Addiction Severity Index Composite Scores as Predictors for Sexual-Risk Behaviors and Drug-Use Behaviors in Drug-Dependent Pregnant Patients

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Abstract

Background—HIV sexual-risk and drug-use behavior predictors have been studied in non-pregnant but not pregnant drug-dependent populations.

Objective—Examine the ability of the ASI composite scores to predict HIV sexual- and drug-risk scores as well as the individual items of a modified version of the Risk Assessment Battery in drug-using pregnant women.

Methods—Pregnant women (*N*=76) completing pretreatment ASI and HIV-risk questionnaires.

Results—The Legal composite score was the sole significant predictor of the sexual-risk score, with a 1 *SD* increase in the Legal composite score resulting in a 24% increase in sexual-risk, *p*<.001. The Medical, Drug, and Legal composite scores were each significant predictors of the drug-risk score, with a 1 *SD* increase resulting in a 31% decrease, and 121% and 73% increases, respectively, in drug-risk, all *p*s<.05.

Conclusions and Scientific Significance—Pregnant drug-dependent women and their fetuses are vulnerable to the consequences of both sexual-risk behaviors and drug-use. The ASI may help screen such patients for HIV sexual-risk and drug-use behaviors as a first step in tailoring treatment to address these issues.

Keywords

substance abuse; pregnancy; sexual behavior; HIV; drug addiction

Introduction

Given that substance-abusing women in their reproductive years have relatively high HIV seroprevalence rates (1) and that perinatal transmission of HIV accounts for 90% of pediatric HIV infection (2), drug-dependent pregnant women are an important population to reach for interventions.

One step in developing tailored HIV-risk reduction interventions is to characterize the personal and environmental characteristics of individuals that may predict HIV-risk

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behaviors. Results of studies of HIV-risk predictors or correlates in substance-abusing populations suggest that a variety of social and psychological factors are predictive of HIV–risk behaviors including drug use duration/type [3], homelessness [4,5], drug-using partner [3], emotional-abuse [4], psychiatric status [6], and prostitution [7]. However, no studies have reported predictors of sexual- or drug-risk behaviors in pregnant women.

Prior studies measuring factors associated with HIV-risk behaviors often use different indices to evaluate a variety of factors, making it difficult to compare results across studies or assess measurement validity [3,4,6]. Using one instrument measuring multiple diverse domains may help to address this problem. The Addiction Severity Index (ASI) assesses the severity of the multiple problems facing substance-abusers [8,9]. Among pregnant patients, the ASI composite scores predicted drug treatment outcomes [10,11], but have not been examined for predicting HIV sexual and drug-risk.

In order to assess the ability of the ASI to predict HIV sexual and drug-risk in drug-using pregnant women, the relationships between the ASI composite scores and both the HIV sexual-and drug-risk scores and the individual items of a modified version of the Risk Assessment Battery [12] were examined.

Methods

Parent Study and Setting

The parent study, from which the current sample was drawn, examined the efficacy of Reinforcement-Based Treatment (RBT) [13], modified for the treatment of drug-using pregnant women, compared to treatment-as-usual in a comprehensive care setting, the Center for Addiction and Pregnancy (CAP) [14].

Parent Study Recruitment

Participants were recruited between 9/2003 and 11/2007. All participants signed an Institutional Review Board approved informed consent form and were randomly assigned to one of two aftercare conditions: Standard CAP care alone or enhanced with RBT.

Parent study inclusion criteria were: CAP admission, minimum 18 years of age, heroin or cocaine use in past 30 days, completing medically-assisted withdrawal from opiates and/or cocaine, electing pharmacotherapy-free treatment, and willingness to live in recovery housing. Exclusion criteria included: gestational age of 35 or more weeks, and a severe concomitant medical/psychiatric condition interfering with study consent/participation.

Of the 225 eligible patients, 97 patients declined overall, either refusing to specify a reason ($n=40$), no interest in recovery housing ($n=29$), no study interest ($n=10$), living out of the area/not returning to CAP ($n=4$), childcare issues ($n=6$), other aftercare plans ($n=6$), declined randomization process ($n=1$), and employment conflicted with study participation ($n=1$). Failing to complete study measures and/or reporting HIV-positive status were additional exclusion criteria for this study. Of the remaining 128 parent study enrollees, 52 were excluded (incomplete data $n=47$, and for positive or unknown HIV-status $n=3$ and $n=2$, respectively), leaving data for 76 participants.

Measures

Addiction Severity Index (ASI)—The ASI is a semi-structured interview assessing both lifetime and recent (30 days prior to treatment entry) events and behaviors in seven domains (Medical, Employment, Drug, Alcohol, Legal, Family/Social, and Psychiatric). This instrument has excellent inter-rater and test-retest reliability, as well as discriminant and

concurrent validity. The composite scores in each domain range from 0 (no problems) to 1 (severe problems) (see Table 1). All interviewers' training and on-going inter-rater reliability has been previously described [13].

Baltimore Risk Assessment Battery (BRAB)—HIV sexual-risk and drug-use was measured using a modified HIV Risk Assessment Battery (RAB) [15], the BRAB [12]. The RAB assesses sexual and drug-risk behaviors over the past month and six months and has established reliability and validity [12,15–16]. The BRAB includes 9 items that assess HIV sexual-risk and 11 items that measure HIV drug-risk behavior over the past 30 days (see Table 1). The sexual- and drug-risk scores can range from 1–25 and 0–29, respectively, with higher scores indicating greater HIV risk behavior.

Statistical Analyses

Separate multiple regression analyses were conducted for the baseline (study entry) BRAB HIV sexual- and drug-use risk scales, as well as for each of the sexual- and drug-risk items, using SAS Version 9.2. Criterion variables distribution followed a Poisson distribution given a preponderance of zero scores for each variable, except for the three binary-items (see Table 1). Poisson regression was conducted for each criterion variable. For binary-items, logistic regression was employed. To control for possible under- or overdispersion, a scale factor was included in the statistical model and the standard errors and likelihood ratio tests of significance were adjusted accordingly. The explanatory predictor variables in each multiple regression were the baseline ASI Legal, Medical, Alcohol, Drug, Employment, Family/Social, and Psychiatric composite scores, with age and ethnicity (White *v*. non-White) serving as control variables. Interpretation of analyses focused on the exponentiated regression coefficients [*exp(b)*] (see Table 2) which were transformed into percentage change for each *SD* change in their respective predictor variable by first subtracting 1 from the exponentiated coefficient and then multiplying by 100, with the exception of Ethnicity, for which exponentiated least squares means are reported.

Results

Sample characteristics

Participant (*N*=76) characteristics are shown in Table 1.

Prediction of Sexual-Risk

The Legal composite score was the sole significant predictor of the BRAB sex risk score, with a 1 *SD* increase in the Legal composite score resulting in a 24% increase (*p*<.001) in HIV sexual-risk. The Legal composite score was likewise a significant predictor of number of male partners, frequency of exchanging sex for drugs, frequency of exchanging drugs for sex, and frequency of exchanging sex for money, with 29%, 50%, 195%, and 67% decreases (all *p*s<.03) in the score of the respective criterion variable with a 1 *SD* increase in the Legal composite score. Frequency of exchanging sex for drugs was notable because 1 *SD* increases in the ASI Drug, Alcohol, and Psychiatric composite scores resulted in 240% and 101% increases and a 61% decrease (all *p*s<.007) in the item score. Other significant ASI scales were the Medical and Employment composite scores. For the Medical composite score, each 1 *SD* increase related to a 58% reduction and a 60% increase (both *p*s<.04), respectively, for frequency of exchanging sex for drugs and frequency of exchanging drugs for sex. For the Employment composite score, each 1 *SD* increase resulted in a 162% increase (*p*<.05) in the likelihood of being bisexual. Finally, a 1 *SD* increase in age was related to a 71% reduction (*p*<.04) in the likelihood of being bisexual. Whites had a higher number of female partners and a greater frequency of exchanging sex for drugs than did non-Whites (both *p*s<.001).

Prediction of Drug-Risk

The Medical, Drug, and Legal composite scores were each significant predictors of the BRAB drug-risk score, with 1 *SD* increases resulting in a 31% decrease, and 121% and 73% increases (all *p*s<.05), respectively, in HIV drug-risk. The Drug composite score predicted all BRAB drug-risk items, with 1 *SD* increases in Drug composite scores associated with from 67% to 1,030% increases (all *p*s<.04) in HIV drug-risk behaviors. As with the BRAB sex-risk scale, the Legal composite score provided useful information regarding HIV drug-risk, predicting 7 BRAB drug-risk items. One *SD* increases in Legal composite scores were associated with a 67% increase in number of people with whom needles were shared to a 244% increase (all *p*s<.004) in the likelihood of sharing needles. Inexplicably, a 1 *SD* increase in Legal composite score was also associated with a 51% decrease (*p*<.04) in number of times sharing straws. In contrast, the Medical composite score was a significant predictor of injection drug use status, number of visits to a shooting gallery, and number of times sharing rinse water, cookers, and cottons, with 56%, 60%, 39%, 39%, and 39% decreases (all *p*s<.05) in the score of the respective criterion variable with a 1 *SD* increase in Medical. The only other significant ASI composite scales were Psychiatric, with each 1 *SD* increase resulting in a 72% increase (*p*<.002) in number of visits to a shooting gallery, and Family/Social, with each 1 *SD* increase related to a 55% increase (*p*<.02) in frequency of back-loading. Finally, for the control variables, a 1 *SD* increase in age was uniformly related to less HIV drug-risk, most notably marked by a 31% reduction (*p*<.04) in overall drug risk, and to a lesser extent was Ethnicity, with Whites having higher overall drug risk scores than non-Whites (*p*<.04).

Discussion

Although not without significant risks, it should be noted that the degree of sexual and drug risk-taking in this sample was not substantial, given the relatively low means for many of the BRAB items. Moreover, the levels of sexual- and drug-risk in this sample of drug-dependent pregnant women enrolled in drug treatment is similar to that of non-pregnant women treated for stimulant use [e.g., 16]. Further, that age is inversely related to HIV drug-risk behaviors in this sample is also consistent with past literature which has reported that older age is positively associated with other positive aspects related to drug use reduction including drug treatment completion [17]. These similarities suggest that the present observed findings may have utility for other samples of drug-using women in treatment.

Results demonstrate that the Legal composite scores for HIV sexual-risk and the Drug, Medical, and Legal composite scores for HIV drug-risk, may serve as important markers for identifying drug-dependent pregnant women at increased risk for HIV risk behaviors. Of note, the Medical and Legal composite scores wield predictive power in explaining HIV drug-risk beyond information regarding drug-use found in the Drug composite score. In contrast, the ASI domains other than Legal for sexual-risk as well as Employment, Alcohol, Family/Social, and Psychiatric for drug-risk, provided limited, if any, additional information. Interestingly, only the Legal ASI composite predicts both sexual- and drug-risk, suggesting that pregnant women with antisocial tendencies may be more likely to engage in both HIV sexual- and drug-risk behaviors. Finally, no ASI composite predicted consistency of condom use. This finding may be due to the complex factors operating in decision-making and negotiations regarding condom use that are not captured by the ASI domains.

Drug-abuse treatment can serve as a means of HIV prevention, primarily through reduction of HIV drug-risk behavior (18. 19). This study provides data on the psychosocial domains that can be targeted for behavior change to reduce multiple dimensions of HIV sexual and drug-risks. Beyond targeting drug-abuse to reduce HIV drug-risk, the findings regarding the

Legal composite suggest that behavioral intervention targeting antisocial behavior may prove important in reducing both HIV sexual- and drug-risk.

Several study limitations merit discussion. First, presented data were collected as a part of a larger behavioral trial. Thus the sample is limited to willing entrants of the trial. Second, the number of potential participants excluded was relatively large, limiting the generalizability of the results. Third, this study relied on a broadly-defined measure of both HIV sexual-risk behavior and drug-use risk behavior. Future prospective studies of HIV sexual-risk behavior in a larger sample of drug-dependent pregnant women should include more comprehensive and sensitive measures of sexual-risk behaviors to yield results supporting stronger conclusions. Likewise, future drug-use risk research with this population should include a more encompassing measure directed to their gender-specific risks in order to more accurately determine HIV drug-risk behaviors.

In summary, drug-dependent pregnant women and their fetuses are particularly vulnerable to the multiple negative consequences of both sexual-risk behaviors and drug-use. Comprehensive addiction treatment programs for pregnant women provide a unique opportunity for assessment and intervention for a more individualized and focused approach to addressing risk behaviors. These results are both clinically relevant and beneficial for future HIV prevention interventions for drug dependent pregnant women in that they provide information showing that a marker such as legal problems predicts HIV sexual or drug-use risks. A marker like legal problems is not commonly thought to predict HIV risk behaviors. The opportunity to be successful with these women may also help improve the lives of their children.

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Table 1

Pre-treatment patient demographic, recent drug use, Addiction Severity Index, and Baltimore Risk Assessment Battery information (*N*=76)

Characteristic	*M*	*SD*
Age in years	31.3	6.13
Years of education completed	11.7	1.52
Estimated gestational age at study entry	21.4	7.71
	%	
Race		
Black or minority status	56.6	
White	43.4	
Hispanic	2.7	
Unemployed	89.5	
Not currently married	85.5	
On probation or parole	32.9	
Self-reported drug use in the 30 days prior to treatment entry		
cocaine	69.7	
heroin	65.8	
other opioids	15.8	
alcohol	30.3	
Ever injected	44.7	
Addiction Severity Index (ASI) Composite Scores	*M*	*SD*
ASI Medical composite score	.32	.35
ASI Employment composite score	.83	.21
ASI Drug composite score	.28	.11
ASI Alcohol composite score	.04	.10
ASI Legal composite score	.18	.24
ASI Psychiatric composite score	.19	.22
ASI Family/Social composite score	.25	.27
Baltimore Risk Assessment Battery	*M*	*SD*
Sex Risk Scale:	5.1	3.3
	%	

Characteristic	M	SD
Sexual Orientation (Straight v. Bisexual): Straight	86.7	
	M	SD
With how many men have you had sex?	1.28	.88
With how many women have you had sex?	.16	.52
How often have you had sex so you could get drugs?	.49	.95
How often have you given drugs to someone so that you could have sex with them?	.11	.42
How often were you paid money to have sex with someone?	.50	.99
How often did you use condoms when you had sex?	1.33	1.33
How often did you give money to someone so you could have sex with them?	.04	.20
How often have you had sex with someone you knew (or later found out) had AIDS or was positive for HIV, the AIDS virus?	0	0
Drug Risk Scale:	2.6	5.3
	%	
Have you injected drugs?	34.7	
Have you shared needles or works?	16.0	
	M	SD
With how many different people did you share needles?	.20	.47
How often have others used after you (with or without cleaning)?	.29	.63
How often have you been to a shooting gallery/house or other place where users go to shoot up?	.29	.78
How often have you shared rinse-water?	.31	.79
How often have you shared cooker?	.36	.85
How often have you shared cotton?	.36	.87
how often have you shared a straw or dollar bill?	.33	.79
How often have you divided or shared drugs with others by using one syringe (yours or someone else's) to squirt or load the drugs into other syringe(s)?	.28	.65
How often have you shared needles with someone you knew (or Later found out) had AIDS or was positive for HIV, the AIDSvirus?	0	0

Notes. The BRAB questions refer to the "past 30 days". To calculate the BRAB HIV sex-risk score, the sexual orientation is scored 1 for "bisexual", while the remaining 8 items use a 4-point rating scale, scored 0–3 (e.g., 0 = "Not at All", 3 = "Everyday"). To calculate the BRAB HIV drug-risk score, the injected drugs and shared needles questions are scored 1 for "yes", while the remaining 9 items use a 4-point rating scale, scored 0–3 (e.g., 0 = "Not at All", 3 = "Everyday"). Thus, the potential range of scores for the HIV sex-risk scale is 0–25, while the potential range of scores for the HIV drug-risk scale is 0–29.

Table 2

Significant ($p < .05$) Exponentiated Regression Coefficients and their (Standard Errors) for the Regression Analysis Predicting HIV Sex- and Drug-Risk from ASI Composite Scores

Sex Risk

	Sex Risk	(1) sexual orientation	(2) number of male partners	(3) number of female partners	(4) frequency of trading sex for drugs	(5) frequency of trading drugs for sex	(6) frequency of trading sex for money	(7) consistency of condom use
Age		.29 (.17)						
Ethnicity				$M_{White}=.17$ $M_{non-White}=.01$	$M_{White}=.61$ $M_{non-White}=.19$			
ASI Medical						.40 (.15)		
ASI Employment		2.62 (1.29)						
ASI Drug				3.40 (1.20)				
ASI Alcohol				2.01 (.46)				
ASI Legal	1.24 (.08)		1.29 (.10)	.39 (.14)	1.50 (.26)		1.67 (.29)	
ASI Psychiatric								
ASI Family/Social								

Drug Risk

	Drug Risk	(1) injection drug use status	(2) needle sharing status	(3) number of people with whom needles were shared	(4) frequency others used needles after you	(5) number of visits to a shooting gallery	(6) number of times sharing rinse water	(7) number of times sharing cookers	(8) frequency of sharing cottons	(9) frequency of sharing straws	(10) frequency of back-loading
Age	.69 (.13)		.25 (.13)		.62 (.15)		.58 (.14)	.54 (.13)	.62 (.14)		
Ethnicity	$M_{White}=1.90$ $M_{non-White}=.63$			$M_{White}=.19$ $M_{non-White}=.04$		$M_{White}=.18$ $M_{non-White}=.01$					$M_{White}=.26$ $M_{non-White}=.02$
ASI Medical	.69 (.13)	.44 (.18)				.40 (.09)	.61 (.14)	.61 (.14)	.61 (.14)		
ASI Employment											
ASI Drug	2.21 (.43)	2.36 (.98)	11.3 (7.5)	1.81 (.46)	1.67 (.39)	3.11 (.62)	2.59 (.70)	2.12 (.53)	1.98 (.49)	1.67 (.38)	1.97 (.45)
ASI Alcohol					.30 (.29)						
ASI Legal	1.73 (.33)		3.44 (1.54)	1.67 (.30)		2.07 (.24)	2.22 (.39)	2.00 (.34)	2.21 (.37)	.49 (.16)	
ASI Psychiatric						1.72 (.31)					

Sex Risk

	Sex Risk	(1) sexual orientation	(2) number of male partners	(3) number of female partners	(4) frequency of trading sex for drugs	(5) frequency of trading drugs for sex	(6) frequency of trading sex for money	(7) consistency of condom use
ASI Family/Social								1.55 (.29)

Note: The BRAB sexual-risk score included 9 questions. To calculate the sexual-risk score, questions asked about (1) sexual orientation (score: 0 or 1, with bisexual as the reference category), (2) number of male partners, (3) number of female partners, (4) frequency of exchanging sex for drugs, (5) frequency of exchanging drugs for sex, (6) frequency of exchanging sex for money, (7) consistency of condom use, (8) frequency of exchanging money for sex, and (9) frequency of sex with someone of known HIV/AIDS positive status. Questions (2)–(9) used 4-point ratings scales, scored 0–3 (e.g., 0 = "Not at All", 3 = "Everyday"). Because only 3 participants responded in the affirmative for (8), and no participant responded in the affirmative for (9), inferential analyses could not be performed for these items, and they are omitted from the table. The BRAB drug-risk score includes 11 questions; 10 were based on prior literature [12,15–16] and 1 question, frequency of sharing a straw or dollar bill, was added due to anecdotal reports of methods for drug administration in the Baltimore area. To calculate the drug-risk score, questions asked about: (1) injection drug use status (score: 0 or 1, with yes the reference category), (2) needle sharing status (score: 0 or 1, with yes the reference category), (3) number of people with whom needles were shared, (4) frequency of having others use needles after you, (5) number of visits to a shooting gallery, number of times sharing (6) rinse water (7) cookers (8) cottons, or (9) straws, (10) frequency of back-loading, and (11) sharing needles with someone who had HIV/AIDS. Questions (3)–(11) used 4-point rating scales, scored 0–3 (e.g., 0 = "Not at All", 3 = "Everyday"). Because no participant responded in the affirmative for (11), inferential analyses could not be performed for this item, and it is omitted from the table. Results in the table are the significant exponentiated Poisson regression coefficients [exp(b)] and their standard errors, with the exception of sex-risk item (1) and drug-risk items (1) and (2), for which the odds ratios [exp(b)] and their standard errors are reported because logistic regression analyses were performed for these binary items. In the case of the Ethnicity effect, exp(b) represents the mean differences between the two ethnic groups (White v. non-White, as the reference group).