

Predictors and Risk-Taking Consequences of Drug Use Among HIV-Infected Women

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Objective: To determine rates of drug use among women with HIV, and to examine associations between drug use, health, risk behavior, and sexually transmitted diseases (STD).

Design: A longitudinal cohort study of 260 women with confirmed HIV-positive serostatus.

Methods: Each participant contributed a self-report interview, a clinical examination, laboratory testing of cultures for *Trichomonas vaginalis*, *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, and urinalysis for the presence of metabolites of cocaine and opiates. Data were examined on 140 women at 1-year follow-up. Women were defined as drug users if they reported crack, cocaine, or heroin use in the 6 months before the interview or if they had a positive toxicologic test result for cocaine or opiates.

Results. 34% of those in the sample were classified as positive for drug use. Drug use was associated with the number of sexual partners, age at first intercourse, prevalence of STDs, and lower quality of life. STDs were present at baseline in 33.7% and 15.5% of drug users and nonusers, respectively. Drug use among this population was also associated at both baseline and follow-up with the likelihood of having a Karnofsky score below 80, and with overall perceived general health.

Conclusions. Drug users in this cohort were more likely to engage in behaviors that place them at risk for STDs, to have elevated STD prevalence, and to have lower perceived health across several indices. Identification of drug use and treatment for it need to be a central component of HIV care for women.

Key Words: Women—Street drugs—Quality of life—Sexually transmitted disease—HIV seropositivity.

Injection drug and crack cocaine use have contributed significantly to HIV rates among women in the United States. Of the estimated 104,000 cases of AIDS among women, approximately 43% are directly attributable to use of injection drugs (1). Drug use also contributes to the heterosexual transmission of HIV. Crack, a smokable form of cocaine, has been associated with increases in

sexually transmitted disease (STD) rates, including gonorrhea (2), syphilis, and chancroid (3); several studies have documented the contribution of crack among women to the spread of the HIV epidemic (4-6). The link between drug use and sexual behavior, and in particular crack use, is complex and varies with drug dosage and addiction severity. At lower doses, cocaine may simultaneously increase interest in sexual activity and lower inhibitions, whereas at higher levels, it may increase sexual interest, but it can be associated with sex-for-drugs exchanges, in which people negotiate sexual activity to obtain drugs or money to buy drugs (7). This activity has

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Manuscript received August 18, 1998; accepted December 15, 1998.

been well documented among crack users (8), whose risk is associated with a tendency to have more sexual partners (9,10) and lower rates of condom use during the exchange (11,12).

Drug use and high risk sexual behavior pose several risks to a woman with HIV infection and to her partners. The consequences of syphilis (13) and other STDs (14) may be more severe in the setting of immune compromise, and lesions accompanying coincident STDs may facilitate sexual transmission of HIV (15-19). In addition, HIV-seropositive women who do not practice safe sex are at risk for acquiring additional STDs (20,21). Through its association with high-risk sexual behavior, drug use compounds these risks by contributing to a higher prevalence of genital ulcer disease, a factor associated with increased rates of HIV transmission (22). Given these risks, the drug-use practices of women with HIV-infection must be understood and addressed. Although the continued use of drugs within this population has been reported (23,24), correlates of drug use in this group in terms of overall health and behavioral risk factors have not been sufficiently examined.

In sum, drug use is both an important determinant of the HIV epidemic among women in the United States and a contributor to the ongoing health of women with HIV infection and their sexual partners. Although studies have documented the relationship between drug use and STDs in populations with HIV, these either dealt only with pregnant women (25), did not consistently obtain toxicologic verification of drug use (26), or did not document collateral behavioral, social, and psychological factors (27-29). In a previous study, we reported that drug use is more strongly associated with STD incidence than HIV serostatus is (30). The current study extends these findings by examining behaviors associated with more recent, toxicologically verified drug use. This study reports on rates of drug use among an inner-city population of women with HIV and outcomes associated with this drug use, including STD prevalence, sexual risk behavior, and quality of life.

MATERIALS AND METHODS

Study Population

Between 1991 and 1994, 285 women with HIV infection were recruited from two HIV ambulatory care clinics in Brooklyn, New York, U.S.A. Eligibility requirements included that participants be at least 18 years old, not pregnant, planning to maintain residence in the New York City area for the length of the study, had a confirmed positive HIV test, and had not been diagnosed with an AIDS-defining illness (1987 U.S. Centers for Disease Control and Prevention [CDC] definition). Standardized methods were used to identify and recruit women.

Of those eligible, 90% agreed to participate. Women recruited into the study were similar to national AIDS cases among women along a range of demographic variables (31).

Procedures

Each study visit involved an interviewer-administered series of measures (conducted in English, Spanish, or Creole) and a physical examination, including collection of specimens for laboratory testing. Data analysis was conducted on information received at baseline and at a 1-year follow-up. Informed consent for all procedures, including confidential drug testing, was required, and all study activities were approved by Institutional Review Boards governing research at participating clinics. Participants received nominal reimbursement for travel costs and child care, access to care for gynecologic problems and STDs, and referrals to drug treatment or other social service programs when appropriate. Each interview portion of a study visit was implemented by a member of the study staff who was unconnected with clinical care.

Measures

Demographic and Behavioral Measures

All participants answered a series of questions assessing sociodemographic characteristics. Income level was categorized according to official poverty thresholds as defined by the 1994 U.S. Census Bureau. Women were also asked to report on a series of behavioral items relating to sexual behavior, including age at first intercourse, number of lifetime sexual partners, number of sexual partners in the last year, consistency of condom use during vaginal intercourse in the last year (always/almost always, sometimes or never) and whether a condom was used at the last episode of heterosexual vaginal intercourse.

STD Prevalence

The presence or absence of STDs was determined by cervical culture for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, and vaginal culture for *Trichomonas vaginalis*, as described elsewhere (10). STD prevalence was defined as a positive baseline test result for either chlamydia, gonorrhea, or *Trichomonas* infection.

Clinical Status

CD4 count was assessed by exact count and classification into three groups (<200 cells/mm³, 200-499 cells/mm³, ≥500 cells/mm³). Quality of life was assessed using the Medical Outcomes Short-Form 20-Item General Health Survey (MOS SF-20). The MOS SF-20 assesses perceived health along a series of dimensions, including physical, role and social functioning, mental health, pain levels, and general health perceptions. Scores range from 0 to 100, with higher scores indicating higher quality of life. The scale has been used with populations of women with HIV-infection and has documented validity and reliability in this population (32). The Karnofsky Performance Status was also used to evaluate overall health. This scale is a single-item measure that is completed by a clinician with scores ranging in 10-point increments from 0 to 100. The Karnofsky Performance Status has been shown to be a valid predictor of overall health status among samples of HIV-infected patients (33). As in other studies, the Karnofsky score in this study was dichotomized to reflect scores above and below 80 (34).

Drug Use

Urine samples obtained during the baseline and 1-year follow-up visits were frozen and subsequently tested for metabolites of opiates (which includes heroin and excludes methadone) and cocaine (which does not differentiate crack cocaine and cocaine use). All participants were asked to report whether they had used cocaine, crack cocaine, or heroin in the 6 months before each interview. Self-reports of crack and cocaine use were combined into one index, as the metabolites of both drugs appear the same in toxicology testing. A positive score for drug use was defined as a positive self-report for cocaine, crack, or heroin use or a positive toxicology for cocaine or opiates at baseline or at follow-up. A negative score was defined as a negative toxicology for both cocaine and opiates coupled with negative self-reports for drug use, either at baseline or follow-up and in the absence of any positive scores across either time period.

Statistical Methods

Mantel extension tests were used to compare groups on ordered variables, and Fisher's exact test was used for dichotomous variables for univariate comparisons involving drug use and demographics, health indices, and sexual risk and STD prevalence. Nonparametric tests of association were substituted in cases in which scores did not meet normality assumptions.

RESULTS

In all, 285 women completed a baseline interview, and 155 attended a 1-year follow-up visit. At the time of data analysis, an additional 130 women were scheduled for follow-up, but they had not completed their interview. Of the women included for analysis, urine samples were available for testing from 260 women at baseline and 140 at follow-up. Completion of the follow-up portion of the study did not differ between drug users and nondrug users, or as a function of CD4 count, age, and race/ethnicity.

At baseline, 18.1% of the urine samples were positive for cocaine metabolites, and 5.8% were positive for opiates. Cocaine use in the past 6 months at baseline was reported by 20.4% of the sample, and 8.5% reported opiate use. In total, 30.6% either reported or tested positive for at least one of these drugs. At follow-up, 23.0% and 11.5% tested positive for cocaine and opiates, respectively, and 18.7% and 6.5% self-reported use of these drugs. In total, 32.1% were classified as drug users at the follow-up visit. Across both baseline and follow-up, 35.4% ($N = 92$) of the entire sample had either tested positive for these drugs or had reported use, and 64.6% ($N = 168$) had not. Among women who reported opiate use at either time, all but one reported heroin use. Drug users in this cohort had lower annual incomes and were more likely to live below the poverty level than were nondrug users. They also tended to be older and more likely to have been born in the United States (Table 1).

TABLE 1. Demographic and behavioral characteristics at baseline as a function of drug status^a

Characteristic	Drug use ($N = 92$)	No drug use ($N = 168$)
U.S. born ^b	90.2	67.3
Race/ethnicity		
Latina/Hispanic	19.6	22.0
Non-Hispanic White	10.9	4.8
Non-Hispanic Black	69.6	73.2
Age (years) ^b	35.0 (6.6)	32.9 (7.8)
Poverty level or below ^b	57.7	44.1
Annual household income (U.S. \$) ^b	12,166 (10,463)	16,625 (14,864)
High school graduate/GED ^b	46.7	60.7
Age at first sexual intercourse (years) ^b	15.0 (2.8)	16.1 (2.8)
Number of sexual partners in past 12 months (or since serostatus known if <12 months) ^b		
0	19.6	28.0
1	52.2	62.5
2	7.6	4.2
+3	20.7	5.4
Used condom last episode of vaginal sex	72.9	63.4
Always used condoms in past 12 months (or since serostatus known if <12 months) ^b	54.8	70.2
Baseline STD prevalence ^b	33.7	15.5

^a Data presented are mean \pm standard deviation or percentage.

^b $p < .05$ between nondrug users and users of heroin, crack, or cocaine.

GED, general education degree (alternate diploma given in U.S. school districts for students outside mainstream educational programs); STD, sexually transmitted disease.

On average, women in the study had been aware of their positive HIV serostatus for 22 months (SD = 21.6), with no statistically significant differences between drug and nondrug users.

Clinical Status and Quality of Life

Univariate comparisons of drug users with nondrug users both at baseline and at follow-up did not detect statistically significant differences in CD4 count but did detect differences along several indices of health status (Table 2). Women who did not use drugs were more likely to have Karnofsky scores that fell above 80 (indicating better perceived health) than were those who did use drugs, both at baseline (89% versus 72%, respectively; $p < .05$) and at the 1-year follow-up (90% versus 76%, respectively; $p < .05$).

At baseline, drug users had a lower overall perception of their own health ($M = 39.4$) than did nondrug users ($M = 50.8$; $p < .05$). Although drug users had lower scores on the remaining five test domains at baseline

TABLE 2. Univariate comparisons of clinical status/quality of life at baseline and follow-up by drug use^a

Characteristics	Drug use		No drug use	
	Baseline	Follow-up	Baseline	Follow-up
CD4 count (mm ³)	401.3 (212.9)	347.8 (197.8)	368.3 (255.7)	310.8 (215.5)
CD4 grouping				
<200/mm ³	19.3	25.9	24.6	30.0
200-499/mm ³	53.4	50.0	50.3	51.0
≥500/mm ³	27.3	24.1	25.1	19.0
Karnofsky score >80 ^{b,c}	72.2	75.9	89.3	90.0
Quality of life subscales				
Physical functioning ^c	82.9 (23.1)	73.0 (30.0)	84.8 (24.3)	86.9 (20.6)
Social functioning	81.2 (25.5)	77.1 (28.1)	81.4 (27.5)	81.1 (28.6)
Role functioning	76.1 (33.5)	74.1 (36.9)	77.8 (34.5)	79.3 (32.6)
Mental health ^c	57.6 (21.7)	53.2 (23.2)	57.0 (22.5)	63.9 (19.2)
Pain ^c	56.1 (37.0)	50.0 (38.5)	62.3 (35.4)	72.5 (33.8)
General health perception ^{b,c}	40.8 (29.9)	38.9 (27.7)	50.0 (32.1)	58.0 (32.2)

^a Data presented as mean ± standard deviation or percentage.

^b $p < .05$ between nondrug users and users of heroin, crack, or cocaine at baseline.

^c $p < .05$ between nondrug users and users of heroin, crack, or cocaine at follow-up.

(indicating lower perceived health), these differences did not achieve statistical significance. At the 1-year follow-up, drug users had lower scores on physical functioning (74% versus 86%), mental health (52% versus 64%), general health perception (39% versus 57%), and pain levels (50% versus 70%; all $p < .05$).

Sexual Behavior and Sexually Transmitted Disease

In univariate analyses (Table 1), women classified as drug users had commenced their sexual activity somewhat earlier than nondrug users ($M = 15$ versus 16 ; both standard deviation [SD] = 2.8 ; $p < .05$), used condoms consistently less often in the last year (55% versus 70%; $p < .05$), and reported having more male sexual partners in the year prior to their baseline interview ($M = 2.9$; SD = 7.2 versus $M = 1.0$; SD = 1.3 ; $p < .05$). No statistically significant differences were found between drug and nondrug users with regard to using a condom at the last episode of vaginal intercourse. At baseline, 21.9% of the sample presented with either *T. vaginalis* (19.6%), *C. trachomatis* (1.9%), or *N. gonorrhoeae* (1.2%). The presence of at least one STD at baseline differed with drug use status; 33.7% of cocaine and heroin users were diagnosed with an STD, compared with 15.5% of nonusers ($p < .05$).

DISCUSSION

Data derived from this large cohort of women with HIV infection demonstrate that drug use is an important determinant of both overall health and sexual behavior in this population. These relationships are particularly troubling, given that over one third of the women participat-

ing in this study tested positive for at least one of these drugs. These high rates reflect the necessity of identification and treatment of drug problems among women undergoing medical care for HIV infection in inner-city ambulatory HIV clinics.

Recent use of heroin, crack, or cocaine had important effects on perceptions of illness. Although drug and nondrug users had similar CD4 classifications, those who were classified as drug users had, overall, lower Karnofsky scores and lower self-reported scores on the quality of life subscales, including physical functioning, mental health, pain, and overall health. This result may be due to several factors. For instance, female drug users have multiple burdens that would produce an impact on their ability to access the care services necessary to maximize their quality of life (35). Second, drug use itself contributes to lower overall levels of psychological functioning, independent of HIV serostatus (36). Finally, drug use may be related to increased HIV disease progression, through lower rates of HIV therapeutic adherence (37). Further research is needed to address the potential contribution of each of these factors.

It might be expected that those with lower physical functioning might be less likely to engage in sexual behaviors. However, drug users in this sample were more likely to present with an STD; approximately one half of all cocaine and heroin users and one quarter of nondrug users were positive for at least one STD at baseline. They also reported higher levels of sexual risk behavior in terms of both number of sexual partners and inconsistency of condom use. Thus, potential is increased for dissemination of HIV from this seropositive cohort through unsafe sex.

Use of toxicology testing to assess drug use behaviors

allowed for a significantly better classification of HIV-positive women by drug use status than has been possible in many previous studies. Despite this advantage, several drawbacks should be noted. First, although our cohort reflects the composition of the HIV epidemic among U.S. women (African American and Hispanic women residing in inner-city areas), the relatively small sample size may have led to some unstable estimates as represented by large confidence intervals. Second, whereas using toxicology results for determining drug using status reduced misclassification, women who use drugs only occasionally and who denied use may still have been misclassified as nondrug users. However, this probably would have biased results toward the null hypothesis. Similarly, because our toxicology for opiates included other drugs besides heroin (e.g., opium), some using other illicit drugs may have been missed in this classification. However, given the low prevalence of opiate use, excepting heroin, in the population under investigation, this risk is small. Third, the 1-year follow-up time period was short and thus may underestimate the effects of drug use on clinical status and quality of life measures. Fourth, our decision to classify drug use across both baseline and follow-up had the advantage of capturing a greater number of women who fall into this category but introduced the disadvantage of making it difficult to infer causal influences. A design with a similar definition of drug use but longer follow-up would allow for a clearer delineation of these relationships. Finally, awareness of confidential drug testing could conceivably have induced some participants to refrain from drug use in the period preceding study visits.

In sum, we have found that cocaine and heroin use was a common phenomenon in this inner-city cohort of women with HIV infection, and that its use has deleterious effects on both overall perceptions of health and safer sexual behaviors. Drug use identification and treatment need to be central components of HIV care for women, particularly as the epidemic moves into communities where its use is endemic. The negative impact of drugs on the health of both the individual and the community are compelling reasons for identifying drug use among HIV-positive women and targeting drug treatment to this population. Clinicians providing care to women living with HIV and AIDS must address the frequency of drug use and its potential impact on their patients' health and must incorporate treatment and referral issues on an ongoing basis into HIV care.

Acknowledgments: This study was made possible by the NIH Fogarty International Center (TW00233), the NICHD under subcontract of Westat Contract (NO1-HD-8-2913), by

the NIAID and NIDA (RO1-AI-3134), and by the CONRAD Program (CSA-94-134).

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