SHORT REPORT

HIV treatment adherence and unprotected sex practices in people receiving antiretroviral therapy

S C Kalichman, D Rompa

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Background: Poor HIV treatment adherence can result in the development of drug resistant strains of HIV and HIV positive people may transmit drug resistant virus to their sex partners.
Objective: To examine the association between HIV treatment adherence and sexual risk behaviour practices in people living with HIV-AIDS.
Methods: Surveys and interviews with 255 men and women living with HIV and receiving antiretroviral therapy.
Results: People who were currently taking antiretroviral medications and missed at least one dose of their medications in the past week scored significantly higher on a hopelessness scale and reported more current use of marijuana. People who had been non-adherent also reported significantly more sex partners, greater rates of unprotected vaginal intercourse, and less protected sex behaviours including less protected sex with partners who were HIV negative or of unknown HIV status.
Conclusions: Associations between HIV treatment adherence and sexual transmission risk behaviours indicate the need for comprehensive and integrated health behaviour interventions for people living with HIV-AIDS.

Successful antiretroviral therapy demands strict adherence to medication regimens. Missing even a few doses of antiretroviral medications can lead to drug resistant strains of HIV,[1] and treatment resistant variants of HIV can be transmitted to uninfected sex partners.[2] Both poor adherence to antiretrovirals and high risk sexual behaviour are associated with depressed mood, pessimism, lack of social support, and substance use,[3 4] suggesting there may be an association between non-adherence to antiretrovirals and continued unprotected sex practices.[5] The current study examined the association between antiretroviral adherence and unprotected sex in a convenience sample of people living with HIV-AIDS.

METHODS

Participants

Participants were 275 HIV positive men and 116 HIV positive women recruited from HIV treatment and social services in Atlanta, Georgia, as part of a larger study.[6] The mean age was 41 years; 71% were African-American, 24% white, and 5% of other ethnicities; 54% completed 12 years of education or less; 64% had annual incomes under $10 000; 53% were identified as homosexual, 11% bisexual, and 36% heterosexual. The mean number of years living with HIV was 8.7 years and 36% of participants had been diagnosed with AIDS.

Measures

Participants reported their age, ethnicity, sexual orientation, employment status, current income, highest level of education, and whether they had been in jail. We also asked the date they first tested HIV positive and whether they had been diagnosed with an AIDS related condition. Participants reported their experience of 15 HIV symptoms, past and current antiretroviral history, and most recent CD4 cell count. Medical records were available for viral load chart abstraction for 75% of participants and self reported viral load was used to estimate values for the remaining 25%[7]; values coded as undetectable (<50 copies/ml) and detectable (>50 copies/ml[1]).

Participants who were currently taking antiretroviral medications were asked to recall their exact medication regimen and whether they had missed any of their antiretrovirals in the previous 7 days. For people who indicated that they had missed at least one dose of their antiretroviral medications, we assessed the number of times that medications were missed in that time period.

To assess depressive mood, participants completed the Beck depression inventory (BDI[8]), cut off of 15 for moderate depression[8] (alpha = 0.91). We also scored the cognitive depression subscale to avoid overlapping symptoms of depression and HIV-AIDS disease progression (alpha = 0.89). Participants also responded to the 20 item Beck hopelessness scale[9] (alpha = 0.89) and the Social Support Questionnaire[10] (alpha = 0.88).

Participants were asked if they had used alcohol, marijuana, powder and crack cocaine, and injection drugs, or any other drugs in the previous 3 months. Responses to these items were coded as dichotomous variables, "Yes" or "No." We also asked participants whether they had ever received substance abuse treatment services.

To assess sexual behaviour, partner by partner interviews ascertained the HIV status of sex partners and rates of sexual practices over the past 3 months. We also computed the proportion of anal and vaginal intercourse occasions with condoms, the percentage of protected sex occasions, with complete protection represented by 100% condom use or not practising any unprotected anal and vaginal intercourse indicating 100% protected. Participants also reported whether they had experienced a sexually transmitted disease (STD) or symptoms of an STD in the previous 3 months.

RESULTS

Among the 391 participants, 65% were currently taking antiretroviral medications. Among people taking antiretrovirals, 44% had missed one dose, 11% missed two doses, 11% missed three doses, and 10% missed four or more doses in the previous week. Comparisons of people who had missed their medications and people who were completely adherent in the past 7 days showed that people who had missed their medications had higher viral loads (log 2.6 *v* 2.0) and lower CD4 counts (366 *v* 395) than adherent participants, although the differences were not statistically significant.

Analyses comparing HIV treatment adherence groups on mental health and substance use characteristics and controlling for years living with HIV, participant sex, and sexual orientation showed that people who had missed a dose of their antiretroviral medications in the previous week scored significantly,

Table 1 Mental health and substance use among HIV positive people who did and did not miss antiretroviral medications

	Missed dose of antiretrovirals (n=112)	Had not missed dose of antiretrovirals (n=143)	
	Mean (SD)	Mean (SD)	Adjusted OR (95% CI)
Total depression	14.7 (9.7)	11.6 (9.1)	1.1 (0.99 to 1.1)
Cognitive depression	2.7 (2.3)	2.0 (2.4)	1.1 (0.97 to 1.2)
Social support	44.3 (9.4)	46.2 (9.3)	0.98 (0.95 to 1.0)
Hopelessness	44.1 (9.1)	40.9 (8.8)	1.1 (1.0 to 1.1)
	No (%)	No (%)	
Moderately depressed	48 (43)	39 (27)	1.6 (0.95 to 2.9)
Alcohol	59 (53)	59 (42)	1.5 (0.88 to 2.5)
Marijuana	34 (31)	20 (14)	2.6 (1.4 to 4.9)
Cocaine	20 (18)	14 (10)	1.9 (0.89 to 3.9)
Inhalants	11 (10)	5 (4)	2.8 (0.92 to 8.5)
Injected drugs	2 (2)	1 (1)	2.7 (0.24 to 30)

Odds ratios for mental health variables adjusted for years living with HIV and number of HIV symptoms experienced and odds ratios for substance use variables adjusted for years living with HIV, sex, and sexual orientation.

Table 2 Sexual behaviours with all partners and HIV negative and unknown HIV status partners in the previous 3 months among HIV positive people who did and did not miss antiretroviral medications

	Missed dose of antiretrovirals (n=112)	Had not missed dose of antiretrovirals (n=143)	
	Mean (SD)	Mean (SD)	Adjusted OR (95% CI)
Sexual behaviours with all partners			
Number of partners	1.5 (1.3)	1.0 (1.2)	1.3 (1.1 to 1.6)
Unprotected anal intercourse	1.2 (5.1)	0.9 (3.1)	1.0 (0.44 to 2.4)
Unprotected vaginal intercourse	2.2 (8.2)	1.1 (5.1)	2.5 (1.1 to 5.8)
Total anal and vaginal intercourse	3.4 (9.4)	1.9 (6.2)	1.5 (0.96 to 2.4)
% Condom use	62.1 (46.4)	78.1 (53.5)	0.50 (0.23 to 1.1)
% Protected sex	79.4 (39.0)	89.4 (38.6)	0.49 (0.24 to 0.98)
Sexual behaviours with HIV negative and unknown HIV status partners			
Unprotected anal intercourse	0.5 (2.9)	0.2 (1.2)	2.2 (0.5 to 9.6)
Unprotected vaginal intercourse	0.6 (2.6)	0.6 (4.3)	2.4 (0.8 to 7.9)
Total anal and vaginal intercourse	3.9 (8.0)	4.0 (16.8)	1.7 (1.0 to 3.0)
% Condom use	69.5 (40.3)	87.5 (43.5)	0.33 (0.10 to 1.0)
% Protected sex	88.0 (29.2)	96.3 (24.1)	0.26 (0.09 to 0.76)
	No (%)	No (%)	
Engaged in any unprotected anal or vaginal intercourse	36 (32)	28 (19)	1.9 (1.1 to 3.5)
Engaged in unprotected anal or vaginal intercourse with HIV negative or unknown HIV status partners	20 (18)	12 (8)	2.5 (1.1 to 5.3)
STD or STD symptoms	28 (25)	26 (19)	1.9 (0.99 to 3.5)

Odds ratios adjusted for years living with HIV, sex, and sexual orientation.

although clinically modestly, higher on the hopelessness scale (see table 1). People who had been non-adherent were also significantly more likely to have used marijuana in the previous 3 months, controlling for the same covariates.

Comparisons for sexual behaviours and controlling for years living with HIV, sex, and sexual orientation indicated that people who had missed their antiretroviral medications were significantly more likely to have engaged in unprotected anal or vaginal intercourse in the past 3 months (see table 2). People who had missed their medications also reported more sex partners, greater rates of unprotected vaginal intercourse, and proportionally less protected sex than people who had adhered to their medications. Restricting analyses to sexual behaviours with partners who were HIV negative or of unknown HIV serostatus, again controlling for years living with HIV, sex, and sexual orientation showed that participants who were non-adherent in the past week were more likely to have engaged in unprotected intercourse with non-HIV positive partners than people who had been adherent. People who missed their medications also reported significantly less condom use and less total protected sex practices than people who were adherent. There was also a non-significant trend for the non-adherent people to have experienced an STD or STD symptoms in the previous 3 months; findings limited by low reliability of self reported STD and STD symptoms.

DISCUSSION

The current study findings suggest that adherence to antiretroviral medications among people living with HIV-AIDS is associated with sexual behaviours that confer risks for HIV transmission. To our knowledge, there have been few behavioural interventions designed to specifically address sexual transmission risk practices among people living with HIV and none of these interventions have integrated elements for improving HIV treatment adherence and transmission risk behaviours. We replicated previous research by finding that, after controlling for potential confounding variables, people who demonstrated adherence difficulties experience a sense of

hopelessness and were more likely to have used marijuana.[3] Given that both emotional distress and substance use are correlates of continued sexual risk behaviour practices in people living with HIV,[4] these characteristics may serve as markers for clusters of health compromising behaviours that include both treatment adherence and continued sexual risk behaviour.

A subgroup of individuals who experience difficulty adhering to their antiretroviral medications and engage in sexual transmission risk practices may benefit from comprehensive health behaviour interventions. Behavioural interventions that have aimed to increase medication adherence and those that target sexual risk behaviour change often share common principles and intervention elements.[4] Integrated behavioural interventions may therefore capitalise on a single overarching framework for multiple target behaviour outcomes. For example, the information-motivation-behavioural skills model of health behaviour change[11] was originally applied to HIV risk reduction interventions and has since been generalised to improve HIV treatment adherence.[12] In an integrated approach to health behaviour change, information, motivational enhancement, and behavioural skills building components could be used across adherence and sexual risk behaviour intervention strategies. Given the grave personal and public health consequences posed by sexually transmitted drug resistant strains of HIV, developing and testing interventions that address medication adherence and sexual transmission risk behaviours should be given high priority.

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CONTRIBUTORS

SK conceptualised the study, selected and developed the instruments, conducted data analyses, and prepared the manuscript; DR assisted in conceptualising the study, wrote study protocols, and managed all field research activities.

Authors' affiliations
S C Kalichman, University of Connecticut
D Rompa, Medical College of Wisconsin

Correspondence to: Seth C Kalichman, Psychology Department, University of Connecticut, 406 Babbidge Road, Storrs, CT 06269, USA; seth.k@uconn.edu

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