outpatient clinics (85.1%) or at a general infectious diseases hospital (87.9%).

The analyses of predictive factors according to the 3 dimensions (Table 4) showed that among the sociodemographic indicators analyzed, having black skin color—a physical attribute that in Brazil is associated with lower socioeconomic conditions because of racism—increased in 1.13 times the probability of LTFU (95% confidence interval [CI]: 1.01–1.28), whereas the increase in age reduced this effect (aPR 26–40 = 0.87, 95% CI: 0.78–0.98 and aPR 41–60 = 0.81, 95% CI: 0.68–0.96). Regarding the contextual factors directly related to the conditions of nPEP use, the increased probability of LTFU was associated with using drug/alcohol (aPR = 1.16, 95% CI: 1.01–1.33), being a sex worker (aPR = 1.18, 95% CI: 1.04–1.33) and having initiated nPEP in a health care facility which is mainly focused on treatment of HIV-infected patients, when compared to a VCT (aPR Outpatient clinic = 1.38, 95% CI: 1.23–1.54 and aPR Infectious diseases hospital = 1.42, 95% CI: 1.21–1.67). However, having previous experience with HIV services (having tested for HIV aPR = 0.83, 95% CI: 0.71–0.98) reduced the probability of LTFU. None of the characteristics related to the risk of infection of the sexual partner was associated with LTFU (Table 4).

When the predictive factors of the 3 dimensions were collectively analyzed (Table 5), sociodemographic characteristics, and contextual conditions of nPEP use remained associated to LTFU. However, previous HIV testing and being a sex work lost a significance <.05. Thus, in synthesis, in the collective analysis of the 3 dimensions, the probability of LTFU increased among women using drugs/alcohol (aPR = 1.15, 95% CI: 1.03–1.32), those self-reporting black skin color (aPR = 1.15, 95% CI: 1.03–1.30) and those attending an outpatient clinic (aPR = 1.35, 95% CI: 1.20–1.51) or an infectious diseases hospital (aPR = 1.37, 95% CI: 1.11–1.69), when compared to VCT. Yet, being ≥25 years remained as a protective factor for LTFU (aPR 26–40 = 0.88, 95% CI: 0.79–0.99 and aPR 41–59 = 0.81, 95% CI: 0.68–0.96).

Other factors that were not associated with LTFU rates in any of the analyzed models were schooling and previous experience of nPEP use.

4. Discussion

To our knowledge, this is the first study specifically analyzing risk profiles and LTFU after nPEP rates among women living in different contexts and treated at different types of health care facilities. We hope that we have, thus, contributed to increasing the body of knowledge on HIV prevention methods and, specifically, on the sex asymmetries regarding the access to such

Table 3

Risk profile of HIV infection among women receiving nPEP in Brazil, by sociodemographic markers, prior HIV testing, and previous nPEP (N = 501 women).

	Risk intrinsic to the woman*			Risk intrinsic to the partner†			
Variable	Sex worker (n = 133)	Alcohol/ drug user‡ (n = 96)	Casual partner of unknown HIV risk (n = 214)	Bisexual, homosexual, or transgender partner (n = 13)	HIV-infected partner (n = 92)	Partner with another risk factor§ (n = 20)	No risks intrinsic to the woman or her partner (n = 41)
City (HDI; health care facility type), *P*	<.001	<.001	.006	.596	.006	.117	<.001
Curitiba (0.820; VCT‖), % (Zres)	4.5 (−4.2)	4.2 (−3.5)	14.0 (−1.0)	15.4 (−0.1)	22.8 (2.0)	15.0 (0.1)	17.1 (−4.3)
Porto Alegre (0.805; outpatient clinic), % (Zres)	5.3 (−3.3)	1.0 (−4.0)	15.0 (0.8)	7.7 (−0.6)	17.4 (1.2)	0 (−1.8)	29.3 (3.1)
São Paulo (0.805; VCT*), % (Zres)	75.2 (7.0)	84.4 (7.7)	42.5 (−2.5)	69.2 (1.5)	39.1 (−2.1)	75.0 (2.4)	43.9 (5.1)
Ribeirão Preto (0.802; outpatient clinic), % (Zres)	14.3 (−0.2)	10.4 (−1.3)	18.7 (2.1)	7.7 (−0.7)	8.7 (−1.8)	10.0 (0.6)	9.8 (−0.9)
Fortaleza (0.754; infectious diseases hospital), % (Zres)	0.8 (−3.2)	0 (−2.9)	9.8 (2.5)	0 (−1.0)	12.0 (2.3)	0 (−1.2)	0 (−1.8)
Level of education, *P*	<.001	.002	<.001	<.469	.105	.204	.023
≤9 y of schooling, % (Zres)	13.5 (2.9)	8.3 (0.2)	2.8 (−3.6)	0 (−1.1)	13.0 (2.1)	10.0 (0.4)	4.9 (−0.7)
9–12 y of schooling, % (Zres)	51.9 (5.0)	45.8 (2.6)	28.5 (−2.4)	38.5 (−0.3)	30.4 (−0.9)	40.0 (0.5)	14.6 (−2.8)
Some college or college degree, % (Zres)	27.1 (−3.5)	40.6 (0.2)	45.8 (2.3)	53.8 (1.0)	34.8 (−1.1)	50.0 (0.9)	56.1 (2.2)
No data, % (Zres)	7.5 (−3.7)	5.2 (−3.6)	22.9 (2.5)	7.7 (−1.0)	21.7 (1.0)	0 (−2.1)	24.4 (1.1)
Self-reported skin color, *P*	<.001	.001	.066	.735	.405	.323	.219
White, % (Zres)	48.1 (−1.9)	54.2 (0.2)	55.1 (0.0)	53.3 (−0.1)	60.9 (1.2)	60.0 (0.5)	58.5 (0.5)
Black, % (Zres)	41.4 (4.0)	39.6 (2.8)	24.8 (−1.5)	38.5 (0.8)	21.7 (−1.5)	35.0 (0.7)	17.1 (−1.6)
Other, % (Zres)	6.0 (2.2)	4.2 (0.6)	2.3 (−0.9)	0 (−0.7)	2.2 (−0.6)	5.0 (0.5)	2.4 (−03)
No data, % (Zres)	4.5 (−3.6)	2.1 (−3.7)	17.8 (2.4)	7.7 (−0.6)	15.2 (0.5)	0 (−1.8)	22.0 (1.6)
Age group, *P*	<.001	.020	.556	.948	<.001	.744	.648
16–25 years, % (Zres)	43.6 (3.2)	43.8 (2.6)	34.1 (0.7)	38.5 (0.5)	14.1 (−4.2)	25.0 (−0.7)	26.8 (−0.8)
26–40 years, % (Zres)	50.4 (0.5)	45.8 (0.6)	46.3 (0.9)	46.2 (−0.2)	48.9 (0.1)	50.0 (0.1)	56.1 (1.0)
41–60 years, % (Zres)	6.0 (−4.1)	10.4 (−2.1)	17.8 (0.0)	15.4 (0.2)	34.8 (4.7)	25.0 (0.9)	17.1 (−0.1)
No data, % (Zres)	0 (−1.5)	0 (−1.2)	1.9 (1.2)	0 (−0.4)	2.2 (1.0)	0 (−0.5)	0 (−0.7)
Previous HIV testing, *P*	<.001	.267	<.001	.806	.658	.009	.562
No, % (Zres)	69.9 (−4.2)	78.1 (−1.1)	89.3 (3.6)	84.6 (0.2)	80.4 (0.4)	60.0 (−2.6)	85.4 (0.6)
Yes, % (Zres)	30.1 (4.2)	21.9 (1.1)	10.7 (−3.6)	15.4 (0.2)	19.6 (0.4)	40.0 (2.6)	14.6 (−0.6)
Previous nPEP, *P*	.113	0.966	0.049	0.507	0.044	0.002	0.225
No, % (Zres)	94.7 (−1.6)	96.9 (<0.1)	98.6 (2.0)	100.0 (0.7)	93.5 (−2.0)	85.0 (−3.1)	100.0 (1.2)
Yes, % (Zres)	5.3 (1.6)	3.1 (<0.1)	1.4 (−2.0)	0 (0.7)	6.5 (2.0)	15.0 (3.1)	0 (−1.2)

nPEP = nonoccupational post-exposure prophylaxis, VCT = HIV voluntary counseling and testing.

* 48 reported being a sex worker or a drug user; 140 reported no risks intrinsic to their practices.

† 5 reported >1 risks intrinsic to their partnership; 381 reported no known risks intrinsic to their partnership.

‡ Excluding those who used only marijuana.

§ In a sexual relationship with a sex worker, drug user, pornographic film actor, or man with multiple partners.

‖ Voluntary counseling and testing center.

methods. In that sense, we highlight that the number of women seeking nPEP in our study was quite low: during the 2-year study period, only 1 of the 5 HIV healthcare centers administered nPEP to >100 women. Also, only 4 of 10 women were part of populations known as most vulnerable to HIV infection or had characteristics of greater social vulnerability. Loss to follow-up rates were high, with more than two-third of the women not completing clinical follow-up. The intersection between health care facilities that have a more treatment-based approach and different circumstances of vulnerability (social and to HIV), such as being young, using drugs/alcohol, and being Black, increased the probability of LTFU after nPEP initiation. In contrast, health care facilities that use a more prevention-based approach, like VCT centers, are more likely to overcome these difficulties.

Our study has some limitations. The retrospective nature of the study, which was based on clinical records, could have influenced the quality of information. For example, the number of sex workers might have been underestimated, given that some sex workers may not report their occupation because they fear discrimination.[27,28] It is also possible that, in some cases, the clinical follow-up visit and HIV testing were performed at another health care facility. Nevertheless, the high proportion of completeness of data, along with the consistency of information across the health care facilities analyzed, minimized those possibilities. Another potential limitation is that we did not analyze certain domains that are relevant for completion of nPEP follow-up, such as the occurrence of adverse events.[15,20] Although knowledge of those aspects could influence the associations observed, it would be unlikely to undermine the importance of structural aspects to the understanding of the phenomenon.

For the majority of women evaluated in the present study, the potential exposure to HIV occurred in sexual intercourses with casual partners of unknown HIV risk. The indication of nPEP in these situations has raised questions for countries with

Table 4

Proportion and crude and adjusted prevalence ratio of loss to follow-up after nPEP initiation among Brazilian women, the reference being completed nPEP follow-up group, for selected models (n = 497).

	nPEP follow-up*							95% CI		
	Completion of nPEP follow-up (n = 135; 27.2%)		Loss to Follow-up (n = 362; 72.8%)							
Characteristic	N	%	N	%	Crude prevalence ratio	P	Adjusted prevalence ratio	Lower limit	Upper limit	P
Model 1—sociodemographic characteristics										
Age group, y										
16–25	31	19.1	131	80.9	1		1	—	—	
26–40	71	29.3	171	70.7	0.89	.017	0.87	0.78	0.98	.018
41–60	32	36.8	55	63.2	0.78	.006	0.81	0.68	0.96	.017
No data	1	16.7	5	83.3	1.01	.872	0.86	0.59	1.25	.431
Level of education										
≤9 years of schooling	12	30.8	27	69.2	1		1	—	—	
9–12 years of schooling	42	24.9	127	75.1	1.09	.478	1.04	0.84	1.31	.705
Some college or college degree	70	35.2	129	64.8	0.94	.580	0.93	0.74	1.17	.511
No data	11	12.2	79	87.8	1.27	.037	1.28	<1.00	1.65	.055
Self-reported skin color										
Non-Black	96	33.1	194	66.9	1		1	—	—	
Black	30	21.6	109	78.4	1.17	.009	1.13	1.01	1.28	.047
No data	9	13.2	59	86.8	1.30	<.001	1.01	0.85	1.21	.910
Model 2—context of use of nPEP										
Sex worker										
No	106	29.1	258	70.9	1		1	—	—	
Yes	29	21.8	104	78.2	1.10	.084	1.18	1.04	1.33	.009
Alcohol/drug user†										
No	114	28.4	288	71.6	1		1	—	—	
Yes	21	22.1	74	77.9	1.09	.184	1.16	1.01	1.33	.036
Previous nPEP										
No	130	27.0	351	73.0	1		1	—	—	
Yes	5	31.3	11	68.8	0.94	.727	0.99	0.71	1.39	.946
Previous HIV testing										
No	105	25.6	305	74.4	1		1	—	—	
Yes	30	34.5	57	65.5	0.88	.126	0.83	0.71	0.98	.029
Health care facility type										
Voluntary counseling and testing center	110	34.1	213	65.9	1		1	—	—	
Outpatient clinic	21	14.9	120	85.1	1.30	<.001	1.38	1.23	1.54	<.001
Infectious diseases hospital	4	12.1	29	87.9	1.33	<.001	1.42	1.21	1.67	<.001

CI = confidence interval, nPEP = nonoccupational post-exposure prophylaxis.

* Four women were transferred or interrupted NPEP and were not included in this analysis.

† Two women reported potential exposure in the last 72 hours within the context of a stable, casual relationship, which was classified as stable.

concentrated epidemics, given that a <1% prevalence of HIV infection in heterosexuals makes the probability of HIV infection low. In Brazil, for example, the prevailing norms before 2015 recommended that nPEP be indicated if the sexual partner belongs to one of the populations with higher HIV infection prevalence.[24] However, cost-effectiveness studies[29,30] show that, although the advantages of nPEP increase in parallel with increases in the risk of infection, it remains cost-effective for men and women even in the context of low compliance rates and a high proportion of individuals who do not know their partners' HIV status .[30] Other studies also indicate that even in countries with concentrated epidemics, there are subgroups of heterosexual men at high risk for infection.[31] Therefore, it seems appropriate, from a public health perspective, to preserve the right of women to access nPEP even in situations where the riskiness of the sexual intercourse and the HIV status of the partner are unknown. A complementary measure to be considered is healthcare facilities implementing measures to actively invite sexual partners of people searching for nPEP for HIV testing, which has shown to reduce the need of using the prophylaxis among victims of sexual assault.

In the present study, most of the women who had sex with casual partners of unknown HIV risk had a high socioeconomic status. That is not a problem in itself, especially because rates of AIDS detection have recently increased in this group.[2] However, our results also show that the interactions among various sociodemographic indicators contributed to generating asymmetry, with socially vulnerable women having limited access to nPEP, similarly to what has been observed for the use of other preventive methods among women.[32,33] It is noteworthy that the number of sex workers receiving nPEP did not exceed 140 during the 2-year study period and that most of those women were treated at only 1 of the 5 health care facilities analyzed. The low rates of nPEP use by sex workers have been reported for other countries,[34] reflecting a preventive environment that has apparently deteriorated.[27,28] especially in contexts of growing political conservatism, like Brazil. In socially vulnerable

Table 5

Adjusted prevalence ratio for loss to follow-up after nPEP initiation among women receiving nPEP in Brazil, the reference being the completed nPEP clinical follow-up group.

Characteristic	Adjusted prevalence ratio	95% CI		P
		Lower limit	Upper limit	
Age group, y				
16–25	1	—	—	
26–40	0.88	0.79	0.99	.026
41–60	0.81	0.68	0.96	.014
No data	0.87	0.59	1.27	.463
Self-reported skin color				
Non-Black	1	—	—	
Black	1.15	1.03	1.30	.016
No data	1.07	0.91	1.26	.412
Alcohol/drug user*				
No	1	—	—	
Yes	1.15	1.01	1.32	.040
Health care facility type				
Voluntary counseling and testing center	1	—	—	
Outpatient clinic	1.35	1.20	1.51	.003
Infectious diseases hospital	1.37	1.11	1.69	<.001

CI = confidence interval, nPEP = nonoccupational post-exposure prophylaxis.
* Excluding those who used only marijuana.

populations, structural interventions can have a positive effect on HIV prevention.[35,36]

The fact that the majority of women in this study had never undergone HIV testing before receiving nPEP raises concern, suggesting that the pattern of testing is different among women at higher risk, who are tested only half as often as are those in the general population.[37] Hypotheses to explain the difference in testing among women at high risk and those at low risk—for example, whether factors such as fear and stigma[38,39] could play different roles depending on the level of risk—should be investigated. It is noteworthy, however, that nPEP has served as an entryway to broader HIV testing for specific segments of society. It is also important to highlight that, in the isolated analysis of the contextual factors that influence compliance with the drug regimen, previous HIV testing reduced the probability of LTFU, thereby suggesting that women's previous concern about HIV could have accounted for better dealing with HIV services and ARV-based prophylaxis.

In the present study, we found especially high rates of LTFU after nPEP. Approximately 30% of the women evaluated had a clinical follow-up consultation and an HIV test after the end of the ART use period. The reported rates of follow-up HIV testing after nPEP have varied widely.[10,13,17,34,40–43] In a study conducted in London, England,[41] those rates were found to be 45.0% and 14.0% at 3 and 6 months after the exposure, respectively. For those same time points, rates of 51.0% and 22.0%, respectively, were reported in a study conducted in Switzerland.[34] In a study conducted in Paris, France,[44] the 30-day post-exposure HIV testing rate was found to be 67.8%. In the present study, the HIV testing rates at 3 and 6 months after the exposure were 24.8% and 1.5%, respectively.

Those low rates were associated with an intersection of factors, with emphasis on healthcare facility type and characteristics of social and HIV-related vulnerability. We found that being treated at a health care facility that is more treatment-focused (HIV outpatient clinics and hospitals) were predictors LTFU after nPEP in all of the scenarios that were analyzed. Such healthcare facilities tend to be organized in a way that focuses more on the clinical procedures, whereas individuals belonging to most vulnerable populations tend to prefer healthcare facilities with a friendlier approach, with an organization and staff that are better suited to meeting their needs.[45] Additionally, prevention-focused healthcare facilities, such as VCT centers, may be better prepared to offer the type of care more appropriate for nPEP users than those focused on treating people living with HIV. This raises an important issue for the provision of new preventive methods such as preexposure prophylaxis (PrEP) and nPEP.

Additionally, among the contextual factors analyzed, alcohol/drug use and sex work increased the probability of LTFU. However, the association with sex work lost significance when all variables were collectively analyzed, possibly because age and skin color influence both sex work and LTFU. In fact, among the study population, having black skin color and being younger increased in 2.0 and 5.6 times, respectively, the chances of being involved in sex work. Low rates of nPEP follow-up were observed among sex workers in Kenya, where only 24% returned for HIV testing 6 weeks after nPEP initiation.[14] Being older was the only factor associated with return for testing in this study.[14] These findings underscore need for a specific public health agenda targeting female sex workers.

Among the social characteristics analyzed in the present study, being young and being Black had the greatest influence on LTFU after nPEP. This shows that social factors played a dual role in the present study: they restrict the access of most vulnerable women to nPEP and, for those who manage to access the prophylaxis, social inequalities reduce their chances of completing the nPEP protocol. These 2 phenomena might contribute to rendering this preventive strategy practically ineffective in such groups, as societal distinctions based on skin color, sex, social class, and sexual identity have become entrenched.[46] In fact, addressing such inequalities must be a priority in HIV prevention programs, once promoting access to most vulnerable populations has been a key challenge also to PrEP[47] and HIV testing,[48] globally.

It is important to highlight that, in all models and analyses done in the present study, none of the risk factors related to the sex partner were associated to LTFU. This occurred even among

women who had HIV-positive partners, although for them the proportion of follow-up completion (35%) was among the highest of all groups analyzed. This result confronts previous studies,[11,49] especially those with MSM, which have shown that completion of nPEP follow-up is higher among individuals who know their partner's risk and serological status. This suggests the need to better investigate the relationships between partner's risk, search for health care and use of nPEP among women.

In conclusion, we analyzed records for a 2-year period and found that the number of women receiving nPEP was approximately 25% of that reported for men. Although not eliminating its effectiveness, high rates of LTFU after nPEP initiation reduced the positive impact of this method. The possibility that new preventive methods will live up to their potential to contain the epidemic is dependent on the implementation of policies aimed at improving the organization of health care facilities and addressing structural inequalities.

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