Published in final edited form as:

AIDS. 2011 March 27; 25(6): 863–865. doi:10.1097/QAD.0b013e3283448790.

The contribution of HIV-discordant relationships to new HIV infections in Rakai, Uganda

Ronald Gray^{a,b}, Victor Ssempijja V^b, James Shelton^c, David Serwadda^{b,d}, Fred Nalugoda^b, Joseph Kagaayi^b, Godfrey Kigozi^b, and Maria Wawer^{a,b}

^aJohns Hopkins University, Bloomberg School of Public Health, Baltimore, MD, USA ^bRakai Health Sciences Program, Entebbe, Uganda ^cUSAID Washington DC, USA ^dMakerere University, School of Public Health, Kampala, Uganda

Abstract

We determined HIV incidence in the Rakai, cohort before (82/9311) and after (131/13082) the availability of antiretroviral therapy (ART). The proportions of total HIV infections pre- and post-ART were 18.3% and 13.7%, respectively, among identifiable HIV-discordant couples, 23.2% and 26.0%, respectively, in concordant HIV-negative couples, 29.3% and 17.6% in married persons with unknown partner status, and 29.3% and 42.7% in the unmarried. VCT targeting discordant couples is unlikely to have substantial impact in this setting.

Introduction

Understanding the transmission dynamic of generalized HIV epidemics is key to prevention strategies. One model estimated that the majority of infections occurred within long term stable HIV-serodiscordant couples, suggesting that couples voluntary counseling and testing (CVCT) could prevent transmission, mitigating the epidemic.^{1,2} An alternative approach estimated that upwards of two-thirds of infections occurred via multiple partnerships, predominantly outside of stable relationships, and thus would not be amenable to a CVCT intervention.³ We examined this issue using data on incident infections from Rakai, Uganda before and after the availability of antiretroviral therapy (ART).

Methods

The Rakai Community Cohort Study (RCCS) conducts census and serosurveys among consenting residents aged 15–49 years in 50 rural communities of rural Rakai District.⁴ For respondents who are married (including stable consensual relationships), we request information on their spouse/partner which allows linkages of couple data to partners residing in the study areas, and approximately 68% of married/consensual individuals (hereafter referred to as “married”) have an identifiable linked partner.

We assessed incident HIV infections among initially HIV-negative cohort participants observed during two inter-survey intervals; one inter-survey interval prior to the availability of antiretroviral therapy (ART) and one after ART services were available. The pre-ART inter-survey interval used data collected from two surveys the first conducted from July, 2002-August, 2003, with follow up between September, 2003 to November, 2004. For the post-ART interval we used data from a survey conducted between January, 2005 to June 2006 with a follow up survey between July, 2006 to January 2008. HIV status was determined by two separate ELISAs and confirmed by HIV-1 Western Blot, as previously described.

We divided the population into HIV-negative participants who were not currently married at the beginning of an inter-survey interval (i.e., never married, or previously married but currently separated, divorced or widowed), and persons who were currently married at the beginning of an inter-survey interval. The currently married were further disaggregated into couples in which both partners were concordantly HIV-negative at the start of the interval, couples who were HIV-discordant, and married persons whose partner's HIV status was unknown (e.g., the partner was absent or refused participation).

We then tabulated the proportion of all new HIV infections observed during the inter-survey intervals by the marital and HIV status of the participants at the initial survey. Our main focus was on the proportion of total incident infections that occurred among couples whose primary relationship was HIV-discordant. In Rakai, most people eventually marry, and divorce is relatively infrequent.⁵ Over 90% of participants agree to HIV testing.⁴

Results

The distribution of the populations at the beginning of the inter-survey intervals and the number of incident HIV infections during follow up are shown in Table 1. The proportions of all new HIV infections that occurred within identifiable HIV discordant couples were 18.3% during the pre-ART period and 13.7% during the post-ART period ($p=0.8$). Most new infections occurred among persons who were not currently married (29.3% pre-ART and 42.7% post-ART, $p = 0.08$), or among married individuals with a partner of unknown HIV status (29.3% pre-ART and 17.6% post-ART, $p = 0.3$). Additionally, 23.2% of infection pre-ART and 26.0% post-ART ($p = 0.5$) occurred among initially concordant HIV-negative couples in which the new index infection must have been introduced from an extramarital relationship.

Discussion

Our data indicate that only a minority of total HIV infections occur to a person in an identifiable stable HIV-discordant couple relationship in this generalized HIV epidemic setting. In much of Southern Africa where age of first marriage is delayed, an even smaller proportion of people are in stable partnerships than in Eastern Africa.^{6,7} Moreover, viral sequencing showed that 29% of new infections in the previously negative partner in a discordant relationship, came from a partner outside the primary relationship.⁸ Thus, in addition to the question of the efficacy of a CVCT intervention with couples, universal VCT

targeted on HIV-discordant couples is unlikely to have a major impact on the epidemic.^{1,2} While it might be argued that our observed infection rates were lowered because of counseling and disclosure among the discordant couples, disclosure and acceptance of couples counseling has been quite low in this cohort, despite efforts to promote CVCT. Part of the explanation for this minority contribution of new infections among identifiable HIV-discordant couples is that infectivity is quite low during chronic phase of infection.^{9,10} The data post-ART reflect an even lower proportion of transmissions from within identifiable discordant couples, perhaps suggesting some collateral benefit of ART in reducing infectivity.¹¹

Thus, while there is definite merit to counseling and testing, including couples counseling, it is likely to have limited impact, particularly if the focus remains on those testing positive and on discordant couples. Rather, prevention efforts need also to embrace specific interventions such as male circumcision, condoms and behavior change to limit outside partners aimed at the broader population where most infections are occurring.

References

1. Dunkle KL, et al. New heterosexually transmitted HIV infections in married or cohabiting couples in urban Zambia and Rwanda: an analysis of survey and clinical data. *Lancet*. 2008; 371:2183–2191. [PubMed: 18586173]
2. Bunnell R, Cherutich P. Universal HIV testing and counselling in Africa. *Lancet*. 2008; 371:2148–2150. [PubMed: 18586156]
3. Shelton JD. A tale of two-component generalised HIV epidemics. *Lancet*. 375:964–966. [PubMed: 20304227]
4. Wawer MJ, et al. A randomized, community trial of intensive sexually transmitted disease control for AIDS prevention, Rakai, Uganda. *Aids*. 1998; 12:1211–1225. [PubMed: 9677171]
5. Porter L, et al. HIV status and union dissolution in sub-Saharan Africa: the case of Rakai, Uganda. *Demography*. 2004; 41:465–482. [PubMed: 15461010]
6. Bongaarts J. Late marriage and the HIV epidemic in sub-Saharan Africa. *Population studies*. 2007; 61:73–83. [PubMed: 17365874]
7. Marston M, et al. Trends in marriage and time spent single in sub-Saharan Africa: a comparative analysis of six population-based cohort studies and nine Demographic and Health Surveys. *Sex Transm Infect*. 2009; 85 (Suppl 1):i64–71. [PubMed: 19307343]
8. Celum C, et al. Effect of aciclovir on HIV-1 acquisition in herpes simplex virus 2 seropositive women and men who have sex with men: a randomised, double-blind, placebo-controlled trial. *Lancet*. 2008; 371:2109–2119. [PubMed: 18572080]
9. Wawer MJ, et al. Rates of HIV-1 transmission per coital act, by stage of HIV-1 infection, in Rakai, Uganda. *J Infect Dis*. 2005; 191:1403–1409. [PubMed: 15809897]
10. Boily MC, et al. Heterosexual risk of HIV-1 infection per sexual act: systematic review and meta-analysis of observational studies. *The Lancet infectious diseases*. 2009; 9:118–129. [PubMed: 19179227]
11. Donnell D, et al. Heterosexual HIV-1 transmission after initiation of antiretroviral therapy: a prospective cohort analysis. *Lancet*. 375:2092–2098. [PubMed: 20537376]

Table 1

The distribution of the population by marital and HIV status at the beginning of two inter-survey intervals prior to and after the availability of ART, and the distribution of incident HIV infections observed during the inter-survey intervals.

Marital status	Inter-survey interval prior to ART		Inter-survey interval after ART availability	
	N	Incident infections (%)	N	Incident infections (%)
Not currently married	3449	24 (29.3)	5155	56 (42.7)
Currently Married	5862		7927	
Concordant HIV-negative couples	3663	19 (23.2)	5105	34 (26.0)
Discordant couples	170	15 (18.3)	236	18 (13.7)
Unknown partner status	2152	24 (29.3)	2586	23 (17.6)
Total	9311	82 (100.0)	13082	131 (100.0)