

OPEN

A Pilot Evaluation of Expedited Partner Treatment and Partner Human Immunodeficiency Virus Self-Testing Among Adolescent Girls and Young Women Diagnosed With *Chlamydia trachomatis* and *Neisseria gonorrhoeae* in Kisumu, Kenya

Victor Omollo, MBChB, MPH,* Elizabeth A. Bukusi, MBChB, MMED, MPH, PhD,*†
 Lara Kidoguchi, MPH,† Felix Mogaka, MBChB,* Josephine B. Odoyo, MPH,*
 Connie Celum, MD, MPH,† Jennifer Morton, MSW, MPH,†
 Rachel Johnson, MPH,† and Jared M. Baeten, MD, PhD†‡§

Background: Expedited partner treatment (EPT) is effective for preventing sexually transmitted infection recurrence, but concerns about intimate partner violence and missed opportunities for human immunology virus (HIV) testing have limited its use in African settings.

Methods: We conducted a pilot prospective evaluation of EPT among adolescent girls and young women (AGYW) accessing HIV preexposure prophylaxis in an implementation project in Kisumu, Kenya. Those with etiologic diagnosis of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* were treated and given the option of delivering sexually transmitted infection medication and HIV self-test kits to their current sexual partner(s). At enrollment, we assessed their reasons for declining. Three months after they delivered medication and kits to the partner(s), we assessed their reasons for failing to deliver medication and kits to their partner and reported partner's reactions.

Results: Between September 2018 and March 2020, 63 AGYW were enrolled. The majority (59/63 [94%]) accepted EPT, and 50 (79%) of 63 partner HIV self-testing (HIVST). Three quarters (46/59) of those accepting EPT returned for the assessment visit with 41 (89%) of 46 successfully delivering medication to 54 partners, of whom 49 (91%) used it. Seventy percent (35/50) who took partner HIVST kits returned for the assessment, with 80% (28/35) reporting providing kits to 40 partners, of whom 38 (95%) used it. Reported barriers to EPT and partner HIVST uptake among women

who declined included anticipated fear that their partner could become angry or violent and loss of relationship.

Conclusions: Both EPT and partner HIVST were acceptable despite noted barriers among Kenyan AGYW with etiologic diagnosis of *Chlamydia trachomatis*/*Neisseria gonorrhoeae* and their partners.

Human immunology virus (HIV) preexposure prophylaxis (PrEP) is an oral medication that is effective in preventing HIV acquisition and is recommended by the World Health Organization for individuals with ongoing substantial risk.¹ With adolescent girls and young women (AGYW) in sub-Saharan Africa (SSA) contributing up to two thirds of new HIV infections yearly,² PrEP programs are making PrEP accessible to them through platforms that they routinely access for sexual reproductive health services.^{3,4} Following World Health Organization recommendations and other PrEP guidelines for sexually transmitted infections (STIs) screening at PrEP initiation and periodically during follow-up,^{5,6} PrEP programs have used etiologic diagnosis to screen for STIs and have reported a high prevalence of curable STIs between 17% and 30% for *Chlamydia trachomatis* (CT) and 8% for *Neisseria gonorrhoea* (GC) among AGYW in SSA.⁷⁻⁹

Outside PrEP programs, etiologic STI diagnostic services are not readily available in most SSA, and syndromic STI diagnosis, a clinical approach that uses STI-associated syndromes to make a diagnosis,¹⁰ is widely used. There is a need to move to etiologic diagnosis because syndromic approach is less effective for detecting vaginal STI syndromes as compared with urethral syndromes and cannot detect asymptomatic cases.¹¹⁻¹⁴ Studies among women in SSA found syndromic approach to have missed about 88% of laboratory diagnosed STIs and identified only 10.4% of women as having STIs compared with 32.2% identified through laboratory tests.^{15,16}

Effective partner strategies to help control STIs are lacking. In many settings, STI partner treatment has focused on partner notification—that is, informing partners through a referral note, or other mechanisms, with mostly passive assumptions that partners subsequently sought treatment. In many SSA countries, male partners infrequently visit health facilities and studies in these countries found that half of partners referred using partner notification do not go for treatment,¹⁷ potentially increasing reinfection rates in AGYW.¹⁸ An alternative partner treatment strategy is expedited partner treatment (EPT), presumptively treating the sex partners of patients diagnosed with an STI by providing medication to the patient to deliver to the partner(s) without the health

From the *Centre for Microbiology Research, Kenya Medical Research Institute, Nairobi, Kenya; and †Department of Global Health, ‡Department of Epidemiology, and §Department of Medicine, University of Washington, Seattle, WA

Acknowledgments: The authors thank the study staff and the clinical site staff for their assistance in data collection and quality assurance. The authors gratefully acknowledge all the adolescent girls and young women who participated in this study.

Conflict of Interest: None declared.

Sources of Funding: The POWER Project was funded by USAID, made possible by PEPFAR, under Cooperative Agreement AID-OAA-A-15-0034.

Correspondence: Victor Omollo, MBChB, MPH, Kenya Medical Research Institute, P. O. Box 614-40100, Agoi St, Kisumu, Kenya. E-mail: vomollo@kemri-ucsf.org/ victorov2@gmail.com.

Received for publication August 31, 2020, and accepted March 16, 2021. DOI: 10.1097/OLQ.0000000000001430

Copyright © 2021 The Author(s). Published by Wolters Kluwer Health, Inc. on behalf of the American Sexually Transmitted Diseases Association. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

care provider examining the partner(s).¹⁹ Expedited partner treatment can lower the risk of STIs recurrence by about 29% compared with standard partner management strategies.²⁰ Concern with EPT is the missed opportunity to test sexual partners for HIV because of risk of coexisting STI with undiagnosed HIV.²¹ Coupling EPT with HIV self-testing (HIVST) could overcome the HIV testing missed opportunities.

We conducted a pilot study to primarily evaluate the uptake and barriers of EPT and partner HIVST and secondarily compare rates of reinfection with gonorrhea and chlamydial infection in AGYW whose partners accepted and used EPT and AGYW who did not use EPT, declined, and/or their partners declined EPT.

METHODS

Study Setting, Population, and Design

This was a prospective cohort pilot study, nested within the Prevention Options for Women Evaluation Research (POWER), an implementation science project that evaluated delivery of HIV PrEP to AGYW attending 2 family planning clinics in Kisumu, Kenya (ClinicalTrials.gov NCT03490058). Eligibility criteria for the POWER cohort were: 16 years to 25 years old, able and willing to provide written informed consent, recently sexually active (having had vaginal intercourse at least once in the previous 3 months) and HIV uninfected on the date of enrollment. In the POWER study, which was conducted between August 2017 and March 2020, AGYW were offered PrEP and were followed up after 1 month and then quarterly for up to 36 months. All AGYW had testing for STIs at baseline and after every 6 months, specifically for CT and GC using nucleic acid amplification testing from a urine specimen using the APTIMA Combo 2 Assay (HOLOGIC/GEN-PROBE, Inc. San Diego, CA). Those who tested positive were offered standard medication according to the Kenya National STI medication guidelines.

This nested EPT and partner HIV self-test pilot study was conducted between September 2018 and March 2020. All women enrolled in POWER study who tested positive (within 2 months of their test results) for either CT or GC or both at the 2 family planning clinics were eligible to participate. Women with a positive STI result were invited to participate when being informed of the results either via a phone call or when attending a scheduled POWER study visit. Willing women gave written informed consent during their POWER study visit or at their next visit after the phone invitation and received counseling on the importance of partner treatment and partner HIV testing in the context of STI diagnosis. Women who initially declined were not offered EPT later.

Intervention

Women were given a partner treatment package (or packages, if multiple partners) that included Kenyan standard of care STI medication plus an HIV self-testing (HIVST) kit (OraQuick HIV Self-Test, OraSure Technologies, USA), with instructions for use. Sexually transmitted infection medication consisted of a single dose of oral cefixime 400 mg for GC and a single dose of oral azithromycin 1000 mg for CT (or both drugs for women with coinfection). All enrolled women who had more than 1 partner were provided with additional medication and HIVST for each extra partner as per their choice, although we strongly encouraged them to take medication for all partners where feasible. Sexually transmitted infection medication was accompanied by a medication card that contained information about the drug, including the dosage, side effects, instruction not to take the medication in case they had an allergic reaction in the past, and a 24-hour emergency contact in case they experienced any adverse drug event.

Women were instructed to inform their partners that any positive HIV test would need to be confirmed at an HIV testing center in accordance with the Kenya national HIV testing algorithm.

Study Visit and Data Collection

For each positive STI episode, 2 visits were conducted: a dispensing visit, the visit the participant had after the positive STI results were made available and EPT was offered, and an assessment visit, the first visit after the dispensing visit. The assessment visit was synchronized with the next visit in the parent POWER study. Standardized questionnaires were administered by a research assistant during the dispensing visit to collect information about the women's willingness to take EPT and HIVST, reasons for declining if applicable, and the characteristics of their relationship with their partner(s). During the assessment visit, we again administered questionnaires to collect information on whether they had given EPT and HIVST to their partners, how their partners reacted and if the partners took the medication and used the HIVST. The male partners were not considered as participants and were not contacted to provide any information. Repeat STI test results, done more than a month after the EPT intervention, were obtained from the AGYW study visit in POWER where STI tests were done at baseline and after every 6 months.

Assessment of Social Harm

Any responses at the assessment visit that indicated that the partner had responded by becoming "angry," "violent," or "ended our relationship" were flagged and followed up with the study sites. After reviewing the sites' summary of each flagged situation, those deemed to meet the criteria of an institution regulatory board's (IRB) reportable social harm were reported, and the AGYW was referred for counseling or to the gender based violent center in one of the study sites.

Measures

Uptake was assessed by the proportion of women who accepted to take STI medication and partner HIVST kits to their partners and by the proportion of partners who accepted to use STI medication and partner HIVST kits. Barrier was assessed by the proportion of response categories for declining EPT and HIVST, reasons for not delivering, and reactions of the partners after receiving STI medication and HIVST kits. Effectiveness was assessed by (1) comparing rates of reinfection with gonorrhea and chlamydial infection between women enrolled in EPT whose partners accepted and used the STI medication and women enrolled in the POWER study who were not offered medication to take to their partners prior to and during the implementation of this pilot study and (2) comparing rates of reinfection with gonorrhea and chlamydial infection within women enrolled in EPT between those whose partners used the STI medication and those whose partners did not.

Ethical Consideration

The study protocol, informed consent forms, and participant education materials were reviewed and approved by the IRBs/Ethics Committee at the Kenya Medical Research Institute and University of Washington.

Statistical Analysis

We calculated the proportions of women who accepted EPT and partner HIVST and used log-Poisson generalized estimating equations with robust standard errors and independence correlation structure to assess factors related to EPT and partner HIVST uptake.

TABLE 1. Uptake of Expedited Partner Treatment and Partner HIV Self-Test Kits Among AGYW With CT or GC and Their Partners

Women EPT and HIVST Uptake (N = 63)	n (%)
EPT only	11 (17.5)
HIVST only	2 (3.2)
Both EPT and HIVST	48 (76.2)
Women EPT uptake, n = 63	
Took STI medication for partner	59 (93.7)
Returned for assessment visit	46 (78.0)
Gave STI medication to partner	41 (89.1)
Men EPT uptake,* n = 60	
Partners given medication	54 (90.0)
Partner took the medication	49 (90.7)
Women partner HIVST uptake, n = 63	
Took HIV self-test kit for partner	50 (79.0)
Returned for assessment visit	35 (70.0)
Gave HIV self-test kit to partner	28 (80.0)
Men HIVST uptake,* n = 50	
Partners given HIV self-test kit	40 (80.0)
Partner took HIV self-test	38 (95.0)

*As reported by women who returned for assessment visit.

All women with an assessment visit were included in an analysis to describe the proportion of women who delivered STI medication and partner HIVST kits to their partners, the response categories for their experience with delivery and the proportion of partners who accepted and used the delivered STI medication and partner HIVST kits. We calculated the number of reinfection with gonorrhea and chlamydial infection among women enrolled in EPT whose partners used the STI medication, among women enrolled

in EPT whose partners did not use EPT (woman declined, woman did not deliver or partner refused) and among women enrolled in POWER who were not offered EPT. We then calculated and compared the unadjusted incidence rates of STI between the groups. We used 2-sided *P* values and considered them significant if less than 0.05. All analyses were done using Stata/SE 15.1.

RESULTS

Between September 2018 and March 2020, a total of 139 STI episodes (126 CT, 28 GC, 15 both) were diagnosed in 124 AGYW (14 women contributed 2 episodes, 1 woman contributed 3 episodes while the rest contributed 1 episode each). Because of the logistical challenges principally related to a laboratory closure resulting in very long periods between sample collection and STI results, 52 women were not assessed for eligibility to join this EPT and partner HIVST pilot. Seventy-two women were screened, of whom 64 met the inclusion criteria and 63 were enrolled; 1 woman declined to provide consent and 8 had a gap in follow-up so that their time from STI diagnosis to being approached for the study was more than 2 months. Of the 63 enrolled, 48 (76%) returned for the assessment visit and provided information on 70 male partners.

Participant Characteristics

Among the 63 enrolled, the median age was 20 years (interquartile range, 19–22 years), 52 (82.5%) were single, 23 (36.5%) had more than 1 sex partner, and 53 (84.1%) had primary partners who were older than them. Condom use was low, with 34 (54.0%) reporting inconsistent use and 24 (38.1%) reporting no use. Nearly half (n = 30, 47.6%) thought that their primary partner had other sex partners.

TABLE 2. Factors Associated With Women Uptake of EPT and Partner HIVST Among AGYW With CT or GC

	*RR (95% CI), <i>P</i>	EPT (n = 59/63) †RR (95% CI), <i>P</i>	Partner HIVST (n = 50/63) *RR (95% CI), <i>P</i>
Age, y			
16–18	Reference	Reference	Reference
19–21	0.95 (0.75–1.20), 0.67		0.80 (0.57–1.13), 0.21
22–25	1.03 (0.82–1.29), 0.83		0.81 (0.57–1.17), 0.26
One			Reference
Multiple	0.88 (0.74–1.04), 0.15		0.85 (0.64–1.15), 0.15
Condom use			
Always	Reference		Reference
Sometimes	1.84 (0.78–4.36) 0.16		0.93 (0.60–1.44), 0.74
Never	1.65 (0.69–3.92), 0.26		1.01 (0.66–1.54), 0.96
Age of partner			
Same age	Reference	Reference	Reference
1–5 y younger	0.82 (0.61–1.09), 0.17	0.90 (0.66–1.23), 0.50	1.21 (0.59, 2.49) 0.60
1–5 y older	0.89 (0.81–0.99), 0.03	0.98 (0.87–1.11), 0.79	1.23 (0.59–2.57), 0.58
6–10 y older	0.81 (0.62–1.06), 0.12	0.89 (0.69–1.14), 0.35	1.03 (0.44–2.41), 0.94
>10 y older	0.67 (0.47–0.94), 0.02	0.73 (0.51–1.04), 0.08	1.67 (0.81–3.43), 0.17
Duration of relationship			
<6 mo	Reference		Reference
6 to ≤12 mo	1.08 (0.79–1.47), 0.63		1.33 (0.91–1.94), 0.72
1 to 2 y	0.91 (0.63–1.30), 0.60		0.95 (0.66–1.36) 0.76
>2 y	1.03 (0.78–1.36), 0.82		1.06 (0.76–1.49) 0.14
Thinks partner has other partners			
No	Reference	Reference	Reference
Do not know	0.85 (0.74–0.98), 0.03	0.85 (0.73–0.99), 0.03	1.05 (0.67–1.64), 0.83
Yes	0.82 (0.72–0.93), 0.00	0.83 (0.72–0.96), 0.01	1.03 (0.67–1.59), 0.88

Age of partner and thought if partner had other partners which were significantly associated with uptake of EPT (*P* < 0.05) were included in the adjusted model.

*Adjusted RR.

†Unadjusted RR.

Uptake of EPT and Partner HIVST

Of the 63 women enrolled, 59 (94%) accepted EPT (Table 1). Of the 59, 22 (37%) had more than 1 partner, of which 11 (50%) took medication for all the partners, whereas the rest took for only 1 partner. More than three quarters (46/59) who took medication to their partners returned for the assessment visit and 41 (89%) reported that they gave the medication to their partners. Among these 46 women, a total of 60 male partners were expected to have been given medication, and women reported that 54 (90%) of 60 received the medication and 49 (90%) of 54 used it. For partner HIVST, of the 63 women enrolled, 50 (79%) accepted to take the kit to their partners. Of the 50, 19 (38%) had more than 1 partner, of which 11 (58%) 19 took a kit for all the partners while the remaining took a kit for only 1 partner. Seventy percent (35/50) who took partner HIVST returned for the assessment visit, and 28 (80%) of 35 reported that they gave the kit to their partners. For the 28 women, a total of 50 male partners were expected to have been given the kit and women reported that 40 (80%) of 50 received the kits and 38 (95%) of 40 used them.

Factors Associated With Uptake of EPT and Partner HIVST

In the adjusted model, knowledge that the partner had other sexual partners (relative risk [RR], 0.83; 95% confidence interval [95% CI], 0.72–0.96) and uncertainty about whether partner had other sex partners (RR, 0.85; 95% CI, 0.73–0.99) were associated with reduced uptake of EPT (Table 2).

Barriers to EPT and Partner HIVST

Responses (1 per STI episode per partner) given by women for declining to take STI medication and HIVST to partners, not giving STI medication and HIVST to partner and partners' reaction after receiving STI medication and HIVST indicated barriers to EPT and partner HIVST exist (Table 3). Of the 14 responses given by the 4 AGYW that declined EPT, 2 (14%) indicated being afraid that her partner would become angry or 1 (7%) thought her partner might end the relationship. The most common reported reaction of partners after receiving EPT was acceptance (49/54 [91%]) with a small proportion of AGYW reporting that their

TABLE 3. Reasons for Declining and Experience With Delivering EPT and Partner HIVST Among AGYW With CT or GC

Item	EPT	HIVST
	n (%)*	n (%)*
Reasons for declining to take EPT/partner HIVST [†]		
Afraid he will get angry	2/14 (14)	1/25 (4)
Afraid he will get violent	0	2/25 (8)
Afraid he will think I have other sex partners	0	0
Afraid he will end our relationship	1/14 (7)	1/25 (4)
He is away, I will not see him	3/14 (21)	2/25 (8)
No longer having sex with partner	2/14 (14)	1/25 (4)
Partner gets routine HIV testing	N/A	16/25 (64)
Other ^{‡,§}	8/14 (57)	5/25 (24)
Reasons for not giving to partner [¶]		
Afraid he would become angry	0	0
Afraid he would become violent	0	0
Afraid he would think I have other sex partners	0	0
Afraid he would end our relationship	0	0
He is away, I have not seen him	0	0
No longer having sex with partner	1/6 (17)	2/10 (20)
Other ^{,**}	5/6 (83)	10/10 (100)
Partners reaction to receiving ^{¶¶}		
He accepted it	49/54 (91)	36/40 (90)
He got angry	6/54 (11)	2/40 (5)
He got violent	0	0
He thought I had other sex partners	1/54 (2)	2/40 (5)
He ended our relationship	2/54 (4)	0
Other ^{††,‡‡}	7/54 (13)	14/40 (35)

Same questions were asked for both EPT and partner HIVST except for the question on HIV testing.

N, Unit of analysis is number of responses and not number of AGYW or partners like in Tables 1 and 2.

*Percentages may add up to more than 100% because women were allowed to give more than 1 response that applied.

[†] Assessed at enrollment.

[‡] Other—EPT: Going to use condoms, partner was treated in the facility (2), wanted to talk to partner first, does not believe that partner has the infection, did not want him to be treated, angry at the partner, partner will not take.

[§] Other—HIVST: Partner is HIV positive (3), wanted to test together at HTS center, angry at the partner,

[¶] Assessed at 3 months follow up.

^{||} Other—EPT: Partner asked they go to the hospital (2), partner disappeared, partner believed he did not have the infection, angry at the partner.

^{**} Other—HIVST: Tested with the partner at HTS center (2), stopped dating the partner (2), Partner disappeared, partner said he was HIV positive, still thinking about it, partner refused, angry at the partner, misplaced the kit.

^{††} Other—EPT: Took time to take the drugs, asked if they will heal him, he did not talk about it, he said does not like drugs, he asked if there is a repeat STI test, he was happy, he asked what they treat.

^{‡‡} Other—HIVST: Asked for another kit (4), thought she does not trust him (3), he preferred testing at the hospital (3), he was happy, he was afraid, he doubted if the result would be accurate, he initially refused.

TABLE 4. Incidence of Sexually Transmitted Infection Among AGYW With CT or GC

Organism	Among Women Whose Partners Used EPT and Women in the POWER Study Who Used Standard of Care						Among Women Enrolled in EPT Whose Partners Used EPT and Women Whose Partners Did Not Use EPT					
	EPT Study*		POWER Study†		IRR (95% CI)	P	Partner Used EPT		Partner Did Not Use EPT		IRR (95% CI)	P
	n	IR	n	IR			n	IR	n	IR		
<i>C. trachomatis</i>	9	43.58	22	44.26	0.98 (0.40–2.23)	0.49	9	43.58	3	71.25	0.61 (0.15–3.51)	0.23
<i>N. gonorrhoeae</i>	0	0.00	2	7.71	0.00 (0.00–6.52)	0.15	0	0.00	1	23.31	0.00 (0.00–78.9)	0.08
Total	9	21.52	24	31.73	0.68 (0.28–1.51)	0.16	9	21.52	4	47.06	0.46 (0.13–2.03)	0.11

Comparison in STI incidence was made among only the Kisumu POWER AGYW.

*AGYW offered EPT and partner received and used EPT.

†AGYW were not offered EPT.

IR, incidence rate per 100 woman years; IRR, incident rate ratio; n, number of new infections.

partner reacted angrily (6/54 [11%]) or ended the relationship (2/54 [0.04%]). The most common reason for AGYW's refusal to accept to take the partner HIVST kits was the knowledge that the partner routinely gets tested (16/25 [64%]). Only 2 (8%) of 25 responses by AGYW who refused to take HIVST kits were because of being afraid that her partner would become violent. Similar to EPT, the most common reported response of partners after receiving HIVST kits was acceptance (36/40 [90%]). A few partners (2/40 [5%]) got angry or raised suspicions of the participant having other partners. There were a total of 10 AGYW with 11 flags for possible social harm situations (1 participant had a flag for 2 partners). After reviewing the site's summary of each flagged situation, none were deemed to meet the criteria of an IRB reportable social harm. The AGYW were, however, followed up and given further counseling.

Potential Effectiveness of EPT

Forty women who took EPT and reported partners medication had a follow-up STI test, of whom 9 (22.5%) had a reinfection with CT and none with GC. Of 72 women who tested positive for an STI and did not have the opportunity for EPT also had a follow-up STI test, 22 (30.6%) had reinfection with CT and 2 (2.8%) with GC. The overall risk of reinfection with gonorrhea and chlamydial infection was lower among women offered EPT compared with women not offered EPT although this result was not statistically significant (RR, 0.68; 95% CI, 0.28–1.51). Six women were eligible for EPT but did not give STI medication to their partners, of whom 4 (66.7%) had reinfection, 1 with GC and 3 with CT (Table 4). The overall risk of reinfection with gonorrhea and chlamydial infection was lower among women whose partners accepted EPT compared with women whose partners did not accept EPT, although not statistically significant (RR, 0.46; 95% CI, 0.13–2.03).

DISCUSSION

Expedited partner treatment was acceptable with 94% of women willing to deliver STI medication to their sexual partners and 90% of these partners accepting medication. Uptake, distribution, and use of HIVST was high as well with 79% of the women agreeing to take the HIVST to their partner, of whom 95% of their partners used it. These pilot results suggest that partner-delivered STI medication coupled with HIVST is a potential prevention intervention for this population.

The uptake of EPT was comparable to that reported in previous studies among pregnant women in Kenya and non-pregnant women in South Africa that reported an uptake of 89% and 87% respectively.^{22,23} Identified barriers to women accepting to take

EPT and partner HIVST to their partners in our study included the anticipated fear of the partner getting angry, being accused of having other partners, and losing the relationship; these would not be unexpected given the sensitive questions (eg, are you having another partner?) that an STI diagnosis can elicit. Similar barriers have been described in Kampala, Uganda for STIs and in multiple SSA countries for HIV.^{24,25} The uptake of EPT had more success than barriers, but before larger studies are rolled out, strategies to overcome these barriers could be developed and discussed with the participants. In our study, 22 participants had multiple sexual partners of which 50% and 42% took STI medication and HIVST kit to only 1 partner, respectively. The main reason given for not taking STI medication and HIVST kits to the other partner was because the women were no longer having sex with them or had tested for HIV together. Although these findings reduced the uptake, it shows some level of rational risk awareness.

The rates of reinfection with gonorrhea and chlamydial infection between women who consented to EPT and those with the standard of care were not statistically different, the point estimate was 0.68 times lower for EPT. We did not have sufficient power to assess the reinfection rates but literature from prior studies of EPT suggests approximately similar differences in rates of reinfection with gonorrhea and chlamydial infection. Our study's reinfection rates were higher than that reported in pregnant women 14 years and older in rural Western Kenya,²² reinforcing the high STI risk of AGYW using PrEP. It is important to point out that similar to our findings, randomized controlled trials in high-income countries have consistently shown a significant reduction in gonococcal infections compared with chlamydial infections for EPT.²⁶ The findings show that women who decline EPT are at particularly high risk, indicating likely selection bias in those who are willing and able to participate in EPT. For this reason, other interventions, such as doxycycline postexposure prophylaxis, may also be necessary for women who fail to take up EPT.

The uptake of partner delivered HIVST mirrored that documented by past literature in Kisumu, Kenya where 90.8% of partners used HIVST delivered to them.²⁷ Because of the possibility of STI and HIV coinfection, HIV testing is recommended for individuals who test positive for STI and concerns with EPT has been the missed opportunity to test sexual partners receiving EPT for HIV.²⁸ Human immunology virus self-testing has not been commonly used within EPT programs, our results suggest that HIVST coupled to EPT could facilitate partner testing in settings where they may be reluctant to seek HIV testing elsewhere, provided clear guidelines are included on what to do in the event that the test result is positive.

Structural barriers for the implementation of EPT in Kenya and other SSA countries may include limited access to affordable

STI diagnostic testing, reliance on syndromic STI medication, and lack of guidelines on EPT. Even when testing is available as in the POWER study, challenges included long waiting times for the test results and need to return to the clinic for treatment.²⁹ Syndromic approach for female STI syndromes has been found to have a low diagnostic accuracy, to be less effective than diagnostic approach, and could be undermined by the rising numbers of asymptomatic cases of STIs.^{11,16} There is a need for cheaper point-of-care STI diagnostic tests to be included in STI clinics to address the high asymptomatic STIs in AGYW in SSA and to address missed opportunities for treatment when results are provided days after sample collection when the woman may not be in a position to return to the clinic. Lessons can be borrowed from diagnostic syphilis testing that is already being implemented in antenatal care clinics.³⁰

Our study had a number of limitations. First, although we had 124 women testing positive for an STI, logistical challenges for implementation of EPT like long turnaround time of the results and women having to return to the clinic for treatment reduced the sample size. In addition, a quarter (17/63) of the women enrolled did not return for the assessment visit, further reducing our sample size. By excluding this large percentage of the sample, we may not know whether their outcomes would have been similar or different from those observed. The small sample size also limited our power to detect differences in rates of reinfection with gonorrhea and chlamydial infection. Second, the reported information from women on whether their partners took the medication or HIVST may be subject to social desirability bias. Finally, several factors (which our study did not explore) need to be considered before we can be certain that the women actually had a reinfection. These include whether the treatment given was actually taken, women had unprotected sex with the infected partner on the day of treatment, or had sex with new partners who may have been unaware of an STI.

Etiologic STI testing in PrEP has unmasked a high prevalence and incidence of STIs among African AGYW in a continent where syndromic diagnostic approach is widely being used. Moving toward etiologic diagnosis and effective partner treatment services will be crucial for successful STI control. Our findings suggest that the model of EPT and secondary distribution of HIVST to partners were acceptable to both the women and their male partners. The high acceptability and uptake of partner HIVST coupled with STI medication is a promising intervention for addressing the concerns of missed opportunities for HIV testing in EPT. Larger studies should evaluate the feasibility and cost effectiveness of this model.

REFERENCES

- World Health Organization. Policy brief: pre-exposure prophylaxis (PrEP): WHO expands recommendation on oral pre-exposure prophylaxis of HIV infection (PrEP). Geneva: WHO/HIV, 2015. Available at: <https://www.who.int/hiv/pub/prep/en/>. Accessed March 10, 2021.
- The Joint United Nations Programme on HIV/AIDS. UNAIDS Data 2019. Geneva, 2019. Available at: <https://www.unaids.org/en/resources/documents/2019/2019-UNAIDS-data>. Accessed March 15, 2021.
- Mugwanya KK, Pintye J, Kinuthia J, et al. Integrating preexposure prophylaxis delivery in routine family planning clinics: A feasibility programmatic evaluation in Kenya. *PLoS Med* 2019; 16:e1002885.
- Pintye J, Kinuthia J, Allen Roberts D, et al. Integration of PrEP services into routine antenatal and postnatal care: Experiences from an implementation program in western Kenya. *J Acquir Immune Defic Syndr* 2018; 79:590–595.
- Centers for Disease Control and Prevention. Preexposure prophylaxis for the prevention of HIV infection in the United States—2017 update: A clinical practice guideline. Atlanta, GA: CDC, 2018. Available at: <https://www.cdc.gov/hiv/guidelines/preventing.html>. Accessed March 10, 2021.
- World Health Organization. Guideline on When to Start Antiretroviral Therapy and on Pre-Exposure Prophylaxis for HIV. Geneva: World Health Organization, 2015. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK327115/>. Accessed March 10, 2021.
- Ong JJ, Baggaley RC, Wi TE, et al. Global epidemiologic characteristics of sexually transmitted infections among individuals using preexposure prophylaxis for the prevention of HIV infection: A systematic review and meta-analysis. *JAMA Netw Open* 2019; 2:e1917134.
- Stewart J, Omollo V, Odoyo J, et al. High prevalence and incidence of bacterial STIs in young women at high risk of HIV prior to PrEP scale-up in Kenya. Presented at: The STI & HIV World Congress (Joint Meeting of the 23rd ISSSTD and 20th IUSTI) [P424]; 2019; Vancouver. CANA.
- Celum CL, Delany-Moretlwe S, Hosek S, et al. Risk behavior, perception, and reasons for PrEP among young African women in HPTN 082. Boston, MA, USA. Presented at: The 2018 CROI Conference [P1049], 2018.
- World Health Organization. Sexually transmitted and other reproductive tract infections: a guide to essential practice. Geneva, Switzerland: WHO, 2005. Available at: <https://www.who.int/reproductivehealth/publications/rtis/9241592656/en/>. Accessed March 15, 2021.
- Kaida A, Dietrich JJ, Laher F, et al. A high burden of asymptomatic genital tract infections undermines the syndromic management approach among adolescents and young adults in South Africa: Implications for HIV prevention efforts. *BMC Infect Dis* 2018; 18:499.
- White RG, Moodley P, McGrath N, et al. Low effectiveness of syndromic treatment services for curable sexually transmitted infections in rural South Africa. *Sex Transm Infect* 2008; 84:528–534.
- Vallely LM, Toliman P, Ryan C, et al. Performance of syndromic management for the detection and treatment of genital *Chlamydia trachomatis*, *Neisseria gonorrhoeae* and *Trichomonas vaginalis* among women attending antenatal, well woman and sexual health clinics in Papua New Guinea: A cross-section. *BMJ Open* 2017; 7:e018630.
- Moodley D, Moodley P, Sebitloane M, et al. High prevalence and incidence of asymptomatic sexually transmitted infections during pregnancy and postdelivery in KwaZulu Natal, South Africa. *Sex Transm Dis* 2015; 42:43–47.
- Otieno FO, Ndivo R, Oswago S, et al. Evaluation of syndromic management of sexually transmitted infections within the Kisumu incidence cohort study. *Int J STD AIDS* 2014; 25:851–859.
- Mlisana K, Naicker N, Werner L, et al. Symptomatic vaginal discharge is a poor predictor of sexually transmitted infections and genital tract inflammation in high-risk women in South Africa. *J Infect Dis* 2012; 206:6–14.
- Alam N, Chamot E, Vermund SH, et al. Partner notification for sexually transmitted infections in developing countries: A systematic review. *BMC Public Health* 2010; 10:19.
- Hosenfeld CB, Workowski KA, Berman S, et al. Repeat infection with chlamydia and gonorrhea among females: A systematic review of the literature. *Sex Transm Dis* 2009; 36:478–489.
- Ferreira A, Young T, Mathews C, et al. Strategies for partner notification for sexually transmitted infections, including HIV. *Cochrane Database Syst Rev* 2013; 2013:CD002843.
- Golden MR, Kerani RP, Stenger M, et al. Uptake and population-level impact of expedited partner therapy (EPT) on *Chlamydia trachomatis* and *Neisseria gonorrhoeae*: The Washington state community-level randomized trial of EPT. *PLoS Med* 2015; 12:e1001777.
- Kerani RP, Fleming M, Golden MR. Acceptability and intention to seek medical care after hypothetical receipt of patient-delivered partner therapy or electronic partner notification postcards among men who have sex with men: The partner's perspective. *Sex Transm Dis* 2013; 40:179–185.
- Unger JA, Matemo D, Pintye J, et al. Patient-delivered partner treatment for chlamydia, gonorrhea, and trichomonas infection among pregnant and postpartum women in Kenya. *Sex Transm Dis* 2015; 42:637–642.
- Garrett NJ, Osman F, Maharaj B, et al. Beyond syndromic management: Opportunities for diagnosis-based treatment of sexually

- transmitted infections in low- and middle-income countries. *PLoS One* 2018; 13:e0196209.
24. Mayanja Y, Mukose AD, Nakubulwa S, et al. Acceptance of treatment of sexually transmitted infections for stable sexual partners by female sex workers in Kampala, Uganda. *PLoS One* 2016; 11:e0155383.
 25. Medley A, Garcia-Moreno C, McGill S, et al. Rates, barriers and outcomes of HIV serostatus disclosure among women in developing countries: Implications for prevention of mother-to-child transmission programmes. *Bull World Health Organ* 2004; 82:299–307.
 26. Golden MR, Whittington WLH, Handsfield HH, et al. Effect of expedited treatment of sex partners on recurrent or persistent gonorrhoea or chlamydial infection. *N Engl J Med* 2005; 352:676–685.
 27. Masters SH, Agot K, Obonyo B, et al. Promoting partner testing and couples testing through secondary distribution of HIV self-tests: A randomized clinical trial. *PLoS Med* 2016; 13:e1002166.
 28. MacDonald MR. Expedited partner therapy-an opportunity in military medicine. *Mil Med* 2010; 175:ix–xi.
 29. Pai NP, Vadhais C, Denkinger C, et al. Point-of-care testing for infectious diseases: Diversity, complexity, and barriers in low- and middle-income countries. *PLoS Med* 2012; 9:e1001306.
 30. Mati C, Ngugi C, Wafula R, et al. Syphilis testing at ANC in Kenya: Dual testing as a game changer towards eMTCT. Presented at: The STI & HIV World Congress (Joint Meeting of the 23rd ISSDR and 20th IUSTI) [P289]; 2019; Vancouver. CANA.