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Hepatitis C antibody prevalence among Mexico City prisoners injecting legal and illegal substances

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ABSTRACT

Background: Hepatitis C virus (HCV) infection is highly prevalent among prisoners and this prevalence estimates reach 64% among prisoners who inject illicit drugs. Prisons are important sites for HCV transmission in the absence of access to sterile injecting equipment; hence, it can be transmitted between prisoners who share contaminated needles and syringes. We aimed to estimate the prevalence of risk factors for anti-HCV prevalence, with particular interest on injecting behavior, and to assess correlates of anti-HCV positivity among Mexico City prisoners.

Methods: Cross-sectional study based on information —collected in three male and two female prisons in Mexico City during 2010–2011— about sexually transmitted infections, socio-demographics, criminal history, substance use, vitamin injection, tattooing, among others (n = 3,910). Weighted multivariable adjusted logistic regression models were estimated to assess the overall and differential odds for anti-HCV due to injecting behavior.

Results: Overall prevalence of anti-HCV was 3.3%. This figure rose to 43.1% among prisoners with a history of illicit drug injection. Prisoners with history of vitamin injection showed a similar prevalence of anti-HCV (43.8%). After stratifying by substance injected, the adjusted odds ratio was 9.8 (95% CI: 4.0, 23.8) for illicit drug injection and 11.9 (95% CI: 5.8, 23.8) for illicit drug and vitamin injection.

Conclusion: Based on data from the most populous prisons in Mexico City, this study showed that anti-HCV is highly prevalent among prisoners with history of injecting behavior. In this sense, injecting behavior *per-se,* independent of the substance used, is associated with increased odds of anti-HCV positivity.

1. Introduction

An estimated 185 million people, or 2.6–3.1% of the global population, are hepatitis C virus (HCV) antibody (anti-HCV) positive, indicating infection with HCV at some point in time (Mohd Hanafiah et al., 2013). Around one-quarter of people with acute HCV infection will clear the virus (Nelson et al., 2011). The others will progress to chronic infection, which after a decade or more may lead to hepatic fibrosis, cirrhosis, and hepatocellular carcinoma (Nelson et al., 2011).

HCV is a *blood-borne* infection, and people who inject drugs (PWID) or have a history of injecting drug use comprise the majority of existing infections; an estimated two-thirds of PWID globally are anti-HCV positive (Nelson et al., 2011). Unsafe injecting practices (e.g., syringe sharing, rushed injecting) and vulnerability to infections among PWID are a result of an array of social, structural, and environmental influences (Rhodes et al., 2006). Previous studies have recognized the potential risk of HCV transmission among people who inject substances other than illicit drugs (McVeigh et al., 2003), such as steroids or vitamins (e.g., anabolic steroids). However, there is limited data about the size of this group's contribution to HCV transmission.

Prisons are important sites for HCV transmission (Larney et al., 2013). Sharing injection equipment represents the greatest risk of transmission of hepatitis in these settings (UNODC et al., 2006). Thus, in the absence of access to sterile injecting equipment (as in the case of almost all prisons globally) (Harm Reduction International, 2016), hepatitis can be transmitted between prisoners who share contaminated

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needles and syringes. Recent evidence from a meta-analysis confirms that HCV infection is highly prevalent among prisoners; an estimated one-quarter of all prisoners globally are anti-HCV positive, and among prisoners who inject drugs, anti-HCV prevalence is estimated at 64% (Larney et al., 2013). International reports suggest that a single syringe could be shared by 10 or more people within this PWID-prisoner context (UNODC, 2014).

Anti-HCV prevalence in Mexico has been estimated at 1–2.5% (Burguete-García et al., 2011; Santos-López et al., 2008; Valdespino et al., 2007). This is below 2016 HCV viraemic prevalence estimates for Mexico of 0.4% (The Polaris Observatory HCV Collaborators, 2016). Among prisoners, there is limited evidence regarding to the epidemiology of HCV. One study in a Durango prison in 2001–2002 found anti-HCV prevalence of 10% (Alvarado-Esquivel et al., 2005). More recently, a large study in Mexico City suggested that anti-HCV prevalence in Mexican prisoner populations is somewhat lower than this, although still higher than in the general population (3.3% in men prisoners and 2.7% in women prisoners) (Bautista-Arredondo et al., 2015).

In addition to the commonly understood risk factors of injecting drug use (Smith et al., 2014), blood transfusion, surgery, dental care (Santos-López et al., 2008), and non-sterile tattooing (Carney et al., 2013), in the Mexican prison context, there may be anti-HCV risks associated with injection of vitamins; however, there is a lack of literature on this subject. Vitamin injection may be carried out because of perceived superiority of injected vs oral administration. Although, prior research has documented the prevalence of HCV in some Mexican prisons, to date there has been no exploration of the risks associated with injection of vitamins. This study has two aims: to determine the prevalence of risk behaviors for anti-HCV prevalence, with particular interest on injecting behavior, and to assess factors associated with anti-HCV positivity among prisoners in Mexico City during 2010–2011.

2. Material and methods

2.1. Study setting

We analyzed data from a cross sectional study carried out among prison population from three male and two female prisons in Mexico City during 2010–2011 (North and South prisons, CERESOVA- Men's Social Rehabilitation Center Santa Martha; Santa Martha Acatitla and Tepepan). The Institutional Review Board at the National Institute of Public Health, Mexico (Protocol ID # 821), approved this study.

This study consisted of two main components, a screening phase that included a general health assessment with clinical measurements and biomarkers for sexually transmitted infections and non-communicable chronic diseases offered to all participants that agreed to participate and give written consent. A second phase that collected information on socio-demographic characteristics, criminal background, substance use, sexual behavior, and other health indicators. It was implemented using ACASI (audio computer assisted self-interview) methodology in a randomly selected sub-sample of those prisoners that underwent and completed screening phase. Details of fieldwork, measurements and provision of testing results to study participants are described thoroughly elsewhere (Arredondo et al., 2015).

In this analysis, we used data from the sub-sample of prisoners that answered the ACASI questionnaire (n = 4,304). Our study selected 10% of men (except in the CERESOVA prison, were both components of the study was offered to the entire inmate population) and 30% of women prisoners that completed the screening phase. We excluded from the analysis those prisoners without a completed ACASI interview (n = 157 prisoners housed in CERESOVA prison) and those prisoners without data on anti-HCV testing and/or history of drug or vitamin injection (n = 236).

2.2. Measures

Our primary outcome was a positive anti-HCV test result. Testing for hepatitis C antibodies was performed using Abbott Architect Anti-HCV. Co-infections were laboratory-confirmed by the presence of human immunodeficiency virus (HIV) 1 and 2 antibodies and p24 antigen tested with Abbott Architect Ag/Ab Combo and hepatitis B virus (HBV) core antibodies using Abbott Architect Anti-HBc II, if positive HBV surface antigen tests were performed to prisoners who were HBV core-antibodies positive. Each test was completed using Chemiluminescent Immunoassay (CLIA) in pools of four participant samples. If a pool was positive, each sample was tested individually (Juárez-Figueroa et al., 2010; Juárez-Figueroa et al.,2011).

The main exposure variable was any injecting behavior, defined with a binary variable that identified three time-periods for injection: ever injected, injected six months prior to incarceration, and injected last month in prison. Additionally, injected either legal substances (vitamins) or illegal substances (drugs) and shared syringes – outside as well as inside the prison- were defined with a binary variable among prisoners with a history of injection.

Socio-demographic characteristics were current age (yrs), schooling (yrs), marital status (married or cohabitation vs. single or divorced or widowed), and prisoner's indigenous origin – defined by self-report as either belonging to an indigenous ethnicity or speaking an indigenous language. We constructed a standardized socio-economic status (SES) index with a principal-components analysis using a polychoric correlation matrix (Kolenikov and Angeles, 2004). This index combined household infrastructure (floor and roof material, kitchen), a household overcrowding index (Sistema Estatal de Información e Indicadores de Suelo y Vivienda Observatorio de Vivienda, 2011), and a poverty index with the prisoner's residence prior to incarceration at the municipality level (Consejo Nacional de Evaluación de la Política de Desarrollo Social, 2010). More positive scores indicate higher SES, while lower SES households have more negative scores.

Self-reported criminal history variables collected were the number of detentions, age at the current admission to the prison (yrs), whether prisoners were incarcerated for committing a drug-related crime, length of incarceration (yrs) calculated by subtracting the date of the interview from the date of incarceration. Additionally, an indicator variable for the prisons (North, South, CERESOVA; women's prisons were collapsed in one category due to the small sample size). We also included risk exposures such as tattooing (if prisoners had any tattoos, whether prisoners received the tattoo outside or inside the prison) and whether a participant had experienced violence during incarceration– either aggressor or assaulted.

2.3. Statistical analysis

The analyzed sub-sample was determined by calculating the minimum detectable odds ratio of two for bivariate logistic regression analyses, recruiting 500–32, 500–3,500 prisoners to achieve adequate power for identifying differences in the self-report questionnaire. Sample weights were generated proportional to the facility size in order to account for differences in facility size. Weighted bivariate and multivariable analyses were performed using Stata's "*svy*" module. The descriptive statistics we employed were: mean values and standard deviations for continuous variables, or number and percentage for categorical and binary variables. Distributional independence by anti-HCV test status was assessed using chi-squared test and unadjusted linear regression for categorical/binary variables and continuous variables, respectively.

Two adjusted logistic regression models were estimated to examine the association between anti-HCV positivity and legal and illegal substances injection. First comparing no injection vs illegal substances (drugs) injection ever; and second, testing differences including also legal substances injection (no injection vs vitamin injection vs illegal

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