



Dual sexual and drug-related predictors of hepatitis C incidence among sex workers in a Canadian setting: gaps and opportunities for scale-up of hepatitis C virus prevention, treatment, and care



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ARTICLE INFO

Article history:

Received 20 September 2016

Received in revised form 14 December 2016

Accepted 16 December 2016

Corresponding Editor: Eskild Petersen, Aarhus, Denmark

Keywords:

Hepatitis C

HIV

Sexually transmitted infections

Sex work

SUMMARY

Background: Hepatitis C virus (HCV) represents a significant cause of morbidity and mortality globally. While sex workers may face elevated HCV risks through both drug and sexual pathways, incidence data among sex workers are severely lacking. HCV incidence and predictors of HCV seroconversion among women sex workers in Vancouver, BC were characterized in this study.

Methods: Questionnaire and serological data were drawn from a community-based cohort of women sex workers (2010–2014). Kaplan–Meier methods and Cox regression were used to model HCV incidence and predictors of time to HCV seroconversion.

Results: Among 759 sex workers, HCV prevalence was 42.7%. Among 292 baseline-seronegative sex workers, HCV incidence density was 3.84/100 person-years (PY), with higher rates among women using injection drugs (23.30/100 PY) and non-injection crack (6.27/100 PY), and those living with HIV (13.27/100 PY) or acute sexually transmitted infections (STIs) (5.10/100 PY). In Cox analyses adjusted for injection drug use, age (hazard ratio (HR) 0.94, 95% confidence interval (CI) 0.86–1.01), acute STI (HR 2.49, 95% CI 1.02–6.06), and non-injection crack use (HR 2.71, 95% CI 1.18–6.25) predicted time to HCV seroconversion.

Discussion: While HCV incidence was highest among women who inject drugs, STIs and the use of non-injection stimulants appear to be pathways to HCV infection, suggesting potential dual sexual/drug transmission. Integrated HCV services within sexual health and HIV/STI programs are recommended.

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Introduction

Hepatitis C virus (HCV) represents a significant and rising global public health issue, with 185 million people estimated to be living with HCV.^{1,2} Most persons living with HCV are chronically infected, which poses a high risk for the development of liver cirrhosis, liver cancer, and chronic liver disease.² In May 2016, the first-ever global hepatitis targets were adopted by the World Health Assembly, galvanizing attention for this previously under-recognized and relatively neglected health priority. These include reducing new viral hepatitis infections by 90% and reducing deaths due to viral

hepatitis by 65% by 2030, supporting increasing calls for scaling-up access to HCV prevention, treatment, and care.³

HCV is known to disproportionately affect marginalized and underserved populations, primarily people who inject drugs (PWID),^{4–6} and to a lesser extent, men who have sex with men (MSM).^{5,7} Although research on HCV among people who use non-injection drugs has recently increased, little remains known regarding HCV incidence among other key populations, particularly sex workers, who face potentially elevated risks due to dual drug and sexual transmission pathways. While little is known about HCV among sex workers, this population faces a greatly elevated burden of HIV, sexually transmitted infections (STIs), and other sexual- and drug-related harms. These harms have been primarily attributed to structural factors, including violence, unsafe working conditions, stigma, and criminalization, which

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undermine the negotiation of sexual and drug risk mitigation,^{8,9} as well as access to health and harm reduction services.^{10,11}

Among a small body of research on HCV among sex workers from non-endemic settings such as Estonia,¹² Argentina,¹³ and South Korea,¹⁴ HCV prevalence has been found to be consistently higher than in the general population, ranging from 1.4% among sex workers in South Korea to 7.9% in Estonia. Although few studies have assessed predictors of HCV incidence or prevalence among sex workers, previous work suggests that sex workers who are street-involved, criminalized, use drugs, and engage in syringe-sharing are particularly vulnerable to HCV.^{15,16} Amidst global calls for HCV treatment scale-up for key populations and the rising availability of new and highly effective direct-acting antiviral (DAA) treatments for HCV, addressing the gap in epidemiological data regarding the incidence and prevalence of HCV among sex workers remains of paramount importance.

In Metropolitan Vancouver, British Columbia (BC), women sex workers face a disproportionate burden of HIV (with an estimated prevalence of 12%),^{8,17} elevated sexual- and drug-related harms,^{18,19} and structural barriers to HIV and harm reduction services.^{8,10,11} Due to advances in HCV treatments, current efforts to scale up HCV treatment are currently being explored in BC, particularly for key populations facing intersecting harms related to substance use disorders, HIV, and HCV. Given evidence suggesting the potential for dual sexual and drug risk pathways for HCV acquisition, particularly within the context of sex with multiple partners, and the current dearth of HCV incidence data among sex workers, this study aimed to characterize the incidence and predictors of HCV infection among sex workers in Metropolitan Vancouver, BC.

Methods

Data collection

Data were drawn from An Evaluation of Sex Workers' Health Access (AESHA), a prospective cohort of over 800 women sex workers recruited through street, indoor, and online outreach across Metropolitan Vancouver from January 2010 to August 2014. AESHA is based on collaborations with sex work agencies that have existed since 2005 and is monitored by a community advisory board of more than 15 organizations. The study was approved by the Providence Health Care/University of British Columbia Research Ethics Board.

As used previously,¹⁷ eligibility criteria included self-identifying as a woman (transgender male-to-female inclusive), age ≥ 14 years, exchanged sex for money within the last month, and provided informed consent. The sample size was calculated to detect associations between structural determinants of primary interest (e.g., work environments, policing) and HIV/STI incidence. Time–location sampling was used to recruit participants through weekly outreach to street, indoor, and online venues across Metropolitan Vancouver, which were identified through community mapping and regularly updated. Between 10% and 15% of individuals screened were deemed ineligible for the cohort. The primary reason for ineligibility was not being actively engaged in sex work at baseline (e.g., did not work within the last 30 days); other reasons accounted for 5% of those screened as ineligible, and included living outside the Metropolitan Vancouver area or being unable to provide informed consent. Following an open cohort design, participants continued to be actively recruited throughout the life of the cohort through extensive ongoing outreach to street, indoor, and online venues. The annual retention of participants under active follow-up was $>90\%$, and primary reasons for attrition included mortality and migration outside Metropolitan Vancouver. Extensive efforts were made to continue to follow women who had

moved outside Metropolitan Vancouver during the study, including mobile outreach/interview teams and phone interviews, to support the high retention rates.

At baseline and semi-annually, participants completed interviewer-administered questionnaires in English, Cantonese, or Mandarin, alongside pre- and post-test counseling and voluntary HIV, STI, and HCV testing; the interviewers were trained and included both experiential (sex workers) and non-experiential staff. The questionnaire collected detailed information on socio-demographic characteristics, sex work patterns, sexual health, substance use, occupational and lifetime violence, health and social services access, and structural features of occupational and residential environments. Participants completed study visits at one of two storefront offices in Metropolitan Vancouver or at their work/home location. All participants received \$40 CAD at each visit for their time, expertise, and travel.

Voluntary HIV, STI, and HCV testing and pre/post-test counseling was performed by a project nurse. As per provincial guidelines, HIV testing was performed using an ELISA, with reactive tests followed by Western blot and individual RNA nucleic acid amplification test (NAAT) testing where necessary. Urine samples were collected to test for acute STIs including gonorrhoea and chlamydia using NAATs. Blood was drawn for syphilis, herpes simplex virus 2 (HSV-2) antibody, and HCV antibody testing. Onsite treatment was provided by the project nurse for symptomatic STIs, and free STI and Papanicolaou testing was also offered, regardless of study enrolment. Nurses offered referral and active connections to care to HIV- and HCV-seropositive women not receiving care, as well as education and referrals to other needed health and social services.

Data analysis

Analyses were restricted to women who were HCV antibody-negative at baseline and who had attended at least one follow-up visit. Independent variables of interest were identified a priori and included socio-demographic characteristics such as age and indigenous ancestry. Time-updated variables used the last 6 months as a reference point and included HIV and acute STI (defined as a new diagnosis of chlamydia, gonorrhoea, or syphilis), assessed based on serological and urine test results; sexual- and drug-related risks, including condom negotiation and use (e.g., inconsistent condom use with clients) and drug use (e.g., non-injection drug use, injection drug use, non-injection crack use); and interactions with health and social services, assessed by asking whether participants had experienced any barriers to accessing healthcare or harm reduction services. Women previously diagnosed as HCV-seropositive were also asked several questions regarding their access and uptake of HCV care, including whether they had received regular blood tests for HCV, had seen an HCV specialist, had been offered HCV treatment, and had been receiving HCV treatment. Other time-updated variables included structural exposures, including the participant's primary place of soliciting clients (coded as outdoor/public vs. indoor/independent), homelessness, client-perpetrated physical/sexual violence, and experiences related to policing and criminalization, including incarceration, police harassment, or arrest.

Kaplan–Meier analyses

Kaplan–Meier methods were used to estimate cumulative HCV incidence. The date of HCV seroconversion was estimated as the midpoint between the last negative and the first positive antibody test result. Participants who remained persistently HCV-seronegative were right-censored at the time of their most recent available HCV antibody test result. Time-zero for all prospective analyses

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