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Trends and correlates of hormonal contraceptive use among HIV-infected women in Rakai, Uganda, 1994–2006

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Abstract

Background: Little is known about what factors correlate with hormonal contraceptive (HC) use in HIV-infected women in sub-Saharan Africa.
Methods: We assessed the trends in HC use among HIV-infected women in Rakai, Uganda; determined factors associated with HC use and considered whether those factors changed over time.
Results: HC use among HIV-infected women in Rakai increased from 5.7% in 1994 to 19.2% in 2006, but nearly half of all pregnancies in this population were unintended. Variables associated with increased HC use included higher education, socioeconomic status, parity, sexual frequency, being currently married or in a relationship, discussion of family planning with a partner and receipt of HIV results. Variables negatively associated with HC use included symptoms suggestive of opportunistic infections, having no sex partner in the past year, condom use, breastfeeding and older age. Most associations remained stable over time.
Conclusion: Although contraceptive use by HIV-infected women has increased three-fold in this rural population, unintended pregnancies persist, placing women and their children at risk of adverse consequences.

Keywords: Hormonal contraception; HIV; Uganda; Injectable contraception; Oral contraceptive pills; Implants

1. Introduction

Use of effective contraception increases reproductive control, averts most unintended pregnancies and reduces the demand for abortion, which is particularly crucial in regions where maternal mortality and morbidity are high and where access to safe and legal abortions are restricted [1,2]. When used by HIV-positive (HIV+) women who wish to prevent pregnancy, contraception is also an effective means of preventing mother-to-child HIV transmission (pMTCT), by avoiding unintended pregnancies that might otherwise result in an HIV-infected infant. Contraceptive use also allows HIV+ women to avoid use of antiretroviral (ARV) prophylaxis for pMTCT, thereby avoiding problems of ARV access [3], the potential for resistant viral mutations[4,5], or of suboptimal response to antiretroviral therapy (ART) [5,6]. Thus, for HIV+ women who wish to avoid pregnancy, the availability of safe, effective contraception provides direct and indirect public health benefits. Although a randomized study in Zambia raised concerns that HC accelerates HIV disease progression [7], the preponderance of observational studies have found no detrimental impact of HC on HIV disease progression [8,9].

Few studies have examined the factors correlated with contraceptive use among HIV+ women in Africa, particularly use of effective hormonal contraception (HC) methods such as oral contraceptive pills, implants, and injectables. Among HIV+ women in the United States, use of HC is

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associated with being younger, having higher CD4 T-cell counts [10,11], being married or living with a partner, use of alcohol [10], lack of injection drug use history [11] and current enrollment in a drug dependency treatment program [12]. In developing countries, HC use among HIV+ women has been associated with better education [13] and marriage [14]. Access to contraceptive services, as well as attitudes towards contraception and gender roles may also affect a woman's probability of using HC. Relationship-level factors, such as partner's feelings towards family planning, HIV disclosure status, and intimate partner violence may also influence a woman's choice or ability to use HC [15–17].

We assessed the levels and trends of HC use, and the factors influencing HC use in HIV+ women in Rakai, Uganda, using data from a community cohort collected between 1994 and 2006.

2. Materials and methods

2.1. The Rakai Community Cohort Study

We analyzed data collected from the Rakai Community Cohort Study (RCCS). Since 1994, the Rakai Health Sciences Project (RHSP) has followed an open cohort of consenting participants aged 15–49 years from selected communities in the Rakai district of southwestern Uganda. The cohort has been described in detail elsewhere [18,19], but in brief, participants are consented and privately interviewed by same-sex interviewers every 12–15 months, using a standardized questionnaire. Venous blood is collected at each survey round for HIV-1 testing. Over 90% of eligible individuals participate in any given survey round.

Prior to June 2004, HIV+ persons received treatment for opportunistic infections through RHSP community-based clinics. After June 2004, participants received enhanced HIV care including ART with the President's Emergency Plan for AIDS Relief (PEPFAR) funding. Pregnant HIV+ women also receive antiretroviral drugs for pMTCT using single-dose nevirapine and, more recently, also zidovudine. Other services provided to the community include free treatment for general illnesses including STIs, free condoms, health education including contraceptive education, and referral for contraceptive services. Free nonsurgical contraceptive services, including hormonal and barrier methods, are available to HIV+ participants attending the RHSP HIV clinics, but individuals may also procure methods from non-RHSP sources. Between 2000 and 2003, RHSP also conducted a family planning promotion and outreach program in 20 of its 56 communities, which offered subsidized non-surgical family planning methods through community depots and community-based personnel.

Institutional review board (IRB) approvals for the RCCS were obtained from Uganda Virus Research Institute's Science and Ethics Committee, Uganda National Council for Science and Technology and from the Western IRB in the US.

2.2. Analytic sample

All sexually-experienced female participants who tested positive for HIV were eligible for inclusion in this analysis. Survey Rounds 1 (1994–1995) through 11 (2005–2006) of the RCCS were available for analysis, but Rounds 2 and 5 were excluded due to differences in survey designs during those years. The number of eligible HIV+ women participating in each survey round ranged from 767 to 1273. Most, but not all, variables were collected consistently during all surveys; therefore, the multivariate models constructed for different time periods differ due to the availability of variables. We included information on HIV-negative women only to assess for differences in frequency of HC use by HIV status.

2.3. Variable definitions

HC use was defined as use of the oral contraceptive pill or injectable contraception (DMPA) in Rounds 1–6. In Rounds 7 through 11, questionnaires also asked about use of hormonal contraceptive implants, which became available at that time. Participants were categorized as having an opportunistic infection during the past year if they experienced one or more of the following symptoms: fever, diarrhea, or cough for at least 1 month; gross weight loss; tuberculosis, herpes zoster or oral/vaginal candida (thrush). Sexual frequency was categorized as above or below the median level reported by the eligible population at each round. Education (none, primary, secondary, or technical/university/professional level) represents the level of education achieved at study entry. Some error may have been introduced if women progressed to the next educational level, but this is likely to be a small proportion of the total sample. Parity (0, 1, 2–4, or 5+ births) information was updated at each round. Information on current condom use was taken from a question which asked women whether she or any of her partners were currently using condoms at the time of the survey. A socioeconomic status (SES) variable was created based upon materials used to construct the floor, walls and roof of their home, and a wealth variable was defined as the cumulative sum of modern household objects, weighted by the inverse of their prevalence among all surveyed members, including transport (car, motorcycle, or bicycle), radio, iron roof, wood or cement floors, brick or stone walls, electricity and a latrine [20].

2.4. Statistical methods

We assessed the prevalence of self-reported HC use by year from 1994-2006 in both HIV-infected and uninfected women. We considered 24 variables which could be hypothesized to correlate with HC use in HIV+ women based on a literature review and variables available in the RCCS data. Variables significant at $p \leq .10$ in univariate analyses were considered for inclusion in multivariate models. After selecting multivariate models for each of nine individual rounds (not shown), we pooled data into

three distinct time periods for ease of presentation. Time 1 included surveys conducted between November 1994 and May 1998; Time 2 included surveys conducted between April 1999 and May 2002 and Time 3 included surveys conducted between July 2002 and Jun 2006. We used generalized estimating equations to pool the data while controlling for correlation within women. We used logistic regression models to obtain odds ratios (OR) and 95% confidence intervals (95% CI). The pooled models included only women who were not currently pregnant and were not subfertile. Survey round was included in the logistic regression models to account for any potential secular trends. All analyses were done using STATA.SE. Release 10.1 (Stata, College Station, TX, USA).

3. Results

3.1. Population characteristics

Overall, 3557 individual women contributed to this analysis. Each woman contributed an average of 2.2 survey visits (standard deviation: 1.7), but visit contributions per woman ranged from one to nine (with nine visits representing a contribution to all potential survey rounds). Nearly half of all women (49%) contributed only one visit; 22% contributed two visits; 12% contributed three visits; 6% contributed four visits; 4% contributed five visits; 3% contributed six visits and the remaining 3% contributed seven, eight, or nine visits. Visits were generally, but not necessarily, completed in consecutive survey rounds.

Table 1
Sociodemographic characteristics at Times 1–3 among HIV+, fertile, non-pregnant women

	Time 1 1994–1998 2830 Obs, 1857 Women		Time 2 1999–2002 2445 Obs, 1619 Women		Time 3 2002–2006 2276 Obs, 1420 Women		p value for trend
	n	%	*n*	%	*n*	%	
Use of hormonal contraception	260	9.2	378	15.5	487	21.4	.0000
Age, years							
15–24	670	23.7	576	23.6	428	18.8	.0001
25–34	1233	43.6	1191	48.7	1140	50.1	.0000
35+	927	32.8	678	27.7	708	31.1	.1329
Education							
No education	332	11.7	250	10.2	332	14.6	.0039
Primary education	1923	67.9	1622	66.3	1405	61.7	.0000
Secondary level	485	17.1	452	18.5	430	18.9	.0984
Technical/university/professional	90	3.2	121	5.0	109	4.8	.0030
Parity							
No births	184	6.5	137	5.6	125	5.5	.1173
One birth	381	13.5	293	12.0	264	11.6	.0401
2–4 births	1277	45.1	1094	44.7	976	42.9	.1169
5+ births	988	34.9	921	37.7	911	40.0	.0002
Sexual partners in past year							
None	689	24.4	512	20.9	521	22.9	.1630
One	1987	70.2	1698	69.5	1585	69.6	.6385
Two+	154	5.4	235	9.6	170	7.5	.0022
Socioeconomic status							
Poor condition home	248	8.8	110	4.5	63	2.8	.0000
Average condition home	1744	61.6	1423	58.2	1265	55.6	.0079
Above average condition home	680	24.0	801	32.8	912	40.0	.0000
SES information missing	158	5.6	111	4.5	36	1.6	.0000
Breastfeeding							
Breastfeeding	778	27.5	23	0.9	6	0.3	.0000
No breastfeeding	1930	68.2	2422	99.1	2270	99.7	.0000
Breastfeeding information missing	122	4.3	–	–	–	–	–
Requested and received HIV results in past year							
No	NA	NA	989	40.5	1030	45.3	.0009
Yes	NA	NA	930	38.0	884	38.8	.5707
Information on HIV results receipt missing	NA	NA	526	21.5	362	15.9	.0000
Current condom use	235	8.3	336	13.7	272	12.0	.0000
Married	1,434	50.7	1130	46.2	1009	44.3	.0000
Nonmarital relationship	532	18.8	655	26.8	662	29.1	.0000
Opportunistic infection	444	15.7	436	17.8	410	18.0	.0236
Sexual frequency above median	NA	NA	999	40.9	914	40.2	.6241
Ever discuss family planning with partner	NA	NA	1279	52.3	NA	NA	–

Obs, observations.

Table 1 shows sociodemographic characteristics of HIV+ women over the three time periods. Most women had at least one child, and the percentage of women with five or more children increased, likely due in part to aging of the HIV+ cohort and availability of ART after 2004. At Time 1, half of the sample reported being currently married, but this percentage declined to 44.3% by Time 3. Concurrently, the percentage of women reporting a non-marital relationship increased from 18.8% in Time 1 to 29.1% in Time 3. The majority of women (between 62% and 68%) had a primary education at all time points. At later time points, the SES of the cohort was higher. At all time points, about 70% of women reported having one sexual partner in the past year, while less than one fourth reported no recent sexual partners. The percentage of women reporting current use of condoms ranged from 8.3% to 13.7%, and about half of our sample reported having ever discussed family planning with a sexual partner. The percent of HIV+ women requesting and receiving HIV results within the past year remained stable around 38% annually, but this estimate was higher for women previously enrolled in the cohort (who had a previous opportunity to receive an HIV test as part of the cohort services). Cumulatively, about 70% of women who had multiple rounds of information in RCCS had ever received voluntary counseling and testing from RHSP. The percent of women reporting symptoms suggestive of opportunistic infections remained near 16% to 18%. Use of breastfeeding for family planning declined sharply, from 27.5% at Time 1 to 0.3% at Time 3 (note that these estimates reflect the entire population of HIV+ women at a given time, not just recently delivered HIV+ women).

3.2. Contraceptive use over time

Use of HC among all HIV+ women in Rakai more than tripled, from 5.7% to 19.2%, between 1994 and 2006, largely due to increased use of injectables, which increased from 3.0% in 1994 to 15.8% in 2006, as well as the availability of contraceptive implants after Round 6 (Fig. 1). Use of oral contraceptive pills remained relatively constant over time, ranging between 2.4% and 4.7% for HIV+ women. There was no significant difference in hormonal contraceptive use by HIV status at any time (p>.05 at all survey rounds).

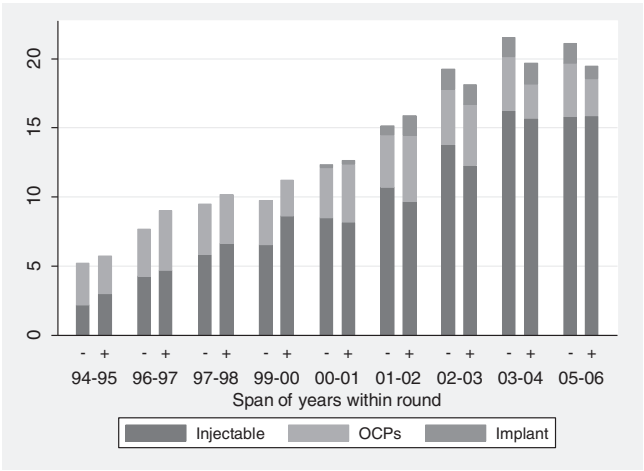

Fig. 1. Use of hormonal contraception among all women, by HIV status over time.

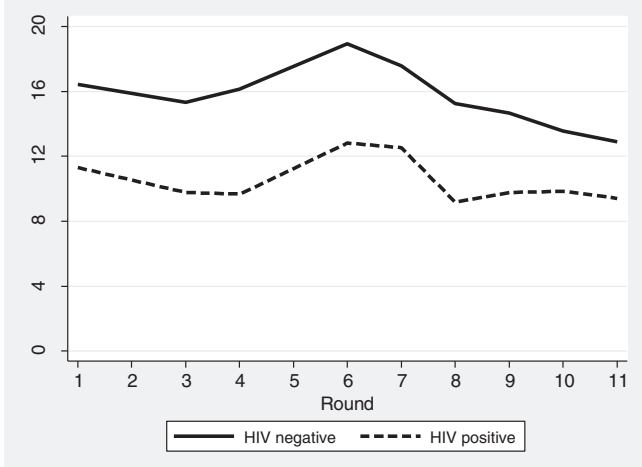

Fig. 2. Prevalent pregnancies by HIV status and round.

Despite the increases in use of highly effective contraceptive methods, decreases in prevalent pregnancies over time were small (Fig. 2) and nonsignificant (p=.23 in chi-square test for trend). We therefore attempted to explore the continuity of HC use. Between Rounds 1 and 11, 1792 HIV+ women had participated in at least two consecutive rounds. Among these women, 487 reported use of HC and 196 (40% of HC users) reported HC use in two or more consecutive surveys, suggesting a low rate of contraceptive continuation.

Pregnancy intention information was collected since 2000. The proportion of unintended pregnancies dropped from 52.3% to 42.4% between 2000 and 2002, but rose again between 2002 and 2006 to 47.8%. The increase in unintended pregnancy between 2002 and 2006 was significant (p=.04 in a chi-square test for trend). Unintended pregnancies accounted for 47.8% (354/740) of all pregnancies to HIV+ women in the most recent survey round. Among women with current or past unintended pregnancies, 32.4% (109/336) reported using any method of contraception in Round 7, and this proportion rose to 37.9% (134/354) in Round 11.

3.3. Factors correlated with HC use in HIV+ women

Variables significantly associated with increased HC use at all time periods included higher education at study entry, higher parity, higher sexual frequency, being currently married or in a non-marital relationship, having ever discussed family planning with a partner and having ever received HIV test results (Table 2). Variables consistently associated with lower HC use included having no recent sexual partners, current condom use, and current

Table 2
Factors correlated with hormonal contraceptive use over time among HIV+, fertile, nonpregnant women

	Use of hormonal contraception	Time 1 (1994–1998) 2830 Obs 1857 Women			Time 2 (1999–2002) 2445 Obs 1619 Women			Time 3 (2002–2006) 2276 Obs 1420 Women		
		OR	95% CI	p value	OR	95% CI	p value	OR	95% CI	p value
Sociodemographic	Age, years			.043			.161			.000
	15–24	1.03	0.70–1.52		0.84	0.58–1.23		1.18	0.84–1.67	
	25–34	1.00			1.00			1.00		
	35+	0.60	0.40–0.91		0.70	0.47–1.04		0.42	0.30–0.59	
	Education			.000			.000			.000
	No education	0.45	0.23–0.89		0.33	0.16–0.69		0.41	0.27–0.62	
	Primary education	1.00			1.00			1.00		
	Secondary level	2.35	1.64–3.37		1.99	1.40–2.83		1.54	1.12–2.11	
	Technical/university/professional	3.56	1.73–7.35		1.68	0.93–3.05		0.97	0.53–1.77	
	Married	3.45	2.25–5.28	.000	4.60	2.73–7.76	.000	2.11	1.34–3.33	.001
	Socioeconomic status			.833			.000			.042
	Poor condition home	1.15	0.71–1.86		0.20	0.06–0.64		0.48	0.21–1.11	
	Average condition home	1.00			1.00			1.00		
	Above average condition home	1.06	0.77–1.47		1.63	1.23–2.15		1.30	1.00–1.68	
	SES information missing	1.29	0.69–2.41		1.22	0.63–2.39		0.73	0.28–1.92	
Reproductive	Parity			.000			.003			.000
	No births	0.30	0.06–1.42		0.14	0.03–0.57		0.17	0.06–0.49	
	One birth	1.00			1.00			1.00		
	2–4 births	3.00	1.71–5.26		1.27	0.79–2.04		1.36	0.90–2.05	
	5+ births	4.19	2.26–7.75		1.65	0.96–2.82		1.83	1.17–2.86	
	Breastfeeding			.000			.055			.529
	No breastfeeding	1.00			1.00			1.00		
	Breastfeeding	0.28	0.19–0.41		0.12	0.01–1.04		0.57	0.10–3.24	
	Breastfeeding information missing	1.05	0.50–2.19		–	–		–	–	
	Ever discuss family planning with partner	NA	NA	NA	3.69	2.70–5.06	.000	NA	NA	NA
Behavioral	Sexual partners in past year			.000			.013			.000
	None	0.17	0.08–0.38		0.27	0.10–0.70		0.22	0.12–0.41	
	One	1.00			1.00			1.00		
	Two+	+0.83	0.47–1.47		1.36	0.87–2.14		0.72	0.45–1.14	
	Nonmarital relationship	4.07	2.51–6.60	.000	11.40	6.68–19.48	.000	4.16	2.61–6.63	.000
	Current condom use	0.36	0.20–0.66	.001	0.08	0.05–0.13	.000	0.03	0.01–0.08	.000
	Sexual frequency above median	NA	NA	NA	1.53	1.18–1.99	.002	1.31	1.02–1.66	.032
Health	Requested and received HIV results in past year			NA			.130			.021
	No	NA	NA		1.00			1.00		
	Yes	NA	NA		1.33	1.00–1.77		1.30	1.02–1.68	
	Information on HIV results receipt missing	NA	NA		1.22	0.87–1.72		0.84	0.60–1.18	
	Opportunistic infection	0.57	0.36–0.91	.018	0.62	0.41–0.93	.022	0.69	0.49–0.97	.033
Time	Round within time period			.041			.058			.377
	First round in time period	1.00			1.00			1.00		
	Second round in time period	1.28	0.92–1.78		1.38	1.03–1.85		1.15	0.88–1.49	
	Third round in time period	1.53	1.10–2.12		1.37	1.02–1.84		1.21	0.92–1.59	

Obs, observations; NA, variable could not be included in model since it was not collected at all rounds in that time period.

opportunistic infections. The associations between HC use and higher education at baseline became weaker over time, as did the association between higher parity and HC use.

Age, SES and breastfeeding were correlated with HC use only at certain time periods. Young women (15–24 years old) were equally likely to use HC as women aged 25–34 years at any time, but older women (35+ years old) were significantly less likely to use HC at Times 1 and 3. Women living in homes of above average condition were significantly more likely than women in homes of average condition to use HC in Times 2 and 3, while women in poor condition homes were significantly less likely to use HC at Time 2, suggesting that SES may have become more strongly correlated with HC use over time. Breastfeeding women were significantly less likely than non-breastfeeding women to use HC only at Time 1, but the lack of statistical significance in Times 2 and 3 is likely due to reduced power, given that few HIV+ women reported current breastfeeding during these later time periods.

CD4 count was available on a subset of individuals at Rounds 7 through 11 (ranging from 11 to 83 women per round). Average CD4 counts were higher among women who reported HC use, but the difference was not statistically significant.

Variables not associated with HC use in any survey round included tribal affiliation, religion, recent alcohol use, exchange of sex for gifts or money, wealth tertile, being bedridden, age at first sex or coercive sexual debut. Use of ART only became available after June 2004. In univariate analysis, lack of ART use was associated with higher use of HC ($p=.035$), but this was not significant in multivariate analysis.

4. Discussion

The prevalence of self-reported current HC use by HIV+ women was not statistically different from the prevalence of self-reported current HC use among HIV-uninfected women. The prevalence of current HC use in Rakai was nearly double that of the national estimate from the 2006 Ugandan Demographic and Health survey (DHS), in which only 10.3% of all women reported current use of HC. According to recent DHS surveys, national levels of HC use in Uganda are lower than in several other Eastern or Southern African countries, but higher than in several Central and Western African countries [21]. The dramatic increase in use of injectable contraception over time in Rakai is reflective of trends in use of injectable contraceptive use throughout Uganda during this time period [21].

Several factors appeared to be associated with use of HC in multivariate pooled analysis. Certain factors, such as ever having a discussion about family planning with a sexual partner, or being married or in a nonmarital relationship showed strong positive associations (generally OR>3) with HC use. On the other hand, low education, low SES, low parity, breastfeeding, lack of sexual partner(s), or use of condoms displayed strong negative associations (generally OR<0.50) with HC use. The negative association between HC use and condom use is concerning, since HIV+ women are at risk of transmitting HIV and of acquiring sexually transmitted infections or HIV superinfection. Strategies to promote simultaneous use of condoms and highly effective contraceptive methods are needed.

Few studies have examined the correlates of HC use for HIV+ women in the developing world. A separate study in Rakai using cohort data from 1995 through 1998 found that regardless of HIV status, women using any form of contraception were more likely to be between 20 and 39 years old, to be married, to be better educated, to have higher parity, to desire fewer children, to wish to space or terminate childbearing and to have experienced unwanted births or abortions [22]. The results of our analysis support these findings. Another analysis of the Rakai cohort restricted to HIV-negative women reported that HC use was associated with women aged 20–34 years, marriage, higher levels of education, multiple sex partners, and ever reporting of condom use [23]. Again, these results are supported by our findings.

Despite higher estimates of contraceptive use in Rakai than in other parts of Uganda, HC use by HIV-infected women was low, and improvements in contraceptive provision, as well as voluntary contraceptive uptake and continuation are needed. We found that unintended pregnancies to HIV+ women rose between 2003 and 2006, that over 60% of HIV+ women in Rakai with past or current unintended pregnancies did not report any current use of hormonal or non-hormonal contraception, and that HC continuation rates were low. Reducing the rate of unintended pregnancies to HIV+ women is one of the four strategies to prevent MTCT of HIV [24] and can thus help reduce the number of perinatal HIV infections and AIDS orphans.

Our analysis reveals several factors associated with HC use which may be useful to consider in designing programs to promote increased voluntary uptake of contraception, such as promoting discussion of family planning with sexual partners and encouraging receipt of HIV test results. Attention to more distal factors, such as improving education and SES among women, may also impact use of contraception, but our analysis was only able to establish association, not causation, and contraceptive decision-making occurs in an extremely complex economic and cultural context. Focus group discussions in Lutalo et al.'s analysis revealed that some of the major barriers to contraceptive use included lack of access to family planning services, the cost of contraception, and men's negative attitudes towards family planning [22]. Some of these factors may have changed in the ten intervening years between these focus groups and the current analysis, but further qualitative work would be useful in understanding the barriers against use of effective methods of contraception among HIV+ women in Rakai today.

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