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HIV Super-infection Beliefs and Sexual Practices of People Living with HIV/AIDS

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Abstract

Background—People living with HIV can be reinfected with a new viral strain resulting in potential treatment resistant recombinant virus known as HIV super-infection. Individual's beliefs about the risks for HIV super-infection may have significant effects on the sexual behaviors of people living with HIV/AIDS.

Purpose—To examine HIV super-infection beliefs and sexual behaviors among people living with HIV/AIDS.

Methods—Three hundred and twenty men, 137 women, and 33 transgender persons completed confidential surveys in a community research setting.

Results—A majority of participants were aware of HIV super-infection and most believed it was harmful to their health. Hierarchical multiple regressions predicting protected anal/vaginal intercourse with same HIV status (seroconcordant) partners showed that older age and less alcohol use were associated with greater protected sex. In addition, HIV super-infection beliefs predicted protected sexual behavior over and above participant age and alcohol use.

Conclusions—Beliefs about HIV super-infection exert significant influence on sexual behaviors of people living with HIV/AIDS and should be targeted in HIV prevention messages for HIV infected persons.

Introduction

Seeking same HIV status sex partners has previously been reported as an HIV transmission risk reduction strategy, particularly among people living with HIV/AIDS [1]. Unprotected anal and vaginal intercourse between two HIV infected partners is not, however, free of potential health risks. HIV seroconcordant sex partners risk exposing themselves to other sexually transmitted pathogens that can potentially complicate the course of their HIV infection. In addition, clinical evidence confirms that people already infected with HIV can be re-infected with a different genetic variant of the virus. Exposure to a new strain of HIV risks genetic recombination that results in a potentially more difficult to treat virus commonly referred to as super-infection [2–4]. Specifically HIV super-infection can encompass multiple-antiretroviral (ARV) drug resistance even when the host has not been treated [3]. The consequences of HIV super-infection can therefore be clinically significant.

The risks for HIV super-infection are well-established and have been widely publicized in popular health media [5,6]. Studies of annual incidence rates of HIV super-infection estimate 4% incidence among highly sexually active people diagnosed with HIV infection

[3,7,8]. The lower population-level occurrence of HIV super-infection does not, however, necessarily negate its potential impact on the beliefs and behaviors of people living with HIV/AIDS.

Despite the emergence of HIV super-infection, there is surprisingly little research on the behavioral ramifications of super-infection among people living with HIV/AIDS. We were only able to identify one study of HIV super-infection attitudes and beliefs in relation to sexual practices. Colfax et al. [9] examined HIV super-infection beliefs in a sample of 196 HIV positive men who have sex with men in San Francisco. The study found that 85% of men had heard about HIV super-infection and these men expressed moderate concern about the risks associated with super-infection. Among the 165 men who had heard about HIV super-infection, 81% believed that super-infection does occur, 64% were concerned about super-infection, 82% believed that super-infection damages the immune system, and 74% indicated that being aware of super-infection had influenced their sexual behavior. Colfax et al. reported that men who believed super-infection damages the immune system were significantly less likely to have unprotected anal intercourse with HIV positive seroconcordant sex partners, suggesting that super-infection beliefs may reduce seroconcordant unprotected sex.

The current study examined super-infection beliefs and their association with sexual behaviors among men and women living with HIV/AIDS. Based on Colfax et al., we predicted that people living with HIV infection would be aware of HIV super-infection and that their beliefs regarding super-infection would be related to their seroconcordant sexual practices. Specifically, we hypothesized that holding stronger beliefs regarding the harms of super-infection would be related to engaging in fewer seroconcordant unprotected sex acts and greater condom use with HIV positive sex partners. We also tested whether HIV super-infection beliefs predict seroconcordant condom use over and above other factors commonly associated with sexual behaviors.

Methods

Participants

Three hundred and twenty men, 137 women, and 33 male-to-female transgender persons living with HIV/AIDS were recruited from AIDS service organizations, health care providers, social service agencies, and infectious disease clinics in inner-city areas of Atlanta, GA. Recruitment relied on widespread provider referrals and systematic word-of-mouth chain recruitment. Interested persons phoned our research program to schedule a study intake appointment for a prevention intervention study. The study entry criteria were age 18, proof of positive HIV status using a photo ID and matching ARV prescription bottle, HIV/AIDS clinic card, positive HIV test result, lab report, or other proof of HIV status. Data reported here were collected as the intake assessments for a prevention trial during the period July 2005-October 2008.

Measures

Assessments were administered using audio-computer-assisted structured interviews (ACASI). Participants viewed assessment items on a 15-inch color monitor, heard items read by machine voice using headphones, and responded by clicking a mouse. Research has shown that ACASI procedures yield higher rates of sensitive behaviors and more reliable responses than face-to-face sexual behavior interviews [10].

Demographic and health characteristics—Participants were asked their age, years of education, income, ethnicity, and employment status. We assessed HIV related symptoms

using a previously developed and validated measure concerning experience of 14 common symptoms of HIV disease. Participants indicated whether they had ever been diagnosed with an AIDS-defining condition and their most recent CD4 cell count and viral load.

Super-infection awareness and beliefs—To assess participant awareness we asked if they had ever heard of HIV super-infection. Specifically, the item read “Reinfection is when a person who has one strain of HIV becomes infected with a different strain of the virus. These two strains together may strengthen HIV or cause super-infection, making HIV more difficult to treat. Have you ever heard of HIV re-infection or super-infection?” Participants responded to the super-infection awareness item yes or no.

Three items were administered to assess super-infection beliefs. These items were adapted from previous research [8] and are presented in the results section. The three super-infection beliefs were responded to on 6-point scales, 1= strongly disagree, 6= strongly agree. The mean score for the three items used to index super-infection beliefs was internally consistent, $\alpha = .72$.

Alcohol Use Disorders Identification Test (AUDIT)—The AUDIT consists of 10 items designed to identify risks for alcohol abuse and dependence [11]. The first three items of the AUDIT represent quantity and frequency of alcohol use and the remaining seven items concern problems incurred from drinking alcohol. Scores on the AUDIT range from 0 – 40 and the AUDIT has demonstrated acceptable internal consistency. Scores of > 8 indicate high-risk for alcohol use disorders and problem drinking.

Drug Abuse Screening Test (DAST - 10)—The DAST-10 is an abbreviated version of the original scale, which was designed to identify drug-use related problems in the past year [12]. DAST-10 scores range from 0–10 and the scale is internally consistent, has demonstrated time stability and acceptable sensitivity and specificity in detecting drug abuse.

Sexual risk and protective behaviors—Participants reported their number of male and female sex partners and frequency of sexual behaviors in the previous 3-months. We assessed behaviors with regard to the HIV status of sex partners, with HIV positive partners defining seroconcordant relationships and HIV negative and unknown HIV status partners defining serodiscordant partnerships. Thus, we measured vaginal and anal intercourse with and without condoms within seroconcordant and serodiscordant partnerships. A three month retrospective period was selected because previous research has shown reliable reports for numbers of partners and sexual events over this time period [13]. Participants were instructed to think back over the past three months and estimate the number of sex partners and number of sexual occasions in which they practiced each behavior. The instructions included cues for recollecting behavioral events over the past three months. Data were analyzed within seroconcordant and serodiscordant relationships with individual behaviors examined as well as behaviors collapsed across unprotected and protected aggregates. In addition, we calculated the percentage of intercourse occasions in which condoms were used by taking the ratio [condom protected vaginal + condom protected anal intercourse/total vaginal + total anal intercourse]. We created a second index of percent sexual protection by including abstinence from anal and vaginal intercourse in the above ratio but with abstinence coded as completely (100%) protected.

Data analyses

We conducted descriptive analyses to examine the sample characteristics and sexual behaviors practiced in HIV seroconcordant and serodiscordant partnerships. Participants

who had not heard of HIV super-infection were compared to participants who were aware of HIV super-infection on sexual behaviors using two-sample t-tests. Associations between the mean ratings of the three super-infection beliefs with sexual behaviors in HIV seroconcordant relationships were examined using Spearman correlation coefficients. Finally, we tested whether the mean ratings of super-infection beliefs predict condom use with HIV positive sex partners using hierarchical linear regression where demographic characteristics and substance use were entered in an initial step and super-infection beliefs were entered in a subsequent step. We report the significance of super-infection beliefs in predicting seroconcordant condom use over and above demographic and substance use characteristics. Statistical significance for all analyses was defined as $p < .05$.

Results

Among 490 men, women and transgender persons living with HIV/AIDS the mean age was 44.3 years ($SD=7.1$). Our sample was primarily African-American ($n = 442$, 90%) with 34 (7%) white and 14 (3%) participants of other ethnicities. The majority of participants (83%) had obtained a high-school education or less, 52% were receiving disability benefits, and 69% had annual incomes under \$10,000. With regard to HIV related health, 76% had experienced HIV symptoms, 52% had been hospitalized for an HIV-related health problem, and 44% had been diagnosed with an AIDS defining condition. The mean CD4-cell count was 420 ($SD = 276$) and 44% had an undetectable viral load.

Participants reported a wide-range of recent sexual experiences (see Table 1). Nearly half of participants had at least one HIV positive sex partner in the previous 3-months and 30% had at least one HIV serodiscordant (i.e., HIV negative or unknown HIV status) sex partner in that time period. Across participants, unprotected anal and vaginal intercourse were more common in seroconcordant relative to serodiscordant relations. Consistent with rates of unprotected sex, we found that condom use was more common with HIV serodiscordant partners than seroconcordant partners.

Super-infection awareness

A total of 389 (79%) participants had heard about HIV super-infection. Table 2 shows the differences in sexual behaviors between participants who had not heard about HIV super-infection and participants who had heard about super-infection. Super-infection awareness was consistently associated with a greater number of seroconcordant partners as well as greater rates of unprotected and condom protected intercourse with seroconcordant sex partners. In contrast, there were no differences between participants who had not and those who had heard of super-infection on any HIV serodiscordant sexual behaviors.

Super-infection beliefs

Table 3 shows the response frequencies for HIV super-infection beliefs among the 389 participants who had heard about super-infection. The majority of participants agreed that super-infection does occur, damages the health of people living with HIV/AIDS, and has influenced their sexual practices.

Spearman correlations showed that super-infection beliefs were significantly ($p < .05$) associated with fewer seroconcordant sex partners ($r = -.11$), lower rates of unprotected sex with seroconcordant ($r = -.16$) and serodiscordant ($r = -.13$) sex partners, and less total seroconcordant intercourse ($r = -.11$). Super-infection beliefs were also significantly related to greater condom use ($r = .24$) and total protective behaviors ($r = .17$) with seroconcordant partners.

Multivariate analysis

Results of the hierarchical multiple regression predicting percent protected seroconcordant sexual behavior, with abstinence coded as completely protected, are shown in Table 4. Protected seroconcordant sex was associated with participant age and alcohol use; older age and less alcohol use were significantly associated with greater protected seroconcordant sex, $F(5,385) = 2.58, p < .05$. Super-infection beliefs were entered in a second step of the model and predicted percent protected behavior over and above the initial model, representing a significant change, $F(1,381) = 8.34, p < .01$. The final model predicting protected seroconcordant sex behavior was significant, $F(6,381) = 3.58, p < .01$.

Discussion

The majority of people living with HIV/AIDS in the current study were aware of HIV super-infection. Individuals who were more sexually active in seroconcordant relationships were more likely to have heard about HIV super-infection. This pattern of results was apparent for both protected and unprotected vaginal and anal intercourse. Thus, awareness of risks for super-infection showed little evidence of rendering actual protection from super-infection. HIV positive persons who engage in greater overall sexual behaviors with seroconcordant partners appear sensitized to super-infection with limited effects on overall risks.

In contrast to seroconcordant sex partners, there were no associations between super-infection beliefs and sexual behaviors with HIV negative and unknown HIV status sex partners. Because HIV super-infection is only relevant to seroconcordant partnerships, this pattern of results provides support for the internal validity of the findings for seroconcordant partners. The differences in associations between awareness of super-infection and HIV status of sex partners supports the conclusion that super-infection is experienced as a salient risk for people with seroconcordant sexual relationships.

Our results replicate Colfax et al.'s [9] findings that super-infection beliefs are prevalent among people living with HIV/AIDS. These findings are further extended by our diverse sample that included women. Greater than 80% of participants believed that HIV super-infection is detrimental to the health of HIV positive persons and 70% indicated having changed their sexual practices in response to super-infection risks. Despite the low incidence of actual super-infection, beliefs about the ill effects of super-infection are common. Findings from the multivariate regression showed that stronger endorsement of super-infection beliefs were associated with greater protective actions within seroconcordant sexual relationships over and above other common factors associated with sexual behavior, including alcohol and other drug use.

The current findings should be interpreted in light of their methodological limitations. Our behavioral measures were self-reported and may have been influenced by social desirability bias. The behavioral risks reported should therefore be considered lower-bound estimates of HIV transmission risks among people living with HIV/AIDS. In addition, participants reported their perceptions of partner HIV serostatus which can be based on impressions rather than conversations and disclosure. Our study was conducted with a convenience sample recruited in one city in the southeastern United States. The findings may therefore not be generalizable to other populations in other regions. With these limitations in mind, we believe that the current findings have important implications for HIV prevention with people living with HIV/AIDS.

Although the annual incidence of HIV super-infection in the highest risk populations appears to be approximately 4%, beliefs about super-infection are common. The effect of super-infection beliefs on sexual decisions are, however, less clear. Beliefs about HIV

transmission are often derived from and reinforced by peers, media, messages from health providers, and community lore. Despite the widely recognized influence that beliefs exert on behavior, HIV prevention programs have not aimed to alter super-infection beliefs among people living with HIV/AIDS. In many cases the key to changing risk behaviors may very well be altering underlying beliefs. On the one hand, further publicizing super-infection may sensitize risks and reduce potential HIV re-exposure. However, risk sensitization may also reduce same-partner selection strategies, i.e., serosorting, among people with HIV/AIDS and increase risks for new HIV infections. Public health policy must therefore carefully weigh the potential benefits and harms of various prevention messages. Research is therefore needed to further understand super-infection beliefs in order to better inform evidence-based prevention messages and sustain risk reduction behavior changes among HIV positive persons with seroconcordant and serodiscordant partners.

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HIV seroconcordant and serodiscordant sexual practices in the previous 3-months among 490 HIV positive adults.

Table 1

Behavior	Seroconcordant Practices		Serodiscordant Practices		p ^a
	N	%	N	%	
Sexual partners					
0	256	52	339	69	
1	158	32	97	20	
2	34	7	25	5	
3+	42	8	29	5	.01 ^b
Unprotected anal intercourse	65	13	33	7	.01
Condom protected anal intercourse	102	21	45	9	.01
Unprotected vaginal intercourse	34	7	14	3	.01
Condom protected vaginal intercourse	57	12	66	14	.39
	M	SD	M	SD	t ^c
Percent intercourse occasions protected by condoms	67	39	73	37	1.2

Note:

^aMcNemar Test for related variables,
^bMcNemar-Bowker Test of symmetry,
^ct-test for related samples.

Sexual practices in the previous 3-months among HIV positive persons who have not heard of HIV super-infection compared to those who have heard about HIV super-infection.

Table 2

Behavior	Not Aware of HIV super-infection (n = 101)		Aware of HIV super-infection (n = 389)		t
	Mean	SD	Mean	SD	
<u>Seroconcordant sexual behavior</u>					
Sex partners	0.56	1.1	0.96	1.9	2.0*
Unprotected anal intercourse	0.42	1.6	1.1	5.7	1.9*
Condom protected anal Intercourse	0.45	1.6	1.6	6.3	3.2*
Unprotected vaginal intercourse	0.12	0.6	0.49	2.7	2.3*
Condom protected vaginal intercourse	0.21	1.1	0.77	5.0	2.0*
Total unprotected intercourse	0.55	1.8	1.56	6.5	2.7*
Total protected intercourse	0.67	1.9	2.37	7.9	3.8*
Total intercourse	1.22	2.9	3.9	12.4	3.8*
Percent intercourse occasions protected by condoms	52.2	40.4	69.7	38.3	2.1*
<u>Serodiscordant sexual behavior</u>					
Sex partners	0.58	1.3	0.59	1.4	0.4
Unprotected anal intercourse	0.25	1.1	0.26	1.5	0.6
Condom protected anal Intercourse	0.29	1.1	0.37	1.5	0.4
Unprotected vaginal intercourse	0.12	0.6	0.05	0.5	1.2
Condom protected vaginal intercourse	0.77	2.7	1.55	9.5	0.8
Total unprotected intercourse	0.61	2.1	0.67	4.2	0.2
Total protected intercourse	1.06	3.1	1.92	9.6	0.9
Total intercourse	1.68	4.6	2.59	10.6	0.8
Percent intercourse occasions protected by condoms	65.7	35.3	78.4	34.6	1.4

Note: all sexual behaviors reported for the previous 3-months,

* p, .05

Table 3

Percent endorsement of beliefs about HIV super-infection among 389 HIV positive adults who were aware of HIV super-infection.

Beliefs	Strongly disagree	Somewhat/slightly disagree	Somewhat/slightly agree	Strongly agree
Re-infection would have damaging effects on my health.	3	4	18	75
Someone who is HIV positive can become super-infected with HIV.	3	3	21	73
My sexual practices are safer because I am concerned about re-infection and super-infection.	4	5	21	70

Table 4

Results from the hierarchical multiple regression model predicting percent protected seroconcordant sex.

Variable	B	se(B)	Beta	t
Age	0.004	0.002	0.110	2.15*
Gender	−0.003	0.033	−0.005	0.10
HIV symptoms	0.003	0.005	0.029	0.56
Alcohol problems (AUDIT)	−0.007	0.004	−0.119	2.03*
Drug use (DAST)	−0.005	0.010	−0.029	0.49
Super-infection beliefs scale	0.015	0.005	0.145	2.89**

Note

*
p < .05,

**
p < .01