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High prevalence of self-reported exposure to adulterated drugs among people who experienced an opioid overdose in a Canadian setting: a cohort study

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Abstract

Background: In North America, rates of overdoses are increasing largely due to the adulteration of illicit drugs by illicit synthetic opioids.

Objectives: We sought to examine the prevalence and correlates of self-reported exposure to adulterated drugs among people who experienced a non-fatal opioid overdose.

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Authors' contributions

MJM, KH, and KD managed the cohorts during the study period. AP and KH designed the present study. EN conducted the statistical analyses. AP drafted the manuscript, and incorporated suggestions from all co-authors. All authors made significant contributions to the conception of the analyses, interpretation of the data, and drafting of the manuscript.

Disclosure of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

DECLARATIONS

Ethics approval and consent to participate

All participants provided written informed consent for study participation. The cohort studies received annual ethics approval from the University of British Columbia and Providence Health Care Research Ethics Board. The Principal Investigators of the cohorts granted permission to use the data for the present study, which was part of the larger cohort study activities that receive annual ethics approval by the aforementioned Research Ethics Boards.

Consent for publication

Not applicable.

Availability of data and materials

The data used for this study is not publicly available. For further information on the data and materials used in this study, please contact the corresponding author.

Methods: Data were derived from three prospective cohort studies of people who use drugs in Vancouver, Canada between June and November 2016. Multivariable logistic regression analyses were used to examine the prevalence and correlates of self-reported exposure to adulterated drugs.

Results: Among 117 participants who reported symptoms consistent with a non-fatal opioid overdose, 78 (66.7%) reported believing the drug was adulterated during their last overdose. Of those, 42 (53.8%) had not perceived adulteration prior to overdose. In the multivariable analysis, engagement in opioid agonist therapy (Adjusted Odds Ratio [AOR] = 2.79, 95% Confidence Interval [CI]: 1.10, 7.45) was independently associated with having not perceived adulteration prior to overdose. Daily heroin use (AOR = 5.28; 95% CI: 1.92, 15.97) and reporting supervised injection site staff were present at most recent overdose (AOR = 6.16; 95% CI: 1.25, 47.27) were independently associated with having perceived adulteration prior to overdose.

Conclusions/Importance: We found a high prevalence of believing adulterated drugs were present for the most recent overdose. Further, the high prevalence of unperceived adulteration prior to overdose supports the need to lower the risk of overdose by providing individuals with options to consume drugs in a safer manner, including supervised consumption sites.

Keywords

overdose; adulterated drugs; addiction treatment

INTRODUCTION

In North America, overdoses from illicit drugs have reached unprecedented levels with many believed to be attributed to synthetic opioids adulterating drugs including heroin, stimulants, and counterfeit prescription opioids (Frank & Pollack, 2017; Mounteney, Giraudon, Denissov, & Griffiths, 2015; Somerville et al., 2017). A major factor in the overdose crisis is illicitly manufactured fentanyl, a synthetic opioid much stronger than morphine, now detected in 74% of opioid overdose deaths in Massachusetts and 81% in the Canadian province of British Columbia (British Columbia Coroners Service, 2017; Somerville et al., 2017; Volpe et al., 2011). However, despite the severity of the crisis, previous U.S. studies suggested that the level of drug users' knowledge regarding adulterated drugs was limited (Carroll, Marshall, Rich, & Green, 2017; Park, Weir, Allen, Chaulk, & Sherman, 2018). This study aimed to investigate the prevalence and correlates of self-reported exposure to adulterated drugs among a cohort of people who use illicit drugs and recently experienced a non-fatal opioid overdose in Vancouver, Canada.

METHODS

Study Procedures

The Vancouver Injection Drug Users Study (VIDUS), the AIDS Care Cohort to evaluate Exposure to Survival Services (ACCESS), and the At-Risk Youth Study (ARYS) are ongoing open prospective cohorts of people who use illicit drugs recruited through self-referral and street outreach in Vancouver, Canada. These studies have been described previously (Tyndall et al., 2003; Wood, Stoltz, Montaner, & Kerr, 2006). At baseline and semiannually thereafter, participants complete a harmonized interviewer-administered

questionnaire eliciting information on socio-demographics, drug use patterns, and health care utilization. Participants receive a \$40 (CDN) honorarium for each study visit. The University of British Columbia/Providence Health Care Research Ethics Board has provided ethical approval for all studies. The study setting of Vancouver includes the Downtown Eastside (DTES), home to a large open drug scene (Wood & Kerr, 2006), with a range of harm reduction programs and treatments for drug use disorders including Insite, North America's first supervised injection facility (Marsh & Fair, 2006; Vancouver Coastal Health, 2017).

The present analysis included all participants who completed a study visit between June 1 and November 30, 2016, and who self-reported overdose symptoms consistent with an opioid overdose (e.g., lost consciousness, had a hard time breathing, stopped breathing) in the previous six months as only those who experienced an overdose answered a question for the primary outcome variable. The primary outcome of interest was self-reported exposure to adulterated drugs, either perceiving it or not prior to the last non-fatal opioid overdose (perceived adulteration vs. unperceived adulteration vs. no adulteration [the reference category]). This variable was ascertained from a question regarding the most recent overdose in the previous six months: "Do you think what you took was cut with anything?" Participants who reported yes were subsequently asked: "Did you expect that it would be cut with anything?" and "What do you think it was cut with?" Participants were additionally asked the drug(s) they intended to take during their last apparent opioid overdose.

Based on the literature, we selected explanatory variables that we hypothesized might be associated with reporting adulterated drug use (Macmadu, Carroll, Hadland, Green, & Marshall, 2017; Mercado et al., 2017). Variables included: cohort designation (ACCESS vs. VIDUS vs. ARYS); age (per year older); sex (male vs. female); ancestry (white vs. non-white); and residing in the DTES in the previous six months. Drug use patterns in the previous six months included: any injection drug use; daily heroin use; daily prescription opioid use; and daily stimulant use (i.e., powder or crack cocaine or crystal methamphetamine). Other exposures and health variables included: Insite (Vancouver's supervised injection site) staff present at the most recent overdose; other people present at the most recent overdose (not including Insite staff); involvement in drug dealing in the previous six months; and engagement in opioid agonist therapy in the previous six months. All behavioural variables were dichotomized as yes vs. no, unless otherwise stated.

We first used bivariable logistic regression to examine variables associated with self-reported exposure to adulterated drugs. Next a multivariable logistic regression model was constructed where age and all variables that demonstrated a p-value of <0.05 in unadjusted analyses were included. All missing data was removed from the analysis. In the sub-analysis, we used descriptive statistics to examine what drug participants intended to take during their most recent opioid overdose stratified by the three categories of self-reported exposure to adulterated drugs. This was done to identify potential differences in reporting adulterated drugs, perceived or not, among the various intended drug types. All *p*-values are two-sided. All statistical analyses were performed using R, version 3.2.4 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

In total 117 individuals were eligible for the present study with a median age of 32.5 (interquartile range [IQR]=24.9–46.3) years and 45 (38.5%) were female. Overall 78 (66.7%) participants reported exposure to adulterated drugs during their most recent overdose; with 36 (46.2%) perceiving and 42 (53.8%) not perceiving adulteration prior to overdose. Among participants reporting adulteration 72 (92.3%) believed the drug was adulterated with fentanyl.

The results of the multivariable analysis for not perceiving adulteration prior to overdose are presented in Table 1. The only factor independently associated with unperceived adulteration was engagement in opioid agonist therapy [Adjusted odds ratio (AOR)=2.79; 95% confidence interval (CI): 1.10, 7.45]. The results of the multivariable analysis for perceiving adulteration prior to overdose are presented in Table 2. Factors independently associated with perceived adulteration included: daily heroin use (AOR=5.28; 95% CI: 1.92, 15.97) and having Insite staff present at the most recent opioid overdose (AOR=6.16; 95% CI: 1.25, 47.27). The results of the sub-analysis investigating significant differences in reporting the exposure to adulterated drugs (i.e. no adulteration vs. perceived adulteration vs. unperceived adulteration) for each intended drug type, are presented in Table 3. Those who intended to use heroin only (or in combination with other opioids or sedatives) appeared more likely to report adulterated drugs, both perceived or unperceived, compared to reporting no adulteration. None of those who used stimulants (or in combination with sedatives) reported perceived adulteration prior to overdose. Likewise, none of those using other opioids (or in combination with sedatives; not heroin) or those using sedatives or other drugs only reported adulteration, either perceived or unperceived. Finally, 19 (16.2%) individuals reported not intending to use opioids nor heroin but still experienced symptoms consistent with an opioid overdose.

DISCUSSION

In the present study, approximately two-thirds of participants who experienced a recent apparent opioid overdose reported believing the drug was adulterated. Our results indicate those currently engaged in opioid agonist therapy were more likely to have not perceived adulteration prior to overdose. This may indicate long-term opioid users engaged in opioid agonist therapy may believe their heroin is unadulterated due to longer histories with drug sources. Research should further investigate this association. The significant association with unperceived adulteration has widespread consequences and signifies the need to strengthen overdose prevention efforts, including increased education for opioid agonist therapy patients.

In our analysis daily heroin use was significantly associated with perceiving drug adulteration prior to overdose. This is consistent with local reports suggesting heroin is the substance most likely adulterated with fentanyl (British Columbia Coroners Service, 2017; Vancouver Coastal Health, 2016), which may have increased awareness of adulterated drugs among daily heroin users. However, we also found individuals who did not intend to use opioids but still had symptoms consistent with an opioid overdose. These findings are

consistent with other reports suggesting illicit fentanyl is present in a range of non-opioid drugs, including cocaine and crystal methamphetamine (Frank & Pollack, 2017). Expanding drug testing services may help people who use drugs identify adulterated drugs and take measures to reduce overdoses.

Participants who had an Insite staff present at their most recent opioid overdose were more likely to have perceived adulteration prior to overdose. Insite users are able to test drugs before they inject and therefore may have an increased awareness for the presence of fentanyl, if they then happen to overdose (Vancouver Coastal Health, 2016). Considering the body of evidence demonstrating decreased overdose frequency when supervised injection sites are available (Potier, Laprevote, Dubois-Arber, Cottencin, & Rolland, 2014), ensuring users have access to supervised consumption sites is essential.

This study has several limitations. First, the VIDUS, ACCESS, and ARYS cohorts are not random samples and therefore cannot represent all populations of people who use illicit drugs. Second, data collection was based on self-report and thus could be subject to reporting bias. In particular, we were unable to determine if the drugs reported as adulterated were truly so, which may have attenuated the significant findings.

In summary, our findings indicate a high prevalence of people believing drugs at their last opioid overdose were adulterated. Further, the high prevalence of unperceived adulteration prior to overdose indicates the need to strengthen overdose prevention efforts and education. It is imperative that communities enable people who use drugs with options to consume drugs in a safer manner, including through supervised injection sites. Also, increased overdose education for patients on opioid agonist therapy is essential for reducing drug overdoses.

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ABBREVIATIONS

DTES	Downtown Eastside
HIV	Human immunodeficiency virus.

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Table 1.

Bivariable and multivariable analysis of factors associated with not perceiving drug adulteration prior to overdose among people who experienced an opioid overdose in Vancouver, Canada.

Characteristic	Unadjusted		Adjusted	
	Odds Ratio (95% CI)	p – value	Odds Ratio (95% CI)	p – value
Cohort				
(ARYS vs. ACCESS)	0.46 (0.13, 1.56)	0.219		
(VIDUS vs. ACCESS)	0.71 (0.20, 2.36)	0.583		
Age				
(per year older)	1.02 (0.98, 1.05)	0.389	1.01 (0.97, 1.05)	0.632
Sex				
(male vs. female)	0.57 (0.23, 1.37)	0.210		
Ancestry				
(Caucasian vs. other)	0.77 (0.32, 1.84)	0.551		
DTES residency[*]				
(yes vs. no)	1.54 (0.64, 3.78)	0.336		
Injection drug use[*]				
(yes vs. no)	3.36 (0.89, 16.30)	0.092		
Daily heroin use^{*,†}				
(yes vs. no)	2.35 (0.97, 5.85)	0.060		
Daily prescription opioid use^{*,†}				
(yes vs. no)	0.92 (0.20, 4.16)	0.912		
Daily stimulant use^{*,†}				
(yes vs. no)	1.46 (0.60, 3.56)	0.407		
Insite staff present				
(yes vs. no)	3.08 (0.66, 22.00)	0.185		
Other people present				
(yes vs. no)	2.13 (0.78, 6.09)	0.147		
Drug dealing[*]				
(yes vs. no)	0.80 (0.31, 2.02)	0.637		
Engaged in opioid agonist therapy[*]				
(yes vs. no)	2.90 (1.16, 7.65)	0.026	2.79 (1.10, 7.45)	0.035

CI: Confidence interval

^{*} Denotes activities in the previous six months.

[†] Refers to any route of consumption (i.e., sniffing, snorting, smoking or injecting).

Table 2.

Bivariable and multivariable analysis of factors associated with perceiving drug adulteration prior to overdose among people who experienced an opioid overdose in Vancouver, Canada.

Characteristic	Unadjusted		Adjusted	
	Odds Ratio (95% CI)	p – value	Odds Ratio (95% CI)	p – value
Cohort				
(ARYS vs. ACCESS)	1.41 (0.34, 6.41)	0.638		
(VIDUS vs. ACCESS)	1.50 (0.36, 6.84)	0.582		
Age				
(per year older)	1.01 (0.98, 1.04)	0.611	1.01 (0.97, 1.05)	0.695
Sex				
(male vs. female)	2.19 (0.81, 6.28)	0.131		
Ancestry				
(Caucasian vs. other)	1.23 (0.49, 3.16)	0.663		
DTES residency *				
(yes vs. no)	1.49 (0.60, 3.79)	0.392		
Injection drug use *				
(yes vs. no)	2.84 (0.75, 13.86)	0.148		
Daily heroin use *,†				
(yes vs. no)	4.80 (1.83, 13.49)	0.002	5.28 (1.92, 15.97)	0.002
Daily prescription opioid use *,†				
(yes vs. no)	0.52 (0.07, 2.82)	0.460		
Daily stimulant use *,†				
(yes vs. no)	1.02 (0.40, 2.59)	0.970		
Insite staff present				
(yes vs. no)	5.29 (1.21, 36.88)	0.045	6.16 (1.25, 47.27)	0.041
Other people present				
(yes vs. no)	1.75 (0.63, 5.07)	0.287		
Drug dealing *				
(yes vs. no)	1.79 (0.71, 4.57)	0.219		
Engaged in opioid agonist therapy *				
(yes vs. no)	2.60 (1.00, 7.05)	0.055		

CI: Confidence interval

* Denotes activities in the previous six months.

† Refers to any route of consumption (i.e., sniffing, snorting, smoking or injecting).

Table 3:

Intended drug stratified by self-reported exposure to adulterated drugs among people who experienced an opioid overdose in Vancouver, Canada.

Intended drug	Self-reporting no exposure 39 (33.3%)	Self-reporting exposure		<i>p</i> – value*
		Unperceived prior to overdose 42 (35.9%)	Perceived prior to overdose 36 (30.8%)	
Heroin only or with other opioids, sedatives/hypnotic				
Yes	9 (23.1)	25 (59.5)	23 (63.9)	<0.001
No	30 (76.9)	17 (40.5)	13 (36.1)	<0.001
Other opioids only or with sedatives/hypnotic (not heroin)				
Yes	4 (10.3)	0 (0.0)	0 (0.0)	0.019
No	35 (89.7)	42 (100.0)	36 (100.0)	0.016
Stimulant only or with sedatives/hypnotics				
Yes	9 (23.1)	6 (14.3)	0 (0.0)	0.005
No	30 (76.9)	36(85.7)	36 (100.0)	0.011
Heroin and stimulant combination only or with other opioids				
Yes	7 (17.9)	6 (14.3)	11 (30.6)	0.204
No	32(82.1)	36(85.7)	25 (69.4)	0.184
Other opioid and stimulant combination only				
Yes	3 (7.7)	3 (7.1)	2 (5.6)	1.000
No	36 (92.3)	39 (92.9)	34 (94.4)	0.931
Sedatives/hypnotic only				
Yes	4 (10.3)	0 (0.0)	0 (0.0)	0.019
No	35 (89.7)	42 (100.0)	36 (100.0)	0.016

* A p-value of <0.05 indicates a significant difference in reporting the exposure to adulterated drugs (i.e. no adulteration vs. perceived adulteration vs. unperceived adulteration) for each intended drug type.