Sexual Assault and HIV Postexposure Prophylaxis at an Urban African Hospital

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Abstract

Antiretroviral postexposure prophylaxis (PEP) may be underutilized in sexual assault cases in Kenya. This study evaluated the characteristics of survivors of sexual violence attending the Gender-Based Violence Recovery Center (GBVRC) at the Kenyatta National Hospital and reviewed the uptake, adherence, and outcomes of those initiated on PEP. In a retrospective cohort, data from charts of the assaulted seen at the GBVRC from 2009 to 2012 were abstracted. Data were collected describing sociodemographic characteristics, nature of sexual assault, HIV serostatus, and aspects of the PEP care cascade. Characteristics of participants who received PEP were compared with those who did not receive PEP. We enrolled 385 assaulted persons; 331 (86%) were female; the median age of the assaulted persons was 21 (interquartile range 14–28) years; and 61 (15.8%) were children aged 10 years and younger. Of 379 assaults with descriptions, 330 (85.7%) were vaginal assaults and 40 (10.3%) were penile-anal assaults. Most perpetrators were unknown to the assaulted 220 of 384 (57.3%). All assaulted persons were offered HIV testing and 359 (93%) accepted testing; 346 (96.4%) of 359 assaulted persons tested HIV negative. In total, 207 (53.8%) of 385 sexual assault survivors initiated PEP. Only 70 (34%) completed 28 days of PEP, and only 21 (10.1%) returned for repeat HIV test at 3 months. In conclusion, PEP was only initiated in 54% of sexual assault cases. The care cascade showed that late presentation and poor adherence were the greatest gaps in PEP provision. Earlier presentation for PEP should be promoted among sexual assault in areas of high HIV prevalence.

Keywords: sexual assault, HIV, postexposure prophylaxis, rape, GBVRC, antiretroviral

Introduction

IN COMMUNITIES WITH high HIV prevalence, the risk of HIV transmission after sexual assault may be high. Gender-Based Violence Recovery Centers (GBVRC), specialized clinics that provide medical care, counseling, support, and HIV and sexually transmitted infection (STI) testing, can play an important role in preventing HIV after sexual assault by providing antiretroviral (ARV) postexposure prophylaxis (PEP) if indicated.¹ However, there is concern that PEP may be underutilized in sexual assault cases in Kenya.² Previous systematic reviews of adherence to PEP have highlighted poor rates of PEP completion for the sexually assaulted who were also more likely to accept PEP than those with other exposures to HIV.³

In sub-Saharan Africa, dual epidemics of HIV and sexual violence make implementation of PEP an important part of

the public health response to sexual assault.⁴ Further, genital trauma associated with sexual violence increases the risk of HIV transmission.^{5,6} Understanding the uptake and utilization of PEP could inform strategies to maximize the effectiveness of PEP.^{7,8}

We designed a retrospective cohort study at the Kenyatta National Hospital (KNH) GBVRC in Nairobi, Kenya. We obtained clinic records to determine the demographics of the assaulted, typologies of assault, time-to-initiation of PEP, and described factors that influence provision of PEP and successful completion of PEP regimens.

Methods

Participants were identified from an existing database of those who attended the GBVRC at the KNH from June 1, 2009 up to June 1, 2012 after sexual assault. At this facility,

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the assaulted undergo professional counseling and are referred to a physician, where medical history is obtained, pelvic examination performed to record physical evidence of sexual assault, high vaginal swab taken for microscopic examination, and blood samples collected for rapid HIV testing. Empirical treatment is offered for gonorrhea and syphilis. HIV testing is offered to all the assaulted and, at the providers' discretion, other tests are performed, including pregnancy tests and hepatitis B surface antigen. Standard protocols recommend that those who are HIV negative and seek medical care within 72 h of the exposure start on ARV prophylaxis for 28 days and are given a follow-up date for a repeat HIV test. One triple ARV regimen was dispensed (lamivudine, zidovudine, and lopinavir-ritonavir). ARVs were free as part of gender-based violence services. Hepatitis B vaccine and emergency contraceptives are also given to the assaulted as indicated.

Study procedures

Data were abstracted from existing survivor patient records and recorded on a data abstraction questionnaire. Patients' age, sex, date of birth, nationality, occupation, level of education, date of assault, date of presentation, HIV serostatus, initiation of PEP (prophylaxis within or after 72 h of exposure), and outcomes after 3 or 6 months post-PEP were noted. HIV serostatus was confirmed from the assaulted who came back for a repeat HIV rapid test. All records were included, even those with incomplete data.

Statistical analysis

Data entry, cleaning, and analysis used Statistical Package for Social Sciences Program (SPSS) version 17.0 (SPSS, Inc., Illinois, USA) and Stata 13 (StataCorp, Texas, USA). Demographic characteristics of female and male persons were tabulated. *t*-Test and chi-square test were used to compare demographic and social characteristics of the assaulted who successfully initiated PEP with those who did not. Multivariate logistic regression was used to model multiple factors related to PEP initiation.

Human subjects protection

Ethical approval was received from the KNH/University of Nairobi Ethics and Research Committee before undertaking the study. Informed consent was obtained from the GBVRC staff members who agreed to participate as key informants. Confidentiality was maintained by ensuring that no names were recorded or entered into the study database.

Results

Characteristics of those sexually assaulted

Between 2009 and 2012, 385 sexually assaulted people were seen, of whom 331 (86%) were female. The median age of the assaulted was 21 years [interquartile range (IQR) 14–28 years], 113 (29.9%) were students in secondary school or above, 101 (26.8%) were unemployed, and 61 (15.8%) were children aged 10 years and younger. The demographic characteristics of the sexually assaulted are shown in Table 1.

Characteristics of sexual assault cases

The type of assault was recorded for 379 assaulted: 330 (85.7%) were vaginal assaults perpetrated by men, 9 (2.3%) were oral assaults perpetrated by men, and 40 (10.4%) were anal assaults perpetrated by men; 10 (3.8%) were reported to be sexual assaults of men perpetrated by women. Some assaulted people reported more than one type of assault. The assaulted reported condom use in 9 cases (2.3%). Males assaulted numbered 53 (13.8%). Data were incomplete for the gender of the perpetrators of male sexual assault, but 29 men reported being assaulted by a man.

Not all of those assaulted were adults: 61 were children aged 10 years and younger. Children at the clinic were majorly female: 46 (75%). Two children were HIV seropositive at baseline. Children older than 6 years were more likely not to receive an initial HIV test. Characteristics of children are described in Table 2.

The location of assault was recorded by 363 persons: 39 (10.7%) occurred outdoors, 113 (31.1%) in hotel rooms, 43 (11.8%) on the street, and 154 (42.4%) in other areas. The time of sexual assault was recorded for 121 persons as from 6 p.m. to 12 midnight for 53 persons (43.8%), 12 midnight to 6 a.m. for 22 (18.2%), 6 a.m. to 12 noon for 15 (12.4%), and 12 noon to 6 p.m. for 31 (25.6%).

Relationship and profile of perpetrator

The relationship to the perpetrator was reported by 381 of those assaulted. Of those, 220 (57.3%) did not know the perpetrator, 44 (11.5%) reported it was a family member, 45 (11.8%) reported it was a friend, and 14 (3.7%) reported it was a boyfriend. The assaulted reported that in 15 (3.9%) assault cases, the perpetrators were under the influence of alcohol, while in 6 (1.6%) assaults, the perpetrators were under the influence of other drugs. Only 5 of 61 children were assaulted by strangers.

Referral to the GBVRC

Patients self-referred for care in the majority of cases (221, 77.4%); the most common other referrals came from neighboring clinics or voluntary counseling and testing centers (53, 13.8%). Other sources of referral included 34 (8.8%) from the casualty department of the adjoining hospital, 27 (7%) from other local hospitals, 27 (5.7%) by family members, 6 (1.6%) by police or legal source, and 14 (3.6%) by teacher or friends.

Time of presentation to the GBVRC

The median time to presentation for the assaulted was 24 h (IQR 12–792 h). Information was missing on the time taken for 69 (18%) sexually assaulted to seek medical help. Assaulted adults who were older ($p=0.001$) and with a higher level of education ($p<0.001$) were more likely to seek care promptly. Gender or marital status did not result in significant differences in the time taken to seek medical help. Those who had suffered anal assaults were more likely to present >72 h after the assault ($p=0.013$). Those persons assaulted who did not know their perpetrators were more likely to present before 72 h ($p=<0.001$); those between ages 21–30 years also presented earliest for care. Only half of children presented to the GBVRC within the time window to receive PEP.

TABLE 1. SUMMARY OF DEMOGRAPHIC CHARACTERISTICS OF THE SEXUALLY ASSAULTED

<i>Demographic characteristic (n = 385)</i>	<i>Number (%)</i>	<i>Female</i>	<i>Male</i>
Gender of assaulted (n = 384)	384	331 (86.2%)	53 (13.8%)
Age (n = 385), years			
0–10	61 (15.9)	46	15
11–20	123 (32)	110	13
21–30	135 (35)	114	21
31–40	51 (13.2)	49	2
>40	15 (3.9)	13	2
Occupation (n = 373)			
Employed	98 (26.3)	85	13
Unemployed	101 (26.8)	99	2
Students	117 (31)	106	11
Children 0–10 years	61 (15.8)	47	14
Disability (n = 385)			
Disabled	2 (0.5)	2	0
Marital status (n = 383)			
Married	44 (11.5)	37	7
Single	261 (68.2)	234	27
Minor <18 years of age	78 (20.4)	60	18
Education (n = 378)			
None (age 0–10)	61 (16.1)	12	4
None (age >10)	21 (5.6)	19	2
Primary	93 (24.6)	122	17
Secondary	90 (23.8)	81	9
College/university	113 (29.9)	94	19
Type of assault (n = 379)			
Vaginal		330	n/a
Anal	37 (9.6)	2	35
Oral	9 (2.3)	7	2
Both vaginal and anal		3	n/a
Gender of perpetrators and the assaulted (n = 264)			
Male perpetrator, female assaulted	224 (84.8)	n/a	224
Male perpetrator, male assaulted	29 (11)	n/a	29
Female perpetrator, male assaulted	10 (3.8)	10	n/a
Female perpetrator, female assaulted	3 (1.1)	3	n/a
Did the assaulted know the perpetrator (n = 384)			
Known	164 (42.6)	140	24
Unknown	220 (57.3)	192	28
Perpetrator's relationship to the assaulted (n = 381)			
Family member	44 (11.6)	38	6
Friend/acquaintance	45 (11.9)	38	7
Boyfriend	14 (3.7)	14	0
Criminal/stranger	107 (28.1)	95	12
Other	171 (44.9)	145	26
Time for presentation for care (n = 316)			
0–72 h	200 (52)	178	22
72 h–1 week	10 (2.6)	8	2
1 week–1 month	26 (6.8)	23	4
1 month–1 year	55 (14.3)	46	9
>1 year after assault	25 (6.5)	23	2
Time to presentation for care (n = 316)			
≤72 h	200 (63)	178	22
>72 h	116 (37)	99	17

(continued)

TABLE 1. (CONTINUED)

<i>Demographic characteristic (n = 385)</i>	<i>Number (%)</i>	<i>Female</i>	<i>Male</i>
HIV test result (n = 380)			
Positive	13 (3.4)	12	1
Negative	346 (91.1)	301	45
Not tested	21 (5.5)	16	5
PEP initiation (n = 341)			
PEP started	207 (57.3)	185	22
28 days of PEP completed (n = 207)			
<28 days	78 (37.7)	70	8
≥28 days	70 (33.8)	63	7
Unknown	59 (28.5)	49	10
PEP initiation time (n = 184)			
≤72 h	173 (94)	161	12
>72 h	11 (6.5)	11	0
Level of adherence to PEP (n = 148)			
1–7 days	19 (12.8)	18	1
8–14 days	1 (0.7)	1	0
15–21 days	52 (35.1)	46	0
22–28 days	6 (4.1)	5	1
>28 days	70 (47.3)	63	7
Follow-up HIV testing done (n = 367)			
3 months	21 (5.7)	19	2
6 months	3 (0.8)	3	0

n/a, not applicable; PEP, postexposure prophylaxis.

TABLE 2. SUMMARY OF DEMOGRAPHIC CHARACTERISTICS OF SEXUALLY ASSAULTED CHILDREN

<i>Characteristic</i>	<i>Total (n = 61)</i>	<i>Female</i>	<i>Male</i>
Age	61	46 (75.4%)	15 (24.6%)
0–5 years	19	14	5
6–10 years	42	32	10
Time to presentation			
<72 h	27	24	3
>72 h	23	17	6
Unknown date of assault	11	5	6
Nature of assault			
Vaginal assault, male perpetrator	46	46	0
Anal assault, male perpetrator	13	0	13
Other	1		1 male assaulted by female
Initial HIV test done	53	42	11
HIV seropositive at baseline	2	1	1
PEP initiation	20	19	1
PEP adherence	14		
0–14 days	5	5	
14–28 days	9	8	1
HIV retesting 3 months	3	3	0
HIV retesting 6 months	0	0	0

PEP, postexposure prophylaxis.

Correlates of seeking care within 72 h are shown in Table 3. In a multivariable logistic regression model of factors associated with presentation to the GBVRC at <72 h, only education level and age remained significantly associated with timely presentation for PEP.

HIV testing among the assaulted

There were 380 assaulted people who were offered voluntary HIV testing upon presentation; 21 (5.5%) sexually assaulted did not consent to HIV testing. Of those who did test, 13 assaulted were HIV seropositive (3.4%) and counseling and referral to an HIV comprehensive care center were offered. There were 346 who tested HIV seronegative, of whom 207 sexually assaulted were initiated on a PEP regimen.

PEP initiation

Of the 385 total sexual assault cases, 207 (57.3%) were initiated on PEP; 7 assaulted presented later than the 72 h window but still received PEP. The correlates of PEP initiation

were similar to correlates of time to presentation at the GBVRC, with university students and employed persons more likely to initiate PEP. Two of the patients who did not get an initial HIV test still received PEP. There were 153 assault survivors who were not initiated on PEP, and data were missing for 24 people.

PEP adherence

Follow-up data were available for 148 survivors who initiated PEP, 70 (47.3%) completed 28 days of PEP, 52 (35.1%) completed only 15–21 days, and 19 (12.8%) completed only 1–7 days. There was evidence that 34% of the 207 assaulted persons who started PEP completed all 28 days. In general, patients did not receive a full 28-day course of PEP when it was initiated and had to return to the pharmacy to refill their ARV prescription, which may explain different completion and adherence patterns.

Repeat HIV testing after PEP

The assaulted were recommended to return to the center at 3 and 6 months for follow-up HIV testing. Of the 346 assaulted, whose initial HIV serostatus was negative, 21 (6.1%) tested HIV seronegative after 3 months, and 325 (93.9%) did not return to the center for a repeat HIV test after 3 months. At 6 months, 3 (0.9%) still tested negative and 343 (99.1%) never repeated the test after 6 months. There were no known seroconversions among those HIV-seronegative survivors who came for a repeat HIV test.

Of the assaulted who initially refused HIV testing, 1 (3.8%) did the test after 3 months and was found to be HIV negative; the other 20 assaulted did not test.

Other conditions identified at the GBVRC

The assaulted were not universally screened for bacterial STIs and pregnancy. There were 21 females who were pregnant out of 78 tested; 9 had a positive syphilis Venereal Disease Research Laboratory (VDRL) out of 22 who were tested. Only 11 of the assaulted were tested for Hepatitis B surface antigen, of whom 1 tested positive. Information was not available for long-term outcomes of emergency contraception use.

Discussion

Our comprehensive review of sexually assaulted persons seeking care at a large urban GBVRC demonstrated that services were actively sought out by men, women, and children. However, our data show that more than 40% of those assaulted presented too late to receive PEP. Those most likely to successfully access PEP services were women in their 20s, single, and with postsecondary education, suggesting that college-educated women were more knowledgeable about resources available for survivors of gender-based violence. Those who did not know their perpetrators also presented to the center early, which we speculate may be because those assaulted by strangers fear HIV acquisition more than those assaulted by family members or friends.

HIV was prevalent in 13 of 359 survivors tested (3.6%). Although this is less than the 5.6% prevalence of HIV in Kenya according to Kenya AIDS Indicator Survey (2012),⁹ it highlights the ongoing need for population-based HIV testing and the high population HIV risk of young women, who are

TABLE 3. CORRELATES OF TIME TO PRESENTATION AT THE GENDER-BASED VIOLENCE RECOVERY CENTER

Correlate	Presentation ≤72 h after assault, n (%)	Presentation >72 h after assault, n (%)	p ^a
Age group, years			
<10	27 (54)	23 (46)	<0.001
11–20	50 (53.8)	43 (46.2)	
21–30	90 (80.4)	22 (19.6)	
31–40	27 (56.3)	21 (43.8)	
>40	6 (46.2.8)	7 (53.9)	
Gender			
Male	22 (56.4)	17 (43.6)	0.37
Female	176 (63.8)	100 (36.2)	
Marital status of assaulted (age >18 years)			
Single	137 (69.2)	75 (35.4)	0.58
Married	27 (69.2)	12 (30.8)	
Education level of assaulted			
None (child <10 years)	27 (54)	23 (46)	<0.001
None (adult)	8 (50)	8 (50)	
Primary	36 (50)	36 (50)	
Secondary	45 (56.3)	35 (43.8)	
College/university	78 (84.8)	14 (15.2)	
Relationship to perpetrator			
Known	65 (50.8)	63 (49.2)	<0.001
Unknown	129 (70.5)	54 (29.5)	
Occupation			
Child <10 years	27 (54)	23 (46)	0.15
Student	57 (63.3)	33 (36.7)	
Employed	61 (71.8)	24 (28.2)	
Unemployed	49 (58.3)	35 (41.7)	
Nature of assault			
Vaginal	179 (65.3)	95 (34.7)	0.013
Anal	9 (33.3)	18 (66.7)	
Oral	5 (62.5)	3 (37.5)	

^aStatistical test used was chi squared to compare categorical variables. A *p*-value of <0.05 was considered statistically significant.

FIG. 1. Cascade of care for the sexually assaulted who present to the GBVRC, from June 1, 2009, to June 1, 2012. GBVRC, Gender-Based Violence Recovery Center; PEP, postexposure prophylaxis.

the majority of those presenting for care. It is not known from the data we collected whether those seeking services were previously aware of their HIV status or not. The population accessing gender-based violence services should be assumed to be at high risk of testing positive for HIV; additional services may be needed to facilitate linkage to HIV care among the sexually assaulted or linking to preexposure prophylaxis (PrEP) services for those at high risk.

The presence of HIV infection in 3.6% of people seeking PEP underlines the urgency of pre-PEP HIV testing to avoid using PEP in the assaulted who are already HIV-infected, which could lead to the development of drug resistance.¹⁰

In a cascade of care approach to providing PEP in cases of sexual assault (Fig. 1), we see that the biggest barriers to PEP provision in this population are late presentation for care and completion of the full PEP regimen.

Low PEP adherence and poor short- and long-term follow-up of the assaulted presented missed opportunities for completion of PEP regimens and repeat HIV testing. The level of adherence to PEP was found to be 47.3%, defined by the completion of 28-day ARV regimen; since drugs were dispensed in a 7-day supply, patients needed to return often for drug refills. Consideration of dispensing more days of drugs, or extending care at satellite clinics closer to a person's residence, could increase ability to adhere to PEP medication by reducing barriers to medication refills.⁷ Ford et al. have published a systematic review demonstrating that PEP completion rates are higher when a full 28-day supply of drugs is dispensed at the first PEP visit.¹¹

This research highlights special considerations for male sexually assaulted, who were the majority of those reporting an anal assault. Anal assaults are high risk for HIV acquisition since receptive anal intercourse is considered the most efficient sexual route of HIV transmission.^{12,13} The majority of men and women reporting anal assaults presented too late to receive ARV PEP.

The World Health Organization guidelines development group recently outlined a research agenda for the remaining evidence gaps in provision of PEP, including clarifying the PEP eligibility window, strategies to promote adherence to PEP, and the optimal follow-up schedule post-PEP. Our research showed that all three of these areas represented gaps in the PEP care cascade for the sexually assaulted seen in our clinic, and we concur that additional research toward clarifying

these issues will benefit patients and promote completion of the care cascade.¹⁴

PrEP is not currently offered in the gender-based violence clinic. Persons presenting for PEP after sexual assault belong to many of the target demographic populations for PrEP and may not often access medical services. Incorporating PrEP into clinic could be a feasible way to improve PrEP uptake in certain populations of youth in Kenya.¹⁵

This study had some limitations. There were missing data in the clinical files. We did not directly interview those assaulted and therefore rely on report and self-report in these data. These data should be generalized with caution to represent persons who have experienced sexual assault in general in Kenya since it is unknown what proportion of sexually assaulted persons will present for care in this clinical setting.

In summary, our study revealed that a diverse population of women, men, and children, all sought postsexual assault counseling and health services, and those who presented early overwhelmingly accepted PEP. PEP can be a powerful tool to help protect the assaulted from acquiring HIV after an assault and desire for PEP may be a service that can attract the assaulted to seek care after assault.

Additional sensitization about the need for prompt presentation to receive PEP, the need to adhere to PEP for 28 days, and the need for follow-up HIV testing at the end of a PEP regimen would benefit persons who have experienced sexual assault.

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Authors' Contributions

E.M.M.: Article writing and data collection, article preparation, data cleaning, and analysis. J.K.: Study coordination, article review, and preparation. Z.M.: Data analysis and article review. J.K.: Article review and preparation. A.C.R.: Article review, guidance on article preparation, data cleaning, and analysis.

Author Disclosure Statement

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References

1. World Health Organization (WHO). Consolidated Guidelines on the Use of Antiretroviral Drugs for Treating and Preventing HIV Infection: Recommendations for a Public Health Approach. Geneva, Switzerland: WHO, 2013.
2. Siika AM, Nyandiko WM, Mwangi A, et al. The structure and outcomes of a HIV postexposure prophylaxis program in a high HIV prevalence setup in western Kenya. *J Acquir Immune Defic Syndr* 2009;51:47–53.
3. Ford N, Irvine C, Shubber Z, et al. Adherence to HIV postexposure prophylaxis: A systematic review and meta-analysis. *Aids* 2014;28:2721–2727.
4. Kim JC, Martin LJ, Denny L. Rape and HIV post-exposure prophylaxis: Addressing the dual epidemics in South Africa. *Reprod Health Matters* 2003;11:101–112.
5. Draughon JE. Sexual assault injuries and increased risk of HIV transmission. *Adv Emerg Nurs J* 2012;34:82–87.
6. Wheeler J, Anfinson K, Valvert D, Lungo S. Is violence associated with increased risk behavior among MSM? Evidence from a population-based survey conducted across nine cities in Central America. *Glob Health Action* 2014;7:24814.
7. Chacko L, Ford N, Sbaiti M, Siddiqui R. Adherence to HIV post-exposure prophylaxis in victims of sexual assault: A systematic review and meta-analysis. *Sex Transm Infect* 2012;88:335–341.
8. Lurie P, Miller S, Hecht F, Chesney M, Lo B. Postexposure prophylaxis after nonoccupational HIV exposure: Clinical, ethical, and policy considerations. *JAMA* 1998;280:1769–1773.
9. Kimanga DO, Ogola S, Umuro M, et al. Prevalence and incidence of HIV infection, trends, and risk factors among persons aged 15–64 years in Kenya: Results from a nationally representative study. *J Acquir Immune Defic Syndr* 2014;66(Suppl 1):S13–S26.
10. Emini EA. Resistance to anti-human immunodeficiency virus therapeutic agents. *Adv Exp Med Biol* 1995;390:187–195.
11. Ford N, Venter F, Irvine C, Beanland RL, Shubber Z. Starter packs versus full prescription of antiretroviral drugs for postexposure prophylaxis: A systematic review. *Clin Infect Dis* 2015;60(Suppl 3):S182–S186.
12. DeGruttola V, Seage GR, 3rd, Mayer KH, Horsburgh CR Jr. Infectiousness of HIV between male homosexual partners. *J Clin Epidemiol* 1989;42:849–856.
13. Sanders EJ, Okuku HS, Smith AD, et al. High HIV-1 incidence, correlates of HIV-1 acquisition, and high viral loads following seroconversion among MSM. *AIDS* 2013;27:437–446.
14. Siegfried N, Beanland RL, Ford N, Mayer KH. Formulating the future research agenda for postexposure prophylaxis for HIV: Methodological challenges and potential approaches. *Clin Infect Dis* 2015;60(Suppl 3):S205–S211.
15. Braksmajer A, Senn TE, McMahon J. The potential of pre-exposure prophylaxis for women in violent relationships. *AIDS Patient Care STDS* 2016;30:274–281.

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