

Original research article

The influence of partnership on contraceptive use among HIV-infected women accessing antiretroviral therapy in rural Uganda^{☆,☆☆}

Christina I. Nieves^a, Angela Kaida^b, George R. Seage III^a, Jerome Kabakyenga^c, Winnie Muyindike^c, Yap Boum^{c,d}, A. Rain Mocello^e, Jeffrey N. Martin^e, Peter W. Hunt^e, Jessica E. Haberer^f, David R. Bangsberg^{c,g}, Lynn T. Matthews^{g,*}

^aHarvard School of Public Health, Boston, United States

^bSimon Fraser University, Faculty of Health Sciences, Burnaby, Canada

^cMbarara University of Science and Technology (MUST), Mbarara, Uganda

^dEpicentre Mbarara, Mbarara, Uganda

^eUniversity of California at San Francisco, San Francisco, United States

^fMassachusetts General Hospital, Center for Global Health & Department of Medicine, Boston, United States

^gMassachusetts General Hospital, Center for Global Health & Division of Infectious Disease, Boston, United States

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Abstract

Objective: The objective was to determine individual and dyadic factors associated with effective contraceptive use among human immunodeficiency virus (HIV)-infected women accessing antiretroviral therapy (ART) in rural Uganda.

Study design: HIV-infected women enrolled in the Uganda AIDS Rural Treatment Outcomes cohort completed questionnaires (detailing sociobehavioral characteristics, sexual and reproductive history, contraceptive use, fertility desires) and phlebotomy (October 2011–March 2013). We describe prevalence of effective contraceptive use (i.e., consistent condom use and/or oral contraceptives, injectable hormonal contraception, intrauterine device, female sterilization) in the previous 6 months among sexually active, nonpregnant women (18–40 years). We assessed covariates of contraceptive use using multivariable logistic regression.

Results: A total of 362 women (median values: age 30 years, CD4 count 397 cells/mm³, 4.0 years since ART initiation) were included. Among 284 sexually active women, 50% did not desire a(nother) child, and 51% had a seroconcordant partner. Forty-five percent ($n=127$) reported effective contraceptive use, of whom 57% ($n=72$) used condoms, 42% ($n=53$) injectables, 12% ($n=15$) oral contraceptives and 11% ($n=14$) other effective methods. Dual contraception was reported by 6% ($n=8$). Only “partnership fertility desire” was independently associated with contraceptive use; women who reported that neither partner desired a child had significantly increased odds of contraceptive use (adjusted odds ratio: 2.40, 95% confidence interval: 1.07–5.35) compared with women in partnerships where at least one partner desired a child.

Conclusions: Less than half of sexually active HIV-infected women accessing ART used effective contraception, of which 44% ($n=56$) relied exclusively on male condoms, highlighting a continued need to expand access to a wider range of longer-acting female-controlled contraceptive methods. Association with partnership fertility desire underscores the need to include men in reproductive health programming.

Abbreviations: ART, antiretroviral therapy; HIV, human immunodeficiency virus; Viral load, HIV RNA plasma level (copies/mL); IUD, intrauterine device; BMI, body mass index.

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* Corresponding author at: MGH-Center for Global Health, 100 Cambridge Street, 15th Floor, Boston 02114.

E-mail address: ltmatthews@partners.org (L.T. Matthews).

Implications statement: Less than half of sexually active HIV-infected women accessing ART in rural Uganda reported using effective contraception, of whom 44% relied exclusively on the male condom. These findings highlight the need to expand access to a wider range of longer-acting, female-controlled contraceptive methods for women seeking to limit or space pregnancies. Use of contraception was more likely when both the male and female partner expressed concordant desires to limit future fertility, emphasizing the importance of engaging men in reproductive health programming.

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1. Introduction

Human immunodeficiency virus (HIV) prevalence is estimated at 7% among women attending antenatal clinics in Uganda [1]. With an average of 6.1 children per woman, Uganda has one of the highest total fertility rates in the world [2]. Expanding access to antiretroviral therapy (ART) and the accompanying benefits on health, survival, and sexual and perinatal HIV transmission influence fertility desires and expectations for childbearing among women living with HIV [3]. In one Ugandan cohort, one third of HIV-infected women initiating ART become pregnant within 3 years [4]. While some of these pregnancies are desired, an estimated 50%–86% are unwanted [5,6], with a high proportion of unwanted pregnancies terminated illegally, contributing to a high risk of maternal death [7].

Provision and appropriate use of effective contraception are important strategies to prevent unintended pregnancy; however, contraceptive uptake remains low among Ugandan married women at 30% [5]. Despite messages promoting the importance of preventing unwanted pregnancies among women living with HIV to both reduce perinatal HIV transmission and promote women's health, contraceptive uptake remains low among Ugandan HIV-infected women [8], including those accessing HIV care [9,10].

Understanding factors associated with contraceptive use among HIV-infected women is essential to tailoring interventions to reduce unwanted pregnancies for those who want to delay or prevent pregnancy and to support safer conception strategies. Data from the Rakai cohort in Uganda suggest that use of condoms and hormonal contraceptives increases over time among HIV-infected women particularly after enrollment into HIV care [11,12]. Regular health monitoring and access to other health services have been suggested as reasons for these trends [13].

Previous studies on contraceptive use investigated individual-level predictors of contraceptive uptake (including woman's fertility desires, age and education level), but less is known about the influence of dyadic factors (e.g., male partner's fertility desires, partner's HIV status) on contraceptive uptake among HIV-infected women, despite recognition of the critical role that male partners play in reproductive decision making [14–16]. Given observations of an increased risk of HIV transmission and acquisition among women using injectable hormonal contraceptives [17], the World Health Organization currently recommends

that HIV-serodiscordant couples practice dual contraception (i.e., use of condoms and a hormonal or permanent contraceptive method) to prevent HIV transmission and unwanted pregnancy [18]. However, little is known about actual patterns of dual contraceptive use. We measured the prevalence of effective contraceptive use and assessed individual and dyadic factors associated with use of contraception among sexually active HIV-infected women enrolled in care and receiving ART at a tertiary care center in rural Uganda.

2. Material and methods

2.1. Study design

This is a cross-sectional analysis of data from HIV-infected women enrolled in a cohort study and accessing ART.

2.2. Participants and setting

Participants were enrolled in the Uganda AIDS Rural Treatment Outcomes (UARTO) cohort study initiated in July 2005 with the primary objective of determining predictors of ART adherence and virologic failure. Participants were recruited from treatment-naïve patients initiating ART at an HIV clinic in southwestern Uganda. Clinic patients who were at least 18 years old and living within 60 km of the clinic were eligible to enroll in the study.

UARTO participants completed baseline then triannual interviews and phlebotomy. Interviewer-administered questionnaires detail sociodemographics, mental and physical health, sexual risk behavior and participant report of partner dynamics including partner HIV status. Interviews were conducted by trained interviewers fluent in English and the dominant local language (Runyankole).

This analysis utilizes data from the Reproductive Health Component of UARTO, initiated in October 2011 with follow-up through to March 2013. This annual questionnaire assesses sexual and reproductive health and history, contraceptive use and personal fertility desire as well as partner dynamics including partner HIV status and fertility desire (by participant self-report using the Pregnancy Risk Assessment Monitoring System instrument [19]). This analysis includes women aged 18–40 years who completed the Reproductive Health Component questionnaire at least once.

2.3. Measures

The outcome of interest is effective contraception use in the past 6 months, defined as self-reported use of at least one of the following methods: consistent condom use (“*condom use all of the time*”) with all partners, oral contraceptive, emergency contraceptive, injectable contraceptive, intrauterine device (IUD) and/or sterilization. Women who used any of these methods were considered effective contraceptive method users [20]. Women who reported no method and those who reported only withdrawal, timed intercourse or inconsistent condom use were considered ineffective contraceptive users. Use of effective contraception was measured among sexually active women, defined as women reporting at least one sexual partner in the previous 12 months.

Potential covariates of contraceptive use were identified a priori based on previous studies [9,21–24]. These factors included participant age, primary partner age, primary partner HIV status, personal and partner fertility desire, number of children, most recent CD4 cell count, efavirenz-containing ART regimen (due to teratogenicity concerns, women planning or with pregnancy were encouraged to avoid efavirenz [25]), body mass index (BMI) [26], education level and socioeconomic status (SES). Socioeconomic status was defined using the Filmer–Pritchett Asset Index, which is a linear proxy for wealth based on asset ownership with higher scores indicating greater wealth [27]. Time on ART is a covariate and a proxy for time in the study since participants initiated ART treatment within 2 weeks of study enrolment. A variable measuring fertility desire within the partnership was created using the CDC Pregnancy Risk Assessment Monitoring System instrument [19] with the following categories: (1) “Partnership fertility desire,” whereby the participant, the partner (by participant report) or both express future pregnancy desire; (2) “No partnership fertility desire,” whereby neither the participant nor the partner expresses fertility desire; or (3) “Unknown partnership fertility desire,” whereby fertility desire of the couple is unknown (missing, a combination of “no” and “don’t know” for couple, or “don’t know” for both members of the couple). We also evaluated use of effective contraception overall and condom use by HIV status of the primary sexual partner. Primary sexual partner was defined as either the main sexual partner or, if no main partner was identified, the most recent sexual partner.

2.4. Analysis

We used descriptive statistics to describe key characteristics of study participants. Baseline characteristics were defined as characteristics of participants obtained at the time they first completed the Reproductive Health Component questionnaire.

We examined bivariate associations between potential covariates with a binary outcome variable of effective contraception use among sexually active women and tested

associations using Fisher’s Exact Test and the Wilcoxon or Mann–Whitney tests for continuous variables. We fit univariate logistic regression models, and all significant covariates from the univariate analyses (p value $< .20$) were included in the multivariable logistic regression model. Statistical tests were two-sided, and significance was determined at the $\alpha = .05$ level. Data analysis was performed using SAS version 9.3.

2.5. Ethical considerations

Ethical approval for all study procedures was obtained from the Institutional Review Committee, Mbarara University of Science and Technology; the Partners Human Research Committee, Massachusetts General Hospital; and the Research Ethics Board of Simon Fraser University. Consistent with national guidelines, we received clearance for the study from the Uganda National Council for Science and Technology and from the Research Secretariat in the Office of the President.

3. Results

3.1. Baseline characteristics

Three hundred sixty-two women ($n=362$) aged 18–40 years old were included in the analysis. Median age was 30 years [interquartile range (IQR): 26–35], and median CD4 count was 397 cells/mm³ (IQR: 286–539). Median time on ART was 4.0 years (IQR: 0.91–5.1). Among those with viral load data and on ART for at least 24 weeks ($n=248$), 93% were virally suppressed (≤ 400 copies/mL). Seventy-eight percent ($n=284$) were sexually active (Table 1).

Of the 284 sexually active women, 146 (51%) reported an HIV-infected primary partner, 50 (18%) reported an HIV-uninfected primary partner, and 86 (30%) did not know the HIV status of their primary partner. In addition, 33% ($n=94$) of women reported personal fertility desire and 35% ($n=100$) reported partner fertility desire. The constructed “partnership fertility desire” variable revealed that 50% of couples expressed fertility desire, 17% did not want additional children (i.e., no fertility desire), and for 34% partnership fertility desire was unknown (Table 1).

3.2. Contraceptive prevalence and types of contraceptive methods used

Among 281 sexually active women with contraception data, 45% ($n=127$) reported use of effective contraception.

Considering all sexually active women, 26% ($n=72$) reported consistent condom use with all partners; 19% ($n=53$) used injectable contraceptives; 5% ($n=15$) used oral contraceptives; and $<4\%$ reported using emergency contraceptives, undergoing sterilization or having an IUD. Sixteen (6%) women reported using dual methods, including 12/16 using condoms with injectables and 4/16 using condoms with oral contraceptives (Fig. 1). An additional 8% of women used withdrawal,

Table 1
 Characteristics of HIV-infected women accessing ART in rural Uganda at first completion of Reproductive Health Component questionnaire.

| Characteristic | All women (<i>n</i> =362) | Sexually active women ^a (<i>n</i> =284) |
|--|------------------------------|---|
| | <i>n</i> (%) or median (IQR) | <i>n</i> (%) or median (IQR) |
| Median age (years) | 30 (26–35) | 29 (25–34) |
| Median CD4 (cells/mm ³) | 397 (286–539) | 403 (285–537) |
| Viral load suppression (≤ 400 U/mL) ^b | | |
| Yes | 230 (93) | 164 (92) |
| No | 15 (6) | 12 (67) |
| Missing | 3 (1) | 2 (1) |
| Median time since initiating ART (years) | 4.0 (0.91–5.1) | 3.1 (0.90–5.0) |
| Number of partners in the past 12 months | | |
| 0 | 78 (22) | N/A |
| 1 | 260 (72) | 262 (92) |
| ≥ 2 | 24 (7) | 22 (8) |
| Self-reported pregnancy in the last 12 months | | |
| Yes | 81 (22) | 73 (26) |
| No | 281 (78) | 211 (74) |
| Number of living children | | |
| 0 | 41 (11) | 34 (12) |
| 1–2 | 149 (41) | 121 (43) |
| ≥ 3 | 163 (45) | 120 (42) |
| Missing | 9 (2) | 9 (3) |
| Condom use within the last 6 months: primary partner | | |
| No condom use | | 112 (39) |
| Inconsistent use | | 58 (20) |
| Always | | 72 (25) |
| Don't know | | 1 (0.4) |
| Missing | | 41 (14) |
| Primary partner HIV status | | |
| HIV negative | 50 (14) | 50 (18) |
| HIV positive | 146 (40) | 146 (51) |
| Unknown status | 86 (24) | 86 (30) |
| No primary partner | 78 (22) | N/A |
| Missing | 2 (0.6) | 2 (0.7) |
| Type of partner ^c | | |
| Spouse/living together as married | | 192 (68) |
| Regular partner (not living together) | | 90 (32) |
| Ongoing casual sex partner (at least 2 encounters) | | 12 (4) |
| One-time encounter | | 20 (7) |
| Personal fertility desire | | |
| Desires another child | 100 (28) | 94 (33) |
| Does not desire another child | 209 (58) | 141 (50) |
| Undecided/refused | 11 (3) | 9 (3) |
| Missing | 42 (12) | 40 (14) |
| Partner fertility desire (by participant report) | | |
| Partner desires another child | | 100 (35) |
| Partner does not desire another child | | 55 (19) |
| Don't know | | 13 (5) |
| Missing | | 116 (41) |
| Partnership fertility desire | | |
| Yes: at least one partner desires another child | | 141 (50) |
| No: neither partner desires another child | | 47 (17) |
| Partnership fertility desire unknown ^d | | 96 (34) |

^a Women who reported at least one sexual partner in the past 12 months.

^b Restricted to women on ART for ≥ 24 weeks. *n*=248.

^c Women were able to describe multiple partner types if they had >1 sexual partner.

^d Defined as missing, a combination of “no” and “don't know” for couple, or “don't know” for both members of the couple.

9% used timed intercourse, and 39% reported not using any method to prevent pregnancy (all considered ineffective contraceptive users).

Among the 127 (45%) women reporting current contraceptive use, 57% reported consistent condom use with all

partners, 42% (*n*=53) used injectable hormonal contraception, 12% (*n*=15) used oral contraceptives, 11% (*n*=14) used other effective methods, and 6% used dual methods (*n*=8).

Three women missing data on contraceptive methods used were excluded from subsequent analyses.

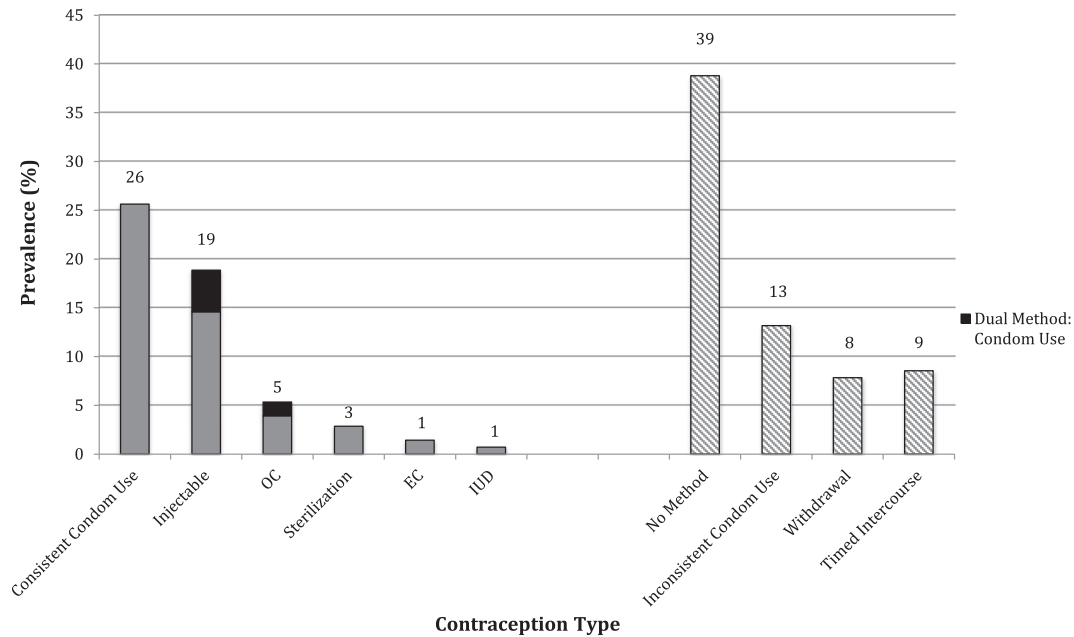


Fig. 1. Prevalence of contraceptive methods used by sexually active women ($n=281$). Overall, 45% ($n=127$) of women reported effective contraception use. Effective methods are represented by solid bars. Ineffective methods are represented by striped bars. Women may be counted twice in this figure if they use multiple methods. OC, oral contraceptive pills; EC, emergency contraception. The black segments represent women who used both condoms and either injectable or oral contraception.

3.3. Bivariate and multivariable covariates of contraceptive use

In the bivariate analysis (Table 2), several dyadic factors were associated with effective contraception use ($p < .20$), including HIV-uninfected primary partner (compared to HIV-infected partner), primary partner with an unknown status (compared to HIV-infected partner) and neither partner wanting to conceive (compared to at least one partner who wants to conceive). In addition, women aged >34 (compared to women aged 18–25), those with 3 or more children (compared to having no children), and those with a high SES (compared to average SES) were more likely to report use of effective contraception. Having a BMI of 30 or greater (compared to having a BMI between 18.5 and 25) and being of lower SES (compared to average SES) were associated with decreased odds of effective contraception use.

In the adjusted multivariable model (Table 2), only partnership fertility desire remained significantly associated with effective contraception use. Compared with women reporting partnership fertility desire, women with no partnership fertility desire (i.e., neither partner desired a child) had significantly increased odds of effective contraception use [adjusted odds ratio (OR): 2.40, 95% confidence interval (CI): 1.07–5.35]. Women with partners with unknown HIV status were less likely to use contraception (compared with women with HIV-infected partners), although the association was not statistically significant (adjusted OR: 0.85, 95% CI: 0.46–1.56).

When we examined types of contraceptive methods used by partner HIV serostatus, we found that 46% of women with HIV-infected partners, 54% of women with HIV-uninfected partners and 40% of women with unknown-status partners used effective contraception ($p=.26$). When looking specifically at condom use (with or without other methods), 27% of women with HIV-infected partners, 34% of women with HIV-uninfected partners and 19% of women with unknown-status partners reported practicing consistent condom use ($p=.12$) (Fig. 2).

4. Discussion

In a cohort of HIV-infected women accessing ART in rural Uganda, 55% of sexually active women were not using effective contraception. The prevalence of contraceptive use in this study (45%) is higher than estimates of 14%–34% reported in previous studies in Uganda among HIV-infected women enrolled in care [8–10,21] and among married Ugandan women in general [5]. Women in this cohort receive care at a tertiary clinic and are enrolled in a study with triannual follow-up and transportation reimbursement. The prevalence of contraceptive use in this study may reflect this high level of access to care or, simply, improving access over time. In addition, women were defined as sexually active based on partnerships in the last 12 months; however, contraceptive use was limited to the past 6 months. Thus, a subset of women not using contraception may have been

Table 2

Estimates from univariate and multivariate logistic regression analyses to identify factors associated with effective contraception use among sexually active HIV-infected women on ART ($n=281$).

| | # of women | # using effective contraception (%) | Unadjusted OR | 95% CI | p value | Adjusted OR | 95% CI | p value |
|---|------------|-------------------------------------|---------------|-----------|---------|-------------|-----------|---------|
| Age (years) | | | | | | | | |
| 18–25 | 75 | 31 (24) | Reference | | | Reference | | |
| 26–29 | 67 | 31 (24) | 1.22 | 0.63–2.38 | .87 | 1.02 | 0.49–2.14 | .46 |
| 30–34 | 73 | 29 (23) | 0.94 | 0.49–1.80 | .26 | 0.50 | 0.27–1.31 | .12 |
| >34 | 66 | 36 (28) | 1.70 | 0.87–3.32 | .09 | 0.90 | 0.40–2.06 | .84 |
| Number of children | | | | | | | | |
| 0 | 34 | 12 (9) | Reference | | | | | |
| 1–2 | 120 | 50 (39) | 1.31 | 0.59–2.89 | .71 | 1.43 | 0.59–3.43 | .91 |
| 3+ | 118 | 63 (50) | 2.10 | 0.95–4.63 | .03 | 2.17 | 0.82–5.77 | .09 |
| Filmer–Pritchett Asset Index | | | | | | | | |
| 1 | 46 | 19 (15) | 0.94 | 0.43–2.03 | .61 | 0.80 | 0.35–1.86 | .46 |
| 2 | 54 | 19 (15) | 0.72 | 0.34–1.53 | .12 | 0.57 | 0.25–1.32 | .05 |
| 3 | 63 | 27 (21) | Reference | | | Reference | | |
| 4 | 50 | 25 (20) | 1.33 | 0.63–2.81 | .38 | 1.26 | 0.56–2.81 | .37 |
| 5 | 63 | 34 (27) | 1.56 | 0.77–3.16 | .10 | 1.63 | 0.76–3.47 | .05 |
| Education | | | | | | | | |
| None | 39 | 16 (13) | Reference | | | | | |
| Primary | 150 | 69 (54) | 1.23 | 0.60–2.50 | | 0.70 | | |
| Secondary/tertiary | 91 | 42 (33) | 1.23 | 0.58–2.63 | | 0.70 | | |
| Age of primary partner (continuous) | | | | | | | | |
| | | | 1.00 | 0.97–1.03 | .88 | | | |
| HIV serostatus of primary partner | | | | | | | | |
| Positive | 145 | 66 (52) | Reference | | | Reference | | |
| Negative | 50 | 27 (21) | 1.41 | 0.74–2.68 | .14 | 1.72 | 0.84–3.53 | .07 |
| Unknown | 86 | 34 (27) | 0.78 | 0.46–1.35 | .13 | 0.85 | 0.46–1.56 | .15 |
| Partnership fertility desire | | | | | | | | |
| At least one partner wants to conceive | 140 | 55 (43) | Reference | | | Reference | | |
| Neither participant nor partner wants to conceive | 47 | 30 (24) | 2.73 | 1.36–5.41 | .01 | 2.40 | 1.07–5.35 | .03 |
| Unknown | 94 | 42 (33) | 1.25 | 0.74–2.12 | .30 | 1.06 | 0.58–1.93 | .21 |
| Time since ART initiation (months) ^a | | | | | | | | |
| | | | 1.01 | 0.99–1.01 | .26 | | | |
| CD4 (cells/mm ³) | | | | | | | | |
| 0–200 | 31 | 12 (9) | 0.63 | 0.27–1.46 | .87 | | | |
| 200–350 | 73 | 35 (28) | 0.92 | 0.49–1.72 | .31 | | | |
| 350–500 | 87 | 36 (28) | 0.71 | 0.39–1.29 | .87 | | | |
| >500 | 86 | 43 (34) | Reference | | | | | |
| EFV-containing ART | | | | | | | | |
| Yes | 47 | 26 (21) | 0.95 | 0.49–1.83 | .65 | | | |
| No | 156 | 74 (28) | Reference | | | | | |
| Unknown ^b | 78 | 26 (21) | 0.68 | 0.39–1.17 | .28 | | | |
| BMI (kg/m ²) | | | | | | | | |
| <18.5 | 20 | 11 (9) | 1.65 | 0.64–4.23 | .51 | 1.64 | 0.58–4.64 | .47 |
| 18.5–25 | 141 | 60 (47) | Reference | | | Reference | | |
| 25–30 | 85 | 43 (34) | 1.38 | 0.81–2.37 | .73 | 1.48 | 0.82–2.68 | .46 |
| 30+ | 30 | 10 (8) | 0.68 | 0.30–1.55 | .10 | 0.78 | 0.30–1.99 | .33 |

EFV, efavirenz.

^a Time since ART initiation is a proxy for time on study: ART-naive participants are enrolled in this cohort within 2 weeks of ART initiation.

^b Women whose use of an EFV-based ARV regimen was “unknown” were retained in the model to maintain the full sample for analysis.

sexually inactive for the last 6 months. Thus, our estimate may underestimate effective contraception use among sexually active women.

Partnership fertility desire was the only factor independently associated with effective contraceptive use. We assessed fertility desire as reported by the participant for herself and her partner. We found that women reporting that neither they nor their partner wants to conceive were more than twice as likely to use effective contraception compared to women who either

want to conceive or have a partner that wants to conceive. When examined separately, neither the woman’s fertility desire ($p=.16$) nor her partner’s fertility desire ($p=.55$) was associated with effective contraceptive use. The effect was only seen when both members of the couple were concordant in their desires not to have a child. This finding may be due to the role of male partners in influencing reproductive decision making. Importantly, over one third of women reported partnership fertility desire and correspondingly lower prevalence of contraceptive use.

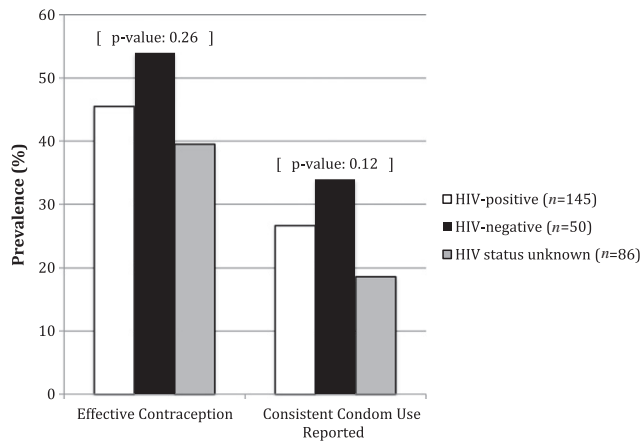


Fig. 2. Prevalence of effective contraceptive use and condom use by female report of partner HIV serostatus.

These findings underscore the importance of comprehensive “family planning” for HIV-infected women and their partners, including safer conception counseling for those seeking to conceive [28,29].

The male condom was the most commonly reported contraceptive method, consistent with previous reports among HIV-infected women enrolled in care [10,13,21]. This differs from results reported by Muyindike and colleagues, who found that, among HIV-infected women enrolling in care, injectable contraception was the most common method [9]. However, in that study of patients accessing care at the clinic where this cohort recruits, contraceptive use was determined via clinic chart review rather than self-report. High condom use in our sample may reflect a strong emphasis on condom-based HIV-prevention counseling in the clinic and inflated reporting due to social desirability bias. Among consistent condom users, only 22% reported using an additional method of contraception (dual method). Given the high failure rate of condoms [5] and the high pregnancy incidence in this cohort [4], these data further support calls to increase access to a wider range of female-controlled and long-acting contraceptive methods. While women in this cohort were accessing care at an ART clinic where oral and injectable hormonal contraception is available, stock-outs of contraceptive methods and referral to a separate clinic for some family planning methods (e.g., implant, IUD) are important barriers to accessing effective contraception.

The most common noncondom method of effective contraception was injectable contraception, as seen in prior studies in Uganda [11]. These data emphasize the importance of preserving injectable contraception as a choice for women while increasing the available method mix [30].

Oral contraceptive methods were used by fewer than 5% of sexually active women. According to qualitative interviews conducted with health care workers in this district,

many providers do not offer oral contraception to women with HIV due to concerns about drug–drug interactions with ART and anticipated adherence challenges [31]. Given the limited methods available to women, it is important to educate providers about the true risks of drug–drug interactions [32] and support women to make informed decisions about adherence to daily oral contraception.

Female sterilization among effective contraceptive users was low (6%). Given concerns about coercive sterilization of women living with HIV [33], these data are reassuring and consistent with overall estimates of low female sterilization uptake in Uganda [5].

Our data highlight the importance of efforts to decrease barriers to access contraceptive methods, including hormonal contraceptive implants [34]. Recent efforts to increase access to contraceptive implants in sub-Saharan Africa are striking. In Uganda, implant use increased from 20,000 users in 2006 to 140,000 in 2011 [35]. While women in this cohort did not report implant use through March 2013, more recent data from our cohort suggest an increase in uptake (data not shown).

For the subgroup of women with a stable partner, we evaluated whether reported partner serostatus affected contraceptive use. There were no significant differences between consistent condom use among partners of HIV-infected women by HIV status of the male partner.

Sexual abstinence was common in this cohort, with 25% of women reporting no sexual activity in the past 12 months. Although these women were not included in the effective contraceptive use analysis (which was limited to sexually active women), women may have used intentional abstinence as a form of contraception. Among abstainers, 90% reported no future fertility desires (data not shown).

There are several limitations to this study. First, these data were collected from HIV-infected women enrolled in a cohort study, which may affect generalizability: these women may not be representative of the general population of women living with HIV in Uganda. Participants are engaged in HIV care and have regular follow-up visits, which may contribute to better overall and reproductive health compared to those without such access to care. Second, sexually active women were defined by sexual activity in the past 12 months, whereas contraceptive use and condom use were reported in the past 6 months. Thus, it is possible that a subset of the women who were sexually active in the past year did not use contraception in the past 6 months due to recent sexual inactivity. In addition, due to the emphasis on family planning in clinics in Uganda, women may overreport condom and other contraceptive use. Finally, information about the male partner and his fertility intention was reported by women enrolled in the study and not the male partner himself.

This study provides an updated picture of contraceptive use patterns among HIV-infected women in rural Uganda. We also were able to evaluate how contraceptive use is affected by partner or personal pregnancy plans.

References

- [1] UN Joint Programme on HIV/AIDS (UNAIDS). Global report: UNAIDS report on the global AIDS EPIDEMIC: 2010. Available from: <http://www.refworld.org/docid/4cfa9c62.html> 2010.
- [2] Central Intelligence Agency. The world factbook 2014: Uganda. Available from: <https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html> 2014.
- [3] Kaida A, Laher F, Strathdee SA, Janssen PA, Money D, Hogg RS, et al. Childbearing intentions of HIV-positive women of reproductive age in Soweto, South Africa: the influence of expanding access to HAART in an HIV hyperendemic setting. *Am J Public Health* 2011;101:350–8.
- [4] Kaida A, Matthews LT, Kanters S, Kabakyenga J, Muzoora C, Mocello AR, et al. Incidence and predictors of pregnancy among a cohort of HIV-positive women initiating antiretroviral therapy in Mbarara, Uganda. *PLoS One* 2013;8:e63411.
- [5] Uganda Bureau of Statistics (UBOS), ICF International Inc.. Uganda Demographic and Health Survey 2011. Available from: <http://www.ubos.org/onlinefiles/uploads/ubos/UDHS/UDHS2011.pdf> 2012.
- [6] Desgrees-Du-Lou A, Msellati P, Viho I, Yao A, Yapi D, Kassi P, et al. Contraceptive use, protected sexual intercourse and incidence of pregnancies among African HIV-infected women. DITRAME ANRS 049 Project, Abidjan 1995–2000. *Int J STD AIDS* 2002;13:462–8.
- [7] Guttmacher Institute. Contraception and unintended pregnancy in Uganda 2013. Available from: <http://www.guttmacher.org/pubs/FB-Contraception-and-unintended-pregnancy-in-Uganda.pdf> 2014.
- [8] Beyeza-Kashesya J, Kaharuza F, Ekstrom AM, Neema S, Kulane A, Mirembe F. To use or not to use a condom: a prospective cohort study comparing contraceptive practices among HIV-infected and HIV-negative youth in Uganda. *BMC Infect Dis* 2011;11:144.
- [9] Muyindike W, Fatch R, Steinfield R, Matthews LT, Musinguzi N, Emenyonu NI, et al. Contraceptive use and associated factors among women enrolling into HIV care in southwestern Uganda. *Infect Dis Obstet Gynecol* 2012;2012:340782.
- [10] Homsy J, Bunnell R, Moore D, King R, Malamba S, Nakityo R, et al. Reproductive intentions and outcomes among women on antiretroviral therapy in rural Uganda: a prospective cohort study. *PLoS One* 2009;4:e4149.
- [11] Brahmhatt H, Makumbi F, Lutalo T, Sekasanvu J, Serwadda D, Wawer MJ, et al. Longitudinal study of correlates of modern contraceptive use and impact of HIV care programmes among HIV concordant and serodiscordant couples in Rakai, Uganda. *J Fam Plann Reprod Health Care* 2014;40:208–16.
- [12] Makumbi F, Nakigozi G, Lutalo T, Kagayi J, Sekasanvu J, Settuba A, et al. Use of HIV-related services and modern contraception among women of reproductive age, Rakai Uganda. *Afr J Reprod Health* 2010;14:87–97.
- [13] Kaida A, Laher F, Strathdee SA, Money D, Janssen PA, Hogg RS, et al. Contraceptive use and method preference among women in Soweto, South Africa: the influence of expanding access to HIV care and treatment services. *PLoS One* 2010;5:e13868.
- [14] Katz DA, Kiarie JN, John-Stewart GC, Richardson BA, John FN, Farquhar C. Male perspectives on incorporating men into antenatal HIV counseling and testing. *PLoS One* 2009;4:e7602.
- [15] Nakayiwa S, Abang B, Packer L, Lifshay J, Purcell DW, King R, et al. Desire for children and pregnancy risk behavior among HIV-infected men and women in Uganda. *AIDS Behav* 2006;10:S95–104.
- [16] Shattuck D, Kerner B, Gilles K, Hartmann M, Ng'ombe T, Guest G. Encouraging contraceptive uptake by motivating men to communicate about family planning: the Malawi Male Motivator project. *Am J Public Health* 2011;101:1089–95.
- [17] Heffron R, Donnell D, Rees H, Celum C, Mugo N, Were E, et al. Use of hormonal contraceptives and risk of HIV-1 transmission: a prospective cohort study. *Lancet Infect Dis* 2012;12:19–26.
- [18] World Health Organization. Hormonal contraceptive methods for women at high risk of HIV and living with HIV: 2014 guidance statement. Available from: http://apps.who.int/iris/bitstream/10665/128537/1/WHO_RHR_14.24_eng.pdf?ua=1 2014.
- [19] Ahluwalia IB, Johnson C, Rogers M, Melvin C. Pregnancy Risk Assessment Monitoring System (PRAMS): unintended pregnancy among women having a live birth. PRAMS Working Group. *J Womens Health Gend Based Med* 1999;8:587–9.
- [20] World Health Organization. Fact sheet: family planning 2013. Available from: <http://www.who.int/mediacentre/factsheets/fs351/en/> 2013.
- [21] Andia I, Kaida A, Maier M, Guzman D, Emenyonu N, Pepper L, et al. Highly active antiretroviral therapy and increased use of contraceptives among HIV-positive women during expanding access to antiretroviral therapy in Mbarara, Uganda. *Am J Public Health* 2009;99:340–7.
- [22] Clark RA, Theall KP. Trends and correlates of hormonal contraception use among HIV-infected women. *J Acquir Immune Defic Syndr* 2004;36:986–8.
- [23] Polis CB, Gray RH, Lutalo T, Nalugoda F, Kagaayi J, Kigozi G, et al. Trends and correlates of hormonal contraceptive use among HIV-infected women in Rakai, Uganda, 1994–2006. *Contraception* 2011;83:549–55.
- [24] Wanyenze RK, Tumwesigye NM, Kindyomunda R, Beyeza-Kashesya J, Atuyambe L, Kansime A, et al. Uptake of family planning methods and unplanned pregnancies among HIV-infected individuals: a cross-sectional survey among clients at HIV clinics in Uganda. *J Int AIDS Soc* 2011;14:35.
- [25] World Health Organization. Technical update on treatment optimization: use of efavirenz during pregnancy: a public health perspective 2012. Available from: http://whqlibdoc.who.int/publications/2012/9789241503792_eng.pdf 2012.
- [26] Burkman RT, Fisher AC, Wan GJ, Barnowski CE, LaGuardia KD. Association between efficacy and body weight or body mass index for two low-dose oral contraceptives. *Contraception* 2009;79:424–7.
- [27] Filmer D, Pritchett LH. Estimating wealth effects without expenditure data — or tears: an application to educational enrollments in states of India. *Demography* 2001;38:115–32.
- [28] Matthews LT, Mukherjee JS. Strategies for harm reduction among HIV-affected couples who want to conceive. *AIDS Behav* 2009;13(Suppl 1):5–1.
- [29] Schwartz SR, Bassett J, Sanne I, Phofa R, Yende N, Van Rie A. Implementation of a safer conception service for HIV-affected couples in South Africa. *AIDS (London, England)* 2014;28(Suppl 3):S277–85.
- [30] World Health Organization. Hormonal contraception and HIV: technical statement 2012. Available from: http://whqlibdoc.who.int/hq/2012/WHO_RHR_12.08_eng.pdf 2012.
- [31] Matthews LT, Bajunirwe F, Kastner J, Akatukwasa C, Sanyu N, Ng C, et al. Barriers and Facilitators to Provider-initiated Assessment of Fertility intentions Among Men and Women Living With HIV in Uganda. 20th International AIDS Conference/AIDS 2014 Melbourne, Australia; 2014.
- [32] Panel on Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission. Recommendations for use of antiretroviral drugs in pregnant HIV-1-infected women for maternal health and interventions to reduce perinatal HIV transmission in the United States. Available from: <http://aidsinfo.nih.gov/contentfiles/lvguidelines/PerinatalGL.pdf>.
- [33] UNAIDS. UN Joint Programme on HIV/AIDS. Unite with women — unite against violence and HIV: 2014. Available from: http://www.unaids.org/en/media/unaids/contentassets/documents/unaidspublication/2014/JC2602_UniteWithWomen_en.pdf 2014.
- [34] Bashir I. Jadelle will ease women's family planning burden. *Kampala, Uganda: The Observer*; 2013.
- [35] Duvall S, Thurston S, Weinberger M, Nuccio O, Fuchs-Montgomery N. Scaling up delivery of contraceptive implants in sub-Saharan Africa: operational experiences of Marie Stopes International. *Glob Health Sci Pract* 2014;2:72–92.