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Antiretroviral Therapy and Sexual Behavior: A Comparative Study between Antiretroviral-Naive and -Experienced Patients at an Urban HIV/AIDS Care and Research Center in Kampala, Uganda

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ABSTRACT

We examined whether use of antiretroviral (ARV) therapy is associated with increased sexual risk behavior in a cross-sectional study of patients undergoing ARV therapy (ARV experienced) compared to patients not undergoing ARV therapy (ARV-naïve) attending an urban HIV clinic in Kampala, Uganda. Sexual behavior during the prior 6 months and sexually transmitted disease (STD) treatment was determined by face-to-face structured interviews. Multiple logistic regression was used to identify independent correlates of sexual activity, multiple sexual partners, inconsistent condom use, and STD treatment during the prior 6 months. Three hundred forty-seven (48%) of the 723 respondents reported a history of sexual intercourse in the 6 months prior to the interview (sexually active). Receipt of ARV therapy was not associated with a significantly higher likelihood of being sexually active (adjusted odds ratio [AOR], 2.0 95% confidence interval [CI], 0.3–9.9). Among both ARV-experienced and ARV-naïve persons who were sexually active, 35% (120) reported one or more casual sexual partners in addition to a main partner (no difference by ARV status). Consistent condom use with spouse, regular, casual, and commercial partners was reported by 57%, 65%, 85%, and 85% of the sexually active respondents, respectively. The ARV-experienced respondents were more likely to report consistent condom use with their spouses than were ARV-naïve respondents (OR 2.82 95% CI 1.74–4.6). ARV-experienced respondents were more likely than ARV-naïve respondents to have disclosed their HIV status to their spouses (OR 1.57 95% CI 1.07–2.30).The ARV-experienced group was more likely to report STD treatment in the prior 6 months (AOR 2.62 95% CI 1.8–3.83) than the ARV-naïve group. The findings suggest that in this population, use of ARV therapy was not associated with risky sexual behavior in the prior 6 months. Still, recall and social desirability biases remain important limitations in interpreting these conclusions.

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INTRODUCTION

Access to antiretroviral (ARV) therapy is increasing in resource-limited settings because of the growth in international commitment to providing therapy, the decline in ARV drug prices, and the introduction of generic therapy.[1,2] Access to ARV in resource-limited settings has lead to high rates of viral suppression and has improved survival.[3–5] Multinational efforts by the Global Fund and the American President's Emergency Program for AIDS Relief (PEPFAR) are expected to increase the number of individuals undergoing ARV therapy in Uganda from 15,000 in 2003 to 60,000 by 2005,[6,7] with further escalation over time.

The introduction of effective ARV therapy in North America and Western Europe was followed by an increase in HIV risk behavior[8–11] and sexually transmitted infections in some settings.[12–14] Such increases have been associated with the belief that ARV therapy mitigates the risk and consequences of HIV infection; this has been described as "HIV optimism."[15,16]

Highly active antiretroviral therapy (HAART) is presumed to reduce HIV infectivity based on declines in viral load and selection for less transmissible drug resistant stains. While increases in risk behavior and sexually transmitted infections (STIs) were documented, it is difficult to determine whether such increases contributed to an increase in HIV transmission. Individuals undergoing antiretroviral therapy may be rendered less infectious,[17,18] and therefore may not transmit the virus as effectively as those not undergoing therapy.

The impact of increasing access to ARV therapy on HIV risk behavior in resource-constrained settings is largely unknown. In Brazil, where all HIV-infected individuals have access to ARV therapy, a prospective cohort of men attending a clinic in Rio de Janeiro reported an increase in number of sexual partners but also reported an increased frequency of condom use 6 months after starting ARV.[19] In Uganda, one of the few countries where both HIV risk behavior and HIV prevalence have declined since the recognition of the epidemic,[20–22] the current gains in prevention may be threatened by behavioral disinhibition resulting from widespread use of ARVs. In this study we examined whether access to ARV therapy in Kampala, Uganda was associated with increased risk behavior among HIV-positive individuals.

MATERIALS AND METHODS

Design

We performed a five-month (August 1, 2003 to December 15, 2003), cross-sectional study to examine HIV risk behavior in HIV-positive adults (older than 18 years of age) attending an outpatient clinic. Persons who had at least 12 months of ARV therapy were compared to ARV-naïve patients who had been aware of their HIV serostatus for at least 12 months.

Study setting

The Joint Clinical Research Center (JCRC) is an HIV specialist care and training center, which has provided care to more than 15,000 patients. Patients undergoing ARV therapy collect their medication monthly. Patients coming to the clinic for the first time and those not yet eligible for ARV therapy (by Ministry of Health treatment algorithm) receive cotrimoxazole prophylaxis, management of opportunistic infections, and laboratory evaluation of HIV disease stage as clinically appropriate. Others who are eligible for ARV therapy but are unable to pay for the drugs also are offered cotrimoxazole prophylaxis and other care as their families arrange to contribute for ARVs. The ARVs provided were the standard World Health Organization (WHO) recommended first-line drugs, which included two nucleoside reverse transcriptase inhibitors (NRTI) and a choice of one or other of the readily available combinations. Some of the patients were on fixed generic combinations. None of the patients was on monotherapy or duotherapy.

Ethical approval was obtained from the JCRC Institutional Review Board and the Ethics Committee for Higher Degrees, Research and Ethics Committee of Makerere University, Institute of Public Health, Kampala, Uganda.

Subject recruitment and data collection procedure

Consecutive patients attending the clinic for their monthly appointments were approached

for potential participation. Informed consent was obtained from those who agreed to participate. Data were collected via face-to-face interviews using semistructured questionnaires by trained interviewers. Interviews lasted 20–40 minutes. All sociodemographic items were dichotomous: age (<, ≥37 years), gender (male, female), residence type (rural, urban), education (lower versus university or tertiary level versus lower), individual income (less than, $50 or more USD per month [the starting salary for most Ugandan government employees]), marital status (married, unmarried). Physical ability was assessed using the Karnofsky scale and a self-reported level of health/activity (in good state of health, not in good state of health). Optimism and beliefs about HIV transmission were assessed using close-ended items.

Measures of sexual behavior assessed activity in the prior 6 months and included: sexually active (any sexual intercourse in the prior 6 months versus no sexual activity in the prior 6 months), number and types of sexual partners (see below), consistent condom use (use of condoms with every sexual encounter—yes, no) and condom use at most recent sexual intercourse (yes, no). Types of sexual partners included spouse, regular partner (defined as a nonmarital relationship that had lasted more than a year), and nonregular partner (relationships of less than 1-year duration and/or partners with whom money was exchanged for sex). Disclosure of HIV status to sexual partners, knowledge of mode of HIV transmission and history of sexually transmitted disease (STD) treatment in the prior 6 months were also assessed. CD4 cell count data was not routinely obtained.

Statistical methods

The main outcome variables were: (1) sexual intercourse in the last 6 months (sexually active), (2) partner types, (3) condom use with all partners, (4) disclosure of HIV status to all partners, (5) STD treatment in the prior 6 months, and (6) correctly believing that transmission can occur while taking ARV therapy. The main outcome variables were compared by ARV treatment status. Potential confounding was examined using multiple logistic regression models to identify independent associations. All variables that were found to be associated with the main outcome variable (sexually active in the prior 6 months) by having odds ratios that reached statistical significance in the bivariate model were included in the multivariate model. Thus the final multivariate model included age, residing in an urban area, lower educational status, earning less than $50 USD, being asymptomatic, and personally feeling well. All analyses were done using SAS version 8.02 (SAS Institute, Cary, NC) and SPSS version 10 (SPSS Inc., Chicago, IL).

Table 1. Sociodemographic Characteristics of ARV-Experienced and ARV-Naïve HIV/AIDS Patients Attending an Urban HIV Care Clinic, Kampala, Uganda

	ARV-experienced n = *369 (%)*	*ARV-naïve* n = *354*	*OR*	*95% CI*
Male	166 (45)	129 (36)	1.43[a]	1.04–1.95
Age < 37 years	150 (41)	225 (64)	0.39[a]	0.29–0.54
Residing in an urban area	240 (65)	318 (90)	0.21[a]	0.14–0.32
Currently employed	306 (83)	252 (71)	1.97[a]	1.36–2.85
Education less than university or tertiary level	185 (50)	285 (81)	0.24[a]	0.17–0.35
Earning < $50 USD per month	109 (30)	208 (59)	0.29[a]	0.21–0.41
Currently married	175 (47)	151 (43)	1.21	0.89–1.65

[a]Statistically significant ($p < 0.05$).
ARV, antiretroviral; OR, odds ratio; CI, confidence interval.

RESULTS

Sociodemographic characteristics

Of 755 respondents who were approached for participation, 20 refused to participate. Of the 735 who were interviewed, 12 (1.6%) were excluded from analysis because of incomplete data. Among 723 respondents, 59% were women. The mean age was 37 years and 77% lived in urban areas. Although the majority (77%) had gainful employment, 56% earned more than $50 USD per month. Thirty-five percent of the respondents had tertiary or university education; this includes persons who stopped formal education at lower levels but proceeded to technical colleges. Fifty-five percent of respondents were currently married. Approximately half (51%) were undergoing ARV therapy and the remainder were ARV-naive. No respondents had begun but discontinued ARV therapy.

Factors associated with use of ARV therapy

The mean duration of ARV therapy was 1.6 years. ARV-experienced patients had a higher mean Karnofsky score than the ARV-naïve patients (93 versus 83, $p < 0.001$). Table 1 shows sociodemographic variables stratified by ARV use. ARV-experienced patients were significantly more likely to be male (OR 1.43 95% CI 1.04–1.95), and employed (OR 1.97 95% CI 1.36–2.85). ARV-experienced patients were less likely to be younger than 37 years of age (OR 0.39 95% CI 0.29–0.54), to reside in an urban area (OR 0.21 95% CI 0.14–0.32), to have less than university or tertiary education (OR 0.24 95% CI 0.17–0.35) and to earn less than $50 USD (OR 0.29 95% CI 0.21–0.41).

Sexual behavior

Among the 348 (48%) respondents who were sexually active (reported sexual intercourse in the prior 6 months), 120 (35%) had more than one sexual partner; of these people, 12% had more than two partners in addition to their main partner. Most of the other partners were regular (80%), while 20% were nonregular; among the nonregular partners, 16% were casual while 4% were commercial.

Table 2 illustrates variables associated with being sexually active in the prior 6 months.

TABLE 2. FACTORS ASSOCIATED WITH SEXUAL ACTIVITY IN PRIOR SIX MONTHS AMONG HIV-POSITIVE PATIENTS ATTENDING AN URBAN HIV CARE CLINIC, KAMPALA, UGANDA

	Sexual activity in prior 6 months					
	Yes n = *348* *(48%)*	*No* n = *375* *(52%)*	*Unadjusted 95%* *OR*	*CI*	*Adjusted* *OR*	*95% CI*
ARV-experienced	191 (55)	178 (47)	1.35	0.77–1.83		
Male gender	194 (56)	101 (27)	3.42[a]	2.47–4.74	1.86	0.32–10.3
Age < 37 years	204 (57)	170 (45)	1.72[a]	1.26–2.34	0.64	0.14–2.90
Residing in an urban area	263 (76)	295 (79)	0.84	0.58–1.71		
Currently employed	49 (14)	116 (31)	0.37[a]	0.25–0.54	0.75	0.76–1.47
Education less than university or tertiary level	217 (62)	253 (67)	0.88	0.5–1.10		
Earning < $50 USD per month	136 (39)	181 (48)	0.69[a]	0.50–0.94	0.00	0.00–9.4
Married	268 (77)	58 (15)	18.3[a]	12.3–27.0	1.62	0.34–7.81
Currently asymptomatic (Karnofsky score = 100)	164 (47)	140 (37)	1.5[a]	1.10–2.04	0.65	0.13–3.32
Reports "good state of health"	242 (70)	229 (61)	1.46[a]	1.05–2.01	0.37	0.36–3.94

[a]Statistically significant ($p < 0.05$).
OR, odds ratio; CI, confidence interval.

There was no significant association between being sexually active and being ARV experienced. Similarly, age, gender, education, employment status, individual monthly income, physical activity level (Karnofsky score), and "personally feeling well" were not associated with being sexually active in the prior 6 months, after adjusting for confounding factors.

Disclosure of HIV status

ARV-experienced respondents were more likely than ARV-naïve respondents to have disclosed their HIV status to their spouses (OR 1.57 95% CI 1.07–2.30). However, there was no significant difference between the two groups in disclosure to "other" sexual partners (OR 1.56 95% CI 0.88–2.76) nor in knowledge of partner's serostatus (OR 1.12 OR 0.82–1.55) (Table 3).

Of the 348 who were sexually active, 213 (61%) were aware of their partners' HIV serostatus. In general, those who knew the HIV status of their sexual partners were more likely to report sexual intercourse in the prior six months (OR 2.5 95% CI 1.8–3.4). ARV treatment experience did not significantly influence knowledge of partner HIV serostatus (OR 1.56 95% CI 0.97–2.53).

Condom use

Overall, 57%, 65%, 85%, and 85% of the sexually active respondents reported consistent condom use with their spouse, regular, casual and commercial partners, respectively. However the ARV-experienced respondents were

Table 3. Sexual Partners, STDs, and Disclosure of HIV Status by ARV Use Among HIV-Positive Individuals Attending an Urban HIV Clinic, Kampala, Uganda

	ARV-experienced n *(%)*	*ARV-naïve* n *(%)*	*OR*	*95% CI*
Sexually active				
Yes	191 (52)	157 (44)	1.35	0.99–1.82
No	178 (48)	197 (56)		
$n = 723$				
Multiple sexual partners				
Yes	65 (34)	55 (35)	0.96	0.60–1.52
No	126 (66)	102 (65)		
$n = 348$				
Number of nonmain sexual partners				
One	59 (46)	47 (43)	1.67	0.48–5.92
Two or more $n = 120$	6 (54)	8 (57)		
Status of nonmain sexual partners				
Regular	53 (82)	43 (78)	0.82	0.33–2.04
Nonregular	12 (18)	12 (22)		
$n = 120$				
STD treatment in prior 6 months				
Yes	59 (16)	136 (38)	0.31[a]	0.21–0.44
No	310 (84)	218 (62)		
$n = 723$				
Ever disclosed HIV status to spouse				
Yes	203 (73)	166 (63)	1.57[a]	1.07–2.30
No	77 (27)	99 (37)		
$n = 545$				
Disclosed HIV status to other sexual partners				
Yes	32 (49)	28 (51)	1.56	0.88–2.76
No	33 (51)	27 (49)		
$n = 120$				
Knew HIV status of spouse or other sexual partner $n = 627$	178 (54) 149 (46)	165 (52) 155 (48)	1.12	0.82–1.55

[a]Statistically significant ($p < 0.05$).
STD, sexually transmitted disease; ARV, antiretroviral; OR, odds ratio; CI, confidence interval.

more likely to report consistent condom use with their spouses than were ARV-naïve respondents (OR 2.82 95% CI 1.74–4.6).

Condom use at last sexual intercourse was reported less with spouse (32% versus 57%), but more with casual partners (100% versus 85%). ARV-experienced participants were more likely to report condom use at last sexual act with their regular partners than were ARV-naïve respondents (OR 3.64 95% CI 1.05–8.3) (Table 4).

Sexually transmitted diseases

Of 713 respondents who provided information on STD treatment in the prior 6 months, 27% reported having been treated for an STD. The ARV-experienced group was more likely to report STD treatment than the ARV-naïve group after controlling for possible confounders (AOR 2.6 95% CI 1.77–3.82) (Table 5).

DISCUSSION

There is growing concern that improved access to ARV therapy in resource-limited settings will lead to increased sexual risk behavior similar to that seen in resource-rich settings.[23,24,26] Our findings suggest that ARV treatment in Kampala, Uganda, was not associated with increased sexual risk behaviors, but was associated with higher rates of disclosure

Table 4. Condom Use by Sexual Partner Type Among ARV-Experienced and ARV-Naïve HIV-Positive Individuals Attending an Urban HIV Care Clinic, Kampala, Uganda

	ARV-experienced	*ARV-naive*	*Bivariate analysis*	
			OR	*95% CI*
Percentage reporting consistent condom use with spouse $n = 268$	71	47	2.8[a]	1.7–4.6
Percentage reporting consistent condom use with regular sexual partner $n = 95$	60	58	1.09	0.59–1.99
Percentage reporting consistent condom use with casual and commercial sexual partners $n = 25$	18	22	0.78	0.37–1.65
Percentage reporting condom use with spouse during last sexual intercourse $n = 268$	67	62	1.24	0.67–2.32
Percentage reporting condom use with regular sexual partner during last sexual intercourse $n = 95$	90	72	3.6[a]	1.50–13.30
Percentage reporting condom use with casual and commercial sexual partners during last sexual intercourse $n = 25$	60	60	1.0	0.50–1.33

[a]Statistically significant ($p < 0.05$).
ARV, antiretroviral; CI, confidence interval; OR, odds ratio.

TABLE 5. FACTORS ASSOCIATED WITH STD TREATMENT AMONG ARV-EXPERIENCED AND ARV-NAÏVE HIV-POSITIVE INDIVIDUALS ATTENDING AN URBAN HIV CLINIC, KAMPALA, UGANDA

	Sexually transmitted diseases in prior 6 months n = *713*		*Unadjusted*		*Adjusted*	
	Yes n = *195 (27)*	n = *518 (73)*	*OR*	*95% CI*	*OR*	*95% CI*
ARV-experienced	59 (30)	310 (59)	0.31[a]	0.21–0.44	2.62[b]	1.767–3.83
Age < 37 years	116 (60)	258 (49)	1.54[a]	1.09–2.17	1.23	0.86–1.76
Residing in an urban area	163 (84)	395 (75)	1.72[a]	1.09–2.70	0.95	0.543–1.65
Currently employed	137 (70)	421 (80)	0.60[a]	0.41–0.89	1.36	0.936–1.97
Education less than university or tertiary level	154 (78)	316 (60)	2.52[a]	1.68–3.79	1.74[b]	1.149–2.63
Currently Married	80 (41)	2.46 (47)	0.80	0.56–1.13		
Sexually active	100 (51)	248 (47)	1.19	0.84–1.68		
Personally feels good health	56 (19)	248 (47)	0.45	0.88–2.14		
Consistent condom use with spouse	48 (60)	148 (60)	0.99	0.58–1.72		
Condom use with spouse at last sexual intercourse	50 (63)	162 (66)	0.86	0.50–1.51		
Reported multiple sexual partners	39 (20)	81 (19)	1.37	0.88–2.14		

[a]Statistically significant in a univariate analysis.
[b]Remained statistically significant after controlling for other factors.

and more consistent condom use. While 52% of the respondents were not sexually active, ARV–experienced patients were modestly more likely to be sexually active than ARV-naïve patients, and more likely to have used a condom, especially with nonregular partners. These finding are similar to experiences from South Africa where a Medicines san Frontiers project to provide ARV therapy has found increased positive feelings toward voluntary HIV testing and higher rates of condoms use[29] in areas where ARV therapy is available. ARV therapy significantly enhances the quality of life and personal sense of well-being of patients who initiate therapy, enabling many individuals to resume sexual activity. This is consistent with our finding that the mean Karnofsky score was elevated in the ARV-experienced group. Our findings of relatively high rates of sexual abstinence are similar to the 53% abstinence rate reported over a 6-month period in Cote d'Ivoire among 711 HIV-positive patients who were aware of their serostatus.[25]

The ARV-experienced respondents were more likely to report treatment for STDs than the ARV-naïve respondents, which may be consistent with increased sexual risk. Alternatively, higher STD treatment rates may be the result of better diagnoses and treatment of STDs among individuals with more regular access to health care.

Interestingly, the ARV-experienced individuals in this study were less educated and more likely to live in rural settings, which may be because many farmers in rural areas may earn more than salaried urban workers.

Our study has several limitations. Sexual behavior was self-reported and subject to both recall and social desirability bias. We attempted to adjust for important confounders including income, education, and residence category (rural/urban). However, it is possible that uncontrolled differences remain between those receiving and those not receiving ARV therapy. We also did not collect information on partner HIV status and cannot comment as to whether HIV risk was mitigated by "sero-selection" between concordant partners. Finally, the design was cross-sectional and does not address changes with sexual risk behavior over time for

individuals undergoing ARV therapy. However, our study design does have key strengths: (1) the use of nonmedical/nonclinic based interviewers might have reduced the tendency to report only the socially acceptable or appropriate behaviors, (2) a variety of measures were used to assess potentially unsafe sexual behavior, and (3) the response rate was very high (96%).

In summary, we found that use of ARV therapy was not associated with risky sexual behavior among individuals receiving antiretroviral therapy in a resource-poor setting. Future studies will be important to assess the durability of this finding as access to ARV therapy expands in resource-limited settings.

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