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Crystal methamphetamine initiation among street-involved youth

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Abstract

Background—Although many settings have recently documented a substantial increase in the use of methamphetamine-type stimulants, recent reviews have underscored the dearth of prospective studies that have examined risk factors associated with the initiation of crystal methamphetamine use.

Objectives—Our objectives were to examine rates and risk factors for the initiation of crystal methamphetamine use in a cohort of street-involved youth.

Methods—Street-involved youth in Vancouver, Canada, were enrolled in a prospective cohort known as the At-Risk Youth Study (ARYS). A total of 205 crystal methamphetamine-naïve participants were assessed semi-annually and Cox regression analyses were used to identify factors independently associated with the initiation of crystal methamphetamine use.

Results—Among 205 youth prospectively followed from 2005 to 2012, the incidence density of crystal methamphetamine initiation was 12.2 per 100 person years. In Cox regression analyses, initiation of crystal methamphetamine use was independently associated with previous crack cocaine use (adjusted relative hazard [ARH] = 2.24 [95% CI: 1.20–4.20]) and recent drug dealing (ARH = 1.98 [95% CI: 1.05–3.71]). Those initiating methamphetamine were also more likely to report a recent nonfatal overdose (ARH = 3.63 [95% CI: 1.65–7.98]) and to be male (ARH = 2.12 [95% CI: 1.06–4.25]).

Conclusions—We identified high rates of crystal methamphetamine initiation among this population. Males those involved in the drug trade, and those who used crack cocaine were more

likely to initiate crystal methamphetamine use. Evidence-based strategies to prevent and treat crystal methamphetamine use are urgently needed.

Keywords

Crystal methamphetamine; social harm; youth

Introduction

Amphetamine-type stimulants, including crystal methamphetamine, are the second most commonly used illicit drug worldwide, following cannabis (1). As a stimulant, crystal methamphetamine can affect any organ system in the body (2) and its use has been associated with numerous health and social harms. Crystal methamphetamine use is associated with the spread of infectious diseases, including HIV and hepatitis C (3,4), perhaps because people who use crystal methamphetamine are more likely to engage in risky sex practices, inject drugs and have a history of incarceration (5–7). A recent study of HIV-positive men who have sex with men initiating antiretroviral therapy found that crystal methamphetamine use was strongly associated with unprotected anal intercourse (8). Crystal methamphetamine is also associated with malnutrition (9) and the negative cardiovascular effects are well described (2,10).

Street-involved youth have high rates of crystal methamphetamine use (6) and this population may be particularly vulnerable to the negative effects of crystal methamphetamine given their street entrenchment and other health and social challenges, (11). Recent cross-sectional studies from Canada have shown that over 70% of street-involved youth who use drugs use crystal methamphetamine (6). High rates of crystal methamphetamine use among street-involved youth may be the result of cheap cost and easy access (12,13). Crystal methamphetamine is made from readily available substances, such as pseudoephedrine, and can be produced in local "meth labs," which are usually small operations in residential locations (2). In a cohort of Canadian street-involved youth, almost 65% of study participants could obtain crystal methamphetamine within 10 minutes (13). Other reasons for crystal methamphetamine initiation may include curiosity and entrenchment in local drug scenes (14).

Several health and social factors have previously been associated with crystal methamphetamine use in street-involved youth. A study of homeless youth showed that those with a history of foster care placement were more likely to use crystal methamphetamine than those without (15). Other factors previously associated with crystal methamphetamine use include a history of incarceration, older age, trading sex for money and injection drug use (6,16). A 2008 meta-analysis found that crystal methamphetamine use was associated with several harmful behaviours, including risky sexual practices and alcohol and cigarette consumption (12). However, all studies included in the meta-analysis were either cross-sectional or retrospective and many of the risk factors analyzed came from one study with a small sample size (12). The study authors concluded that future research should utilize prospective study designs so that temporal relationships between risk factors and crystal methamphetamine use can be established (12).

Although there is a lack of research on factors affecting initiation of crystal methamphetamine among street youth, there is a diverse literature in other populations. For instance, gender differences in methamphetamine use patterns are well described (17,18) and seem to vary based on the population studied. A Chinese study of adults with substance abuse found that men were more likely to use methamphetamine than women (19). Similarly, in a cohort of adult injection drug users from Canada, female gender was found to

be protective against methamphetamine initiation (20). In contrast, a study of injection drug users in Tijuana, Mexico, found that females were more likely to use methamphetamine, a finding possibly explained by an increased prevalence of methamphetamine use among sex-trade workers (21). However, a common finding is that females tend to initiate methamphetamine use at a younger age (17).

Ethnic differences in methamphetamine use have also been studied (22–24). This literature generally suggests that methamphetamine use is more common among individuals of Caucasian ethnicity (23,24), especially male blue-collar workers (2).

Mental health disorders have also been associated with methamphetamine use. A recent systematic review found that methamphetamine use was associated with psychosis and depression in young people (25). Of the few prospective studies included in the analysis, one found that methamphetamine users were more likely to have depression, dysthymia and post-traumatic stress disorder (PTSD) (26), although a separate study found that early depression and anxiety were not predictive of future methamphetamine use in adulthood (27). Despite these findings, most of the studies included in the systematic review were cross-sectional. Therefore, conclusions regarding possible links between pre- existing mental health disorders and subsequent methamphetamine initiation could not be made.

Despite the recognition of increasing crystal methamphetamine use among high-risk young people, few prospective studies have examined socio-demographic and drug use- related risk factors for initiation of use. Therefore, the present study was conducted on a prospective cohort of street-involved youth to examine rates of initiation and risk factors for initiation into crystal methamphetamine use.

Methods

The At-Risk Youth Study (ARYS) is a prospective cohort study of Vancouver street-involved youth that has been described in detail previously (28). In brief, extensive street and agency-based outreach recruitment methods, with snowball sampling (whereby participants recruit their friends), were utilized. Eligibility for the ARYS study included age 14–26 years at baseline and use of illicit drugs other than marijuana in the past 30 days. At baseline and every 6 months thereafter, participants completed an interviewer- administered questionnaire pertaining to socio-demographic information and sex- and drug-related risk behaviors, including specific drugs used and modes of use. Pre- and post- test counseling, as well as referral to health services, was provided at each interview. At every visit, participants also provided blood samples in order to ascertain HIV and hepatitis C (HCV) infection status and received $20 CAD as remuneration. The study has received ethics approval by the Research Ethics Board of the University of British Columbia. For the present analyses, individuals recruited between September 2005 and May 2012, reporting never having used crystal methamphetamine at baseline and who had at least one follow- up visit (to assess for initiation into crystal methamphetamine use) were eligible.

Given this study's objective to identify socio-demographic characteristics potentially associated with crystal methamphetamine initiation (27), and given past analyses showing the potential role of a range of sociodemographic characteristics on methamphetamine use and related harms (6,12,15–19,21,23–27), we selected the following covariates a priori based on their known or hypothesized relationship with the primary outcome: age at interview; age of first illicit (hard) drug use; gender (female versus male); ethnicity (Caucasian versus other); high school drop-out (yes versus no); living in Vancouver's drug use epicenter, known as the "Downtown Eastside" (14) (yes versus no); homelessness (yes versus no); injection drug use (yes versus no); daily marijuana use (yes versus no); cocaine

use (yes versus no); crack cocaine smoking (yes versus no); heroin use (yes versus no); nonfatal overdose (yes versus no); borrowing or sharing syringes (yes versus no); any injection of drugs in public (yes versus no); hepatitis C positivity (yes versus no); HIV positivity (yes versus no); unsafe sex, defined as vaginal or anal penetration without a condom (yes versus no); diagnosis of a mental illness (yes versus no); victim of violence (yes versus no); police encounter, defined as having been stopped, searched or detained by police (yes versus no); history of sexual abuse (yes versus no); history of physical abuse (yes versus no); involvement in sex work, defined as exchanging sex for money, gifts, food, shelter, clothes, drugs or other (yes versus no); and drug dealing (yes versus no). Unless otherwise noted, all behavioral variables refer to the 6-month period prior to the interview. All variable definitions have been used extensively and were identical to earlier publications (29,30).

Descriptive statistics were used to describe the sample at baseline. Categorical explanatory variables were analyzed using Pearson's chi-square test and continuous variables were analyzed using the Wilcoxon rank sum test. We then used Cox regression analysis to identify risk factors for initiation into crystal methamphetamine use. As a first step, bivariate Cox regression analyses were used. In order to adjust for potential confounding, we fit a multivariate model where all variables that were p 0.20 in Cox regression bivariate analyses were considered in a full model. Variable selection for the final model was done using Akaike Information Criterion (AIC) statistic with a backward model selection procedure (31). All statistical analyses were performed using SAS software version 8.0 (SAS, Cary, NC, USA). All p values are two sided.

Results

Between September 2005 and May 2012, 1019 street youth were recruited into the ARYS cohort, among whom 704 (69.0%) reported any prior crystal methamphetamine use at baseline. Overall, 205 (20.1%) reported never having used crystal methamphetamine at baseline interview and had at least one follow-up visit and were therefore included in the analysis. There were no significant differences in age, gender or ethnicity between these participants and the 110 (10.8%) individuals who were ineligible for the present study because they did not complete a study follow-up visit (all $p > 0.05$).

Of the 205 participants, 46 (22.4%) reported crystal methamphetamine use at some point during follow-up for an incidence density 12.2 per 100 person-years. Among this sample, the median age was 21 (interquartile range [IQR]: 19–24), 135 (65.8%) were male, and 116 (56.6%) were Caucasian. The median follow-up duration was 19.9 months (IQR = 11.7–29.0).

Table 1 displays the baseline characteristics of the study sample. Almost two-thirds of participants (65.4%) were homeless in the 6 months prior to baseline interview and a high prevalence of illicit drug use was present, including marijuana (48.8%), cocaine (48.8%), crack cocaine (45.4) and heroin (18.0%). Injection drug use was also common with 12.7% of participants reporting injection drug use in the 6 months prior to baseline interview. There was also a high prevalence of unsafe sex (48.3%), mental illness (39.5%), victims of violence (42.4%) and drug dealing (52.2%).

Table 2 shows the unadjusted and adjusted relative hazards of crystal methamphetamine initiation. As shown, in the multivariate Cox regression analysis, factors that were independently associated with crystal methamphetamine initiation included being male (adjusted relative hazard [ARH] = 2.12 [95% CI: 1.06–4.25]), crack cocaine smoking (ARH = 2.24 [95% CI: 1.20–4.20]), nonfatal overdose (ARH = 3.63 [95%CI: 1.65–7.98]) and drug

dealing (ARH = 1.98 [95% CI: 1.05–3.71]). Several factors were also significantly associated with crystal methamphetamine use in the unadjusted model (injection drug use, cocaine use and police encounters), but were no longer significant in the adjusted model.

Discussion

In the present study, we found high rates of crystal methamphetamine initiation among street-involved youth and found that being male, smoking crack cocaine and engaging in drug dealing were all independently associated with crystal methamphetamine initiation. Those reporting crystal methamphetamine initiation were also more likely to report a recent nonfatal overdose.

To our knowledge, this is the first study to show prospectively that crystal methamphetamine initiation is associated with crack cocaine smoking among street-involved youth. Those participants who smoked crack cocaine had over two times the risk of initiating crystal methamphetamine use. Our findings are consistent with studies of other high-risk populations, which show a link between crystal methamphetamine and crack cocaine use (32,33). This reflects the possibility that crack cocaine use predisposes to other stimulant use, such as crystal methamphetamine, and visa versa. Street youth who use stimulants may be part of social networks where other stimulant use is readily available (34). As well, entrenchment in drug culture likely precipitates use of other drugs (14). Another possibility is that street youth who use crack cocaine may switch to crystal methamphetamine, as it is easy to access (13). Furthermore, first use of harder drugs often occurs between the ages of 18–22, a similar age range to our population (35). Given that stimulant users often engage in polysubstance use, and that crack cocaine has been associated with HIV and HCV risk behavior (36–39), the possible combination of crack cocaine use with crystal methamphetamine use is especially concerning from a public health perspective.

This study is also unique in that it shows, prospectively, that drug dealing is a risk factor for crystal methamphetamine use. This is supported by a prior study that found an association between more frequent crystal methamphetamine use and crystal methamphetamine injection with drug dealing in a cohort of methamphetamine users (40). The association between dealing drugs and initiation of crystal methamphetamine may represent several factors. First, drug dealers may be more likely to use the drugs they are selling, especially as many drug users sell drugs to support their own drug use (40,41). Secondly, drug dealing often occurs in a hostile, violent environment and crystal methamphetamine use may help dealers cope in this environment. Conversely, people who have hostile personalities may be more likely to deal drugs and use drugs such as crystal methamphetamine (40). Interestingly, a 2011 study by Werb et al. showed that drug dealers who recently used crystal methamphetamine were less willing to cease dealing than those that recently used other drugs (42). Thirdly, as drug dealers are targets for law enforcement, they are less likely to access harm reduction or drug prevention or treatment programs (43). Nevertheless, the connection between drug dealing and subsequent initiation of crystal methamphetamine use is unknown and is an area for further research.

Our study showed that men were significantly more likely to initiate crystal methamphetamine use, a finding seen in other studies (40,44). The cause of this gender difference is unknown, but it may relate to drug market influences, including potentially men having more opportunity to buy drugs (45,46). It also may relate to the popularity of crystal methamphetamine in the men-who-have-sex-with-men population, though this group is overall not well represented in our sample (47). However, these findings may also be the

result of regional differences, as a 2012 study of 156 street youth in Los Angeles found no gender differences among crystal methamphetamine users (16).

There are several limitations to this study. As there are no voters' lists or other registries from which to draw a random sample, caution is required when interpreting our results to other populations of street youth. However, it is noteworthy that the cohort demographics are similar to other local and international studies of street-involved youth (16,48,49). Second, there is a concern of socially desirable responding in studies of marginalized populations (50). With respect to this concern, we know of no reason why risk behaviors would be differentially reported between crystal methamphetamine users and nonusers. Nevertheless, although confidentiality is assured as part of the interview and interviewers are trained to build trust and rapport with the participants, it is possible we underestimated some behaviors in the present study.

In summary, the present study found high rates of crystal methamphetamine initiation among street-involved youth and that this behavior was associated with being male, crack cocaine smoking and drug dealing. These findings identify a specific population that may benefit from more targeted intervention strategies. In an environment where public health initiatives are continuously hindered by a lack of funding, targeting the highest risk groups with evidence-based interventions may be the most efficient way of decreasing rates of initiation of crystal methamphetamine use and decreasing the subsequent spread of infections diseases and other harms. However, our findings also underscore the urgent need for novel evidence-based prevention and addiction treatment initiatives for crystal methamphetamine users.

Acknowledgments

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Table 1

Characteristics of 205 street-involved youth reporting never having used crystal methamphetamine at baseline.

Characteristic	Total (%) (n = 205)
Age at interview (median [IQR[a]])	21.4 (19.1–23.5)
Age of first hard drug use (median [IQR])	16.0 (14.0–18.0)
Male	135 (65.8)
Caucasian	116 (56.6)
High school drop-out	140 (68.3)
Living in the DTES[b,c]	49 (23.9)
Homelessness	134 (65.4)
Injection drug use	26 (12.7)
Daily marijuana use	100 (48.8)
Cocaine use[d]	100 (48.8)
Crack cocaine smoking	93 (45.4)
Heroin use	37 (18.0)
Frequent alcohol use	24 (11.7)
Nonfatal overdose	14 (6.9)
Syringe sharing	3 (1.4)
Public injection	16 (7.8)
Hepatitis C positive	7 (3.4)
HIV positive	2 (1.0)
Unsafe sex	99 (48.3)
Mental illness diagnosis	81 (39.5)
Victim of violence	87 (42.4)
Police encounter	57 (27.8)
History of sexual abuse	46 (22.4)
History of physical abuse	74 (36.1)
Sex work	10 (4.9)
Drug dealing	107 (52.2)

[a]IQR, interquartile range.

[b]DTES, downtown eastside.

[c]Recent = all behavioral variables refer to the past 6 months.

[d]Powder by any route.

Table 2

Bivariate and multivariate Cox regression analysis of factors associated with crystal methamphetamine initiation in street-involved youth.

Characteristic	Unadjusted		Adjusted	
	Relative hazard (95% CI)	*p* Value	Relative hazard (95% CI)	*p* Value
Age at interview (yes versus no)	0.93 (0.84–1.03)	0.157		
Male (yes versus no)	1.70 (0.86–3.34)	0.126	2.12 (1.06–4.25)	0.035
Caucasian (yes versus no)	1.08 (0.60–1.93)	0.809		
Homelessness[a] (yes versus no)	1.69 (0.93–3.07)	0.084		
Injection drug use (yes versus no)	2.15 (1.09–4.27)	0.028		
Daily marijuana use (yes versus no)	1.18 (0.65–2.15)	0.584		
Cocaine use[b] (yes versus no)	1.86 (1.02–3.38)	0.043		
Crack cocaine smoking (yes versus no)	3.35 (1.72–6.53)	<0.001	2.24 (1.20–4.20)	0.012
Heroin use (yes versus no)	1.63 (0.82–3.23)	0.162		
Alcohol use (yes versus no)	1.23 (0.55–2.76)	0.610		
Nonfatal overdose (yes versus no)	4.34 (2.08–9.09)	<0.001	3.63 (1.65–7.98)	0.001
Unsafe sex (yes versus no)	1.06 (0.59–1.89)	0.847		
Mental illness diagnosis (yes versus no)	1.62 (0.90–2.88)	0.104		
Police encounter (yes versus no)	2.04 (1.10–3.77)	0.023	1.66 (0.88–3.14)	0.118
History of sexual abuse (yes versus no)	0.74 (0.35–1.54)	0.414		
History of physical abuse (yes versus no)	1.49 (0.81–2.73)	0.197		
Sex work (yes versus no)	1.67 (0.59–4.71)	0.334		
Drug dealing (yes versus no)	3.05 (1.70–5.46)	<0.001	1.98 (1.05–3.71)	0.034

[a] All behavioral variables refer to the past 6 months.

[b] Powder by any route.