Factors Associated with ART Adherence and Plasma HIV-1 RNA Suppression among Crack Cocaine Users in Vancouver, Canada

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Background

- Crack cocaine use is known to increase the risk of HIV transmission and contribute to poor adherence to antiretroviral medications.
- However, little is known about facilitators of or barriers to effective HIV treatment use among HIV-infected crack cocaine users.
- Therefore, we sought to identify correlates of optimal medication adherence and plasma HIV RNA viral load (pVL) non-detectability among HIV-positive crack cocaine users who accessed highly-active antiretroviral therapy (HAART). In a sub-analyses, we also sought to identify the correlates among dual crack cocaine and opioid users.

Methods

- Data were derived from the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), an open prospective cohort study of HIV-positive people who use illicit drugs in Vancouver, Canada, beginning in 1996.
- Through self-referral and street-based outreach, ACCESS has enrolled HIV-positive individuals who were aged ≥18 years, had used illicit drugs other than cannabis in the previous month, resided in the Greater Vancouver area, and provided informed consent.
- At baseline and semi-annually thereafter, participants complete an interviewer-administered questionnaire soliciting data on socio-demographics, drug use patterns, and other exposures. Participants were compensated $30 CAD at each visit.
- ACCESS data were confidentially linked to a province-wide centralized HIV treatment dispensation program database at the BC Centre for Excellence in HIV/AIDS, through which a complete HIV-related clinical profile of each participant was obtained.
- For the present analysis, the sample was restricted to those who were enrolled in ACCESS between December 2005 and November 2013, reported having smoked crack cocaine in the previous six months at baseline, had initiated HAART prior to baseline, and had at least one observation of CD4 cell count and pVL within ±180 days of the day of study enrolment. For the sub-analysis, the sample was further restricted to those with a history of any opioid use or methadone maintenance therapy use at baseline.
- The primary outcomes of interest were optimal adherence to antiretroviral medications (i.e., ≥95% based on antiretroviral medication dispensation records) and pVL non-detectability (i.e., <50 copies/mL of plasma) in the previous six months (yes *vs.* no).
- We considered a range of demographic, behavioural, clinical and social/structural variables that might be associated with optimal medication adherence and/or pVL non-detectability, as presented in Table 1.
- We used multivariable generalized linear mixed-effects modelling (GLMM) with the logit link to longitudinally identify factors associated with the outcomes. For the sub-analysis, we added enrolment in opioid substitution therapies as a covariate.

Table 1: Baseline characteristics of HAART-exposed crack cocaine users in Vancouver, Canada, stratified by optimal medication adherence in the previous 6 months (*n* = 438).

Characteristic	Total (*n* = 438) *n* (%)	≥95% medication adherence[a] Yes 240 (54.8%)	No 198 (45.2%)	*p*-value
Age[c] (median, IQR)	44 (38–49)	45 (40–51)	42 (37–46)	<0.001
Male gender	293 (66.9%)	171 (71.3%)	122 (61.6%)	0.033
Caucasian ancestry	239 (54.6%)	147 (61.3%)	92 (46.5%)	0.002
Less than secondary education	228 (52.1%)	116 (48.3%)	112 (56.6%)	0.069
Homeless[a]	129 (29.5%)	57 (23.8%)	72 (36.4%)	0.003
≥Daily crack cocaine smoking[a]	175 (40.0%)	78 (32.5%)	97 (49.0%)	0.001
≥Daily heroin use[a]	48 (11.0%)	19 (7.9%)	29 (14.7%)	0.024
≥Daily crystal methamphetamine use[a]	9 (2.1%)	5 (2.1%)	4 (2.0%)	1.000
Heavy alcohol use (≥5 drinks per day)[a]	13 (3.0%)	5 (2.1%)	8 (4.0%)	0.266
Engagement in sex work or drug dealing[a]	164 (37.4%)	78 (32.5%)	86 (43.4%)	0.018
Incarceration[a]	58 (13.2%)	32 (13.3%)	26 (13.1%)	0.951
Seeing a less experienced HIV physician (i.e., having previously treated <6 patients)[b]	48 (11.0%)	25 (10.4%)	23 (11.6%)	0.397
CD4 cell count[a,d] (median, IQR)	300 (180–450)	340 (223.5–495)	235 (120–360)	<0.001
Participation in inpatient addiction treatment[a]	35 (8.0%)	19 (7.9%)	16 (8.1%)	0.950
Participation in outpatient detoxification or other outpatient addiction treatment[a]	5 (1.1%)	4 (1.7%)	1 (0.5%)	0.384
Seeing drug counsellors or participation in addiction-related peer support meetings[a]	43 (9.8%)	31 (12.9%)	12 (6.1%)	0.016
Restricted to dual crack cocaine and opioid users (n = 293)				
Participation in opioid substitution therapies[a]	186 (63.5%)	115 (70.6%)	71 (54.6%)	0.005

HAART: highly active antiretroviral therapy. CI: confidence interval. IQR: interquartile range.
[a] denotes activities/events in the past 6 months.
[b] denotes at the time of antiretroviral therapy initiation.

Results

- Among 438 HAART-exposed crack cocaine users who were eligible for this analysis, 240 (54.8%) had ≥95% medication adherence in the previous six months at baseline. Other baseline sample characteristics are presented in Table 1.
- As shown in Table 2, in multivariable analyses adjusting for age and CD4 cell count, homelessness (adjusted odds ratio [AOR]: 0.58; 95% confidence interval [CI]: 0.44 – 0.77), ≥daily crack cocaine smoking (AOR: 0.64; 95% CI: 0.50 – 0.81), and ≥daily heroin use (AOR: 0.43; 95% CI: 0.29 – 0.65) were independently associated with optimal medication adherence. The results for pVL non-detectability (Table 3) were consistent with those of medication adherence.
- Similarly, the results of the sub-analysis were also consistent with those of the primary analysis, except that participation in opioid substitution therapies was independently associated with pVL non-detectability (AOR: 1.87; 95% CI: 1.25 – 2.79).

Table 2: Multivariable GLMM logistic regression analyses of factors associated with optimal medication adherence among HAART-exposed crack cocaine users in Vancouver, Canada, 2005–2013.

Characteristic	Total sample of crack cocaine users (*n* = 438) Adjusted OR (95% CI)	Dual crack cocaine and opioid users (*n* = 293) Adjusted OR (95% CI)
Age[b]		
(per 10-year older)	1.65 (1.33 – 2.04)	1.72 (1.30 – 2.26)
Homeless[a,b]		
(yes *vs.* no)	0.58 (0.44 – 0.77)	0.56 (0.40 – 0.79)
Crack cocaine smoking[a,b]		
(≥daily *vs.* <daily)	0.64 (0.50 – 0.81)	0.57 (0.43 – 0.75)
Heroin use[a,b]		
(≥daily *vs.* <daily)	0.43 (0.29 – 0.65)	0.45 (0.29 – 0.70)
CD4 cell count[a,b]		
(per 100-cell increase)	1.31 (1.23 – 1.41)	1.34 (1.23 – 1.45)
Participation in opioid substitution therapies[a,b]		
(yes *vs.* no)	——	1.39 (0.99 – 1.96)

GLMM: generalized linear mixed-effect modelling. HAART: highly active antiretroviral therapy. OR: odds ratio. CI: confidence interval.
[a] denotes activities/events in the past 6 months.
[b] denotes time-varying variables.

Table 3: Multivariable GLMM logistic regression analyses of factors associated with pVL non-detectability among HAART-exposed crack cocaine users in Vancouver, Canada, 2005–2013.

Characteristic	Total sample of crack cocaine users (*n* = 438) Adjusted OR (95% CI)	Dual crack cocaine and opioid users (*n* = 293) Adjusted OR (95% CI)
Age[b]		
(per 10-year older)	2.85 (2.09 – 3.89)	2.43 (1.69 – 3.49)
Homeless[a,b]		
(yes *vs.* no)	0.36 (0.26 – 0.51)	0.36 (0.24 – 0.53)
Crack cocaine smoking[a,b]		
(≥daily *vs.* <daily)	0.67 (0.50 – 0.89)	0.56 (0.40 – 0.77)
Heroin use[a,b]		
(≥daily *vs.* <daily)	0.50 (0.31 – 0.80)	0.55 (0.33 – 0.92)
CD4 cell count[a,b]		
(per 100-cell increase)	1.79 (1.63 – 1.97)	1.82 (1.63 – 2.03)
Participation in opioid substitution therapies[a,b]		
(yes *vs.* no)	——	1.87 (1.25 – 2.79)

GLMM: generalized linear mixed-effect modelling. pVL: plasma HIV RNA viral load. HAART: highly active antiretroviral therapy. OR: odds ratio. CI: confidence interval.
[a] denotes activities/events in the past 6 months.
[b] denotes time-varying variables.

Conclusions

- Homelessness, and daily crack cocaine and/or heroin use were independently and negatively associated with optimal HAART-related outcomes.
- Notably, with the exception of opioid substitution therapies, no addiction treatment modalities assessed appeared to facilitate medication adherence or viral suppression.
- Evidence-based treatment options for crack cocaine use that also confer benefits to HAART need to be developed.

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