Impact of binge alcohol on mortality among people who inject drugs

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A R T I C L E   I N F O

A B S T R A C T

Introduction: While the impacts of illicit drug use on mortality have been well described, the impact of poly-substance that includes alcohol has received less attention. We examined the impact of binge alcohol use on mortality among a cohort of people who inject drugs (PWID) in a Canadian setting.

Methods: Using data derived from a prospective cohort study of PWID in Vancouver, Canada recruited between May 1996 and November 2013. We ascertained dates and causes of death through a confidential linkage with the provincial registry and examined the impact of binge alcohol use. The primary outcome of interest was all-cause mortality. We used Cox proportional hazard regression to determine factors associated with mortality, including socio-demographic characteristics, drug use patterns and other risk behaviours.

Results: During the study period, 2550 individuals were followed (844 of whom were HIV positive at baseline) for a median of 75.4 months (interquartile range 37.9–113.2). Of these, 795 (31%) participants reported binge alcohol use at some time during the study period. In multivariable analyses, binge alcohol use remained independently associated with all-cause-mortality (adjusted hazard ratio = 1.41; 95% confidence interval: 1.06–1.88) after adjustment for other drug use patterns.

Conclusions: Binge alcohol use was associated with time to all-cause mortality among PWID in this setting. Since alcohol use is often overlooked as a risk factor for mortality among this population, these findings highlight the continued need to incorporate addiction treatment and public health interventions and policies that address binge alcohol use to reduce alcohol related-harms.

1. Introduction

Approximately 11–21 million people inject drugs worldwide (Degenhardt & Hall, 2012). Injection drug use is a well established-risk factor for increased morbidity and mortality (Degenhardt, Bucello, et al., 2011; Mathers & Degenhardt, 2014; Mathers et al., 2013; Miller, Kerr, Strathdee, Li, & Wood, 2007) with previous studies demonstrating that the mortality for people who inject drugs (PWID) exceeds the general population by as much as 13 to 15 times (Hulse, English, Milne, & Holman, 1999; Mathers et al., 2013). Previous studies have denoted that fatal overdose accounts for the majority of deaths in the illicit drug using population (Degenhardt, Bucello, et al., 2011; Mathers

et al., 2013). Though other acute and chronic diseases also contribute to mortality for PWID the majority of non-overdose related deaths are attributable to preventable risk factors including infectious disease such as HIV as well as suicide (Miller et al., 2007).

Although alcohol consumption patterns vary geographically (Rehm et al., 2003), alcohol use disorder (AUD) is one of the most prevalent substance use disorders with an estimated 3.6% of adults affected globally (J Rehm et al., 2009). In Canada in 2012, 18.1% of the population met the criteria for AUD in their lifetime and 3.2% of the population met the same criteria over the last 12 months (Pearson, Janz, & Ali, 2013). AUDs inflict one of the largest burdens on mortality globally and are estimated to account for the largest years of life lost within mental health and substance use disorders at 44.4%, with the largest burden occurring among working age adults (Whiteford et al., 2013). AUD also has a large impact on the non-fatal burden of disease and is estimated to account for 9.6% of disability-adjusted-life years lost worldwide and an estimated 7.9% of years of life lived with disability (Whiteford et al., 2013). Individuals with AUD have a high mortality risk, with individuals in clinical settings estimated to be three to five times greater risk for death, with women at an increased risk in comparison to men (Roerecke & Rehm, 2013).

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Concurrent use of illicit drugs and alcohol is known to be a major contributor to overdose mortality. The impact of the use of central nervous system depressants such as alcohol on fatal and non-fatal overdose has been well described with opioid injection drug use (Degenhardt, Bucello, et al., 2011; Kerr et al., 2007; White, Hingson, Pan, & yi, 2011), with one study reporting an increased mortality risk by as much as 69% (Fischer et al., 2004). In New York City between 1990 and 1998, the combination of alcohol, opioids and cocaine was shown to be the most common cause of overdose death, accounting for 97.6% of all overdose deaths (Coffin et al., 2003). Another study in California showed a two-fold increase in nonfatal overdose for PWID who reported drinking alcohol 17 out of the last 30 days (Martinez, D'Amico, Kral, & Bluthenthal, 2012). In this study, 19% of participants reported drinking alcohol daily in the last 30 days (Martinez et al., 2012). Although this evidence suggests the importance of understanding the impact of alcohol on overdose mortality, there are limited data that explore the impact of binge alcohol use patterns on all-cause mortality among PWID. Therefore, the present study was undertaken to examine the effect of binge alcohol use on mortality in PWID in a Canadian setting.

2. Materials and methods

Our study was performed using data from the Vancouver Injection Drug Users Study (VIDUS) and AIDS Care Cohort to Evaluate Access to Survival Services (ACCESS), which are longstanding prospective cohorts of PWID operating in the Downtown Eastside of Vancouver, Canada. Both studies share identical recruitment and follow-up procedures, allowing for pooling of the data, with the only variance between the cohorts being that the ACCESS cohort includes only HIV-positive individuals and includes injection and non-injection drug users whereas VIDUS includes only HIV-negative PWID. Detailed descriptions of sampling and recruitment procedures for both cohorts have been described elsewhere (Milloy et al., 2012; Strathdee, Palepu, Cornelisse, et al., 1998; Tyndall et al., 2003).

Eligibility criteria included participants aged 18 years or older, any illicit drug use other than cannabinoids in the previous month (for ACCESS) or any injection drug use in the previous month (for VIDUS) and a current resident of the Greater Vancouver Regional District. All participants provided written and informed consent and are compensated ($20) their time and transportation for each study visit. These cohorts receive annual approval from the University of British Columbia/Providence Healthcare Research Ethics Board.

At baseline and semi-annually thereafter, participants complete an interviewer-administered questionnaire and provide blood samples. Questionnaires ascertain a range of data including demographic characteristics, injection and non-injection drug use and sexual risk behaviours. All interviews occur in a private space with pre- and post-test counselling provided by trained study nurses. Participants who test positive for antibodies to HIV or Hepatitis C virus (HCV) are referred for ongoing health care. Individuals known to be HIV-positive provide blood samples for ongoing HIV disease monitoring.

Using a confidential linkage with the British Columbia Vital Statistics Agency, we ascertained dates and causes of death among study participants and through ongoing locator contacts provided by study participants. The Vital Statistics database recorded causes of death according to International Classification of Diseases (ICD), 10th edition. Both studies are observational and do not include any active study interventions. Participants in the VIDUS cohort that seroconvert during the study period are offered continued study participation in the ACCESS (HIV-positive) cohort.

The present study was restricted to individuals with a history of injecting drugs who were recruited between May 1996 and November 2013. To avoid potential bias relating to long durations between the last date of study visit where behavioural information was assessed and the date of death (i.e., loss to regular follow up), individuals who were identified as deceased more than 24 months after the last follow-up visit were censored on the date of the last follow up.

Our primary outcome of interest was time to death (all-cause). The primary explanatory variable of interest was binge alcohol use, defined by answering "Yes" to the question, "Have you binged on alcohol in the last 6 months (that is when you used alcohol more than usual)?". We also considered a number of substance use behaviours in the previous six months including ≥daily heroin injection (yes vs. no), ≥daily cocaine injection (yes vs. no), ≥daily crack cocaine smoking (yes vs. no) and ≥daily amphetamine injection (yes vs. no). Other variables included: age (per 10 years older); gender (male vs. female); ethnicity (Caucasian vs. non-Caucasian); living in unstable housing (yes vs. no); HIV serostatus (positive vs. negative) and enrolment in methadone maintenance treatment (yes vs. no). These time-updated variables referred to exposures occurring in the six-month period prior to each study interview. As previously defined, unstable housing includes living in single room occupancy hotels, shelters or other transitional housing or living on the street (Spittal et al., 2002; Wood et al., 2007).

First, we examined baseline characteristics of the study sample, stratified by self-reported binge alcohol use in the previous 6 months. The initial analysis included the Chi-square test for dichotomous variables and the Wilcoxon rank sum test for continuous variables. All-cause mortality rate and 95% confidence intervals [CI] were calculated using the Poisson distribution.

Next, we used bivariable Cox proportional hazard regression to examine the relationship between each explanatory variable and time to death. All behavioural variables were treated as time-varying variables. To fit the multivariable model, we employed a conservative stepwise backward selection approach, as previously described in full (Lima et al., 2012; Milloy et al., 2011). In brief, we included all variables found to be significantly associated with time to death in bivariable analyses at $p < 0.10$ in a multivariable model, and used a stepwise approach to fit a series of reduced models. After comparing the value of the coefficient associated with binge alcohol use in the full model to the value of the coefficient in each of the reduced models, we dropped the secondary variable associated with the smallest relative change. We continue this iterative process until the minimum change exceeded 5%. Remaining variables were considered as potential confounders in a final multivariable model.

3. Results

A total of 2854 individuals were recruited during the study period between and May 1996 and November 2013. Among these 304 (10.7%) participants were excluded as a result of only having a baseline study visit, lacking of either follow-up visit or death date within 24 months from baseline. In comparison to those included in the present study, those excluded were younger ($p = <0.001$) but had no significant differences in gender, ethnicity and binge alcohol use ($p > 0.05$).

Overall, the study sample was followed for a median of 75.4 months (inter-quartile range [IQR]: 37.9–113.2). At baseline, 1687 were male (66.2%), 1541 reported Caucasian ethnicity (60.4%), the median age was 37.7 years (IQR: 29.9–44.2) and 381 (15%) reported binge alcohol use in the previous six months. At baseline, 971 (36%) individuals reported ≥daily heroin injection in the previous six months, 735 (28.8%) reported ≥injected cocaine daily, 614 (24.1%) reported ≥daily crack cocaine smoking and 44 (1.7%) injected amphetamines ≥daily. As shown in Table 1, at baseline, those who reported binge alcohol use were more likely to be younger (median age: 34.6 years vs. 38.3 years, $p < 0.001$), less likely to be enrolled in methadone maintenance treatment (odds ratio [OR] = 0.19; 95% CI: 0.12–0.29) and less likely to be HIV positive (OR = 0.63; 95% CI: 0.49–0.81). In terms of drug use patterns, binge alcohol use was negatively associated with ≥daily heroin injection (OR = 0.60; 95% CI: 0.47–0.76) and ≥daily crack cocaine smoking (OR = 0.50; 95% CI: 0.37–0.67) and positively associated with ≥daily cocaine injection (OR = 1.61; 95% CI: 1.28–2.02).