

Original Article

Sexual Behavior and HBV Infection Among Noninjecting Cocaine Users (NICUs)

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The aim is to estimate HBV prevalence and the associated risks among noninjecting cocaine users (NICUs). In 2002–2003, a total of 824 NICUs from Buenos Aires (Argentina) and Montevideo (Uruguay) were interviewed using a structured questionnaire. Serologic tests were carried out for Human Immunodeficiency Virus (HIV), hepatitis B (HBV), syphilis, and others. The population was divided into two serologic groups: HBV-infected and seronegative group. Univariate and binary logistic model were developed. The results seem to indicate that, among NICUs, HBV is transmitted through sexual contact. Prevention measures, including vaccine, are needed in order to control and minimize risks. The study's limitations are noted.

Keywords hepatitis B; sexually transmitted disease; noninjecting cocaine use coinfection

Introduction

Drug users manifest a high rate of hepatitis B virus (HBV) infection. In many cases, the virus coexists with other infections which are transmitted in similar ways. Injecting drug users (IDU) who are engaged in unsafe sexual practices and drug use manifest a higher risk of being infected by HBV (Kuo, Sherman, Thomas, and Strathdee, 2004) and so do noninjecting drug users (NIDUs), such as cocaine and heroin users. However, no explanation has yet been provided for the higher prevalence of HBV in this population when compared to the population in general (Bastos et al., 2000; Kuo et al., 2004; Rich, Anderson, Schwartzapfel, and Stein, 2006) and hence the relation between HBV infection and NIDUs remains highly controversial.

Recent studies have suggested that subjects may be infected by HBV by sharing injecting equipment while using drugs (Bialek et al., 2005; Caiaffa et al., 2006; Lewis-Ximenez et al., 2002), which is similar to what has been reported for hepatitis C (HCV) (Caiaffa et al., 2006; Segurado, Braga, Etzel, and Cardoso, 2004). A research carried out by the Brazilian Reference Centre for viral hepatitis in Rio de Janeiro has reported that subjects with acute HBV infection showed various ways of infection by the virus and the use of intranasal cocaine accounts for 8% of the cases (Lewis-Ximenez, et al., 2002). This may be an indication that, within this population, contamination may occur during the drug inhalation since bleeding is not unusual during procedures (Hagan, Thiede, and Des Jarlais, 2005; Lewis-Ximenez et al., 2002).

By contrast, other researchers argue that unsafe sexual practices are the main reason for HBV infection among NIDUs. Within this population, HBV seropositive infection is usually associated with multiple sexual partners, men who have sex with man (MSM), unprotected sex, and sexually transmitted diseases (STD) (Caiaffa et al., 2006; Gyarmathy, Neaigus, Miller, Friedman, and Des Jarlais, 2002; Lewis-Ximenez et al., 2002; Rich et al., 2006; Rossi et al., 2006).

Coexistence of infectious diseases among NIDUs is also widely acknowledged (Howe et al., 2005; Rossi et al., 2006; Segurado et al., 2004). A significant association was observed between HBV seropositive and HCV infection in a cohort of NIDUs (Segurado et al., 2004). HCV seropositive was also linked to HIV infection among NIDUs in New York (Howe et al., 2005). Not surprisingly, these various infections and risks increase the death rate among this population, due mainly to hepatic failure (Rockstroh, 2006). HBV/HIV coinfection seems to influence the natural course of HBV infection which, as a consequence, determines necroinflammation and hepatic fibrogenesis (Puoti, Torti, Bruno, Filice, and Carosi, 2006). To make matters worse, complex interactions between highly active antiretroviral therapy (HAART) and HBV/HIV coinfection makes it difficult to determine whether HAART has beneficial effects on subjects who are chronically infected by HBV (Puoti et al., 2006).

The increase in the use of cocaine and its derivatives by noninjecting cocaine users (NICU) in Latin America in the last 15 years, with changes in the usage patterns, together with subjects' dynamic relationship seems to have spread multiple infections in this group (Rossi *et al.*, 2006). Within this context, the present study aims to investigate the factors associated with HBV infection among NICUs in two South American cities.

Methods

The present study is cross sectional. The data analyzed here was extracted from a database which has been compiled on the basis of two cross-sectional studies carried out simultaneously in two South American cities—Buenos Aires (Argentina) and Montevideo (Uruguay)—between November 2002 and March 2003. In both metropolitan areas, the recruitment process included out-of-treatment and in-drug-user treatment NICU participants from low-income neighborhoods.

Outreached participants (82.5%) were recruited by civil associations, in different settings, using snowball technique. Hospitalized or outpatients were recruited from two public and one nonpublic hospital for drug user and psychiatric diseases comprising 17.5% of the total sample.

Eligibility criteria included cocaine and its derivatives users who were males or females 18 years or older, who reported never injecting drugs but did engage in noninjection use via sniffing, snorting, or smoking in the previous 90 days prior to the interview (Osimani and Latorre, 2003; Rossi *et al.*, 2008; Vignoles *et al.*, 2006). They agreed to participate by signing an informed consent.

Since exposure to cocaine encompasses a person's total history of use, the field work of this research was precluded by numerous systematic contacts with institutions and neighborhoods. Several efforts were made to define noninjection drug use for minimizing misclassification. Inspections for evidence of track marks as well as a protocol using information of subjects to describe the route of drug administration were used. A trustable interaction between cocaine users and researchers were sought in combination to another methodological approach involving qualitative data collection.

Participants underwent to face-to-face interviews using a structured questionnaire with information on sociodemographic characteristics, drug and sexual histories, criminal records, previous infectious diseases, and HIV serologic testing. Personal interviews were carried out in a private and confidential way.

Regarding drug use variables, initially a list of drugs was provided. For each positive answer the interviewer then asked how they consumed the drug, whether snorted, smoked, injected, chewed, or drunk an infusion. All possibilities were allowed. Next, participants were asked if they shared drugs and if positive if they have used straws for sharing.

Two weeks after the first interview, volunteers were informed of their test results and were provided with information and counseling on prevention of sexual-transmitted infections. Volunteers who tested positive for any of these agents were referred to corresponding infectious disease clinics for appropriate care. Those who tested HBV negative were offered free immunization against HBV. The volunteers in our study demonstrated a high level of commitment. Eighty-three percent of participants returned to receive their test results and appropriate counseling (Rossi *et al.*, 2008; Touzé, 2006).

About 10 ml of blood was collected through venipuncture from each participant. HBV surface antigen (HBsAg) and HBV core antibody (anti-HBc) assays were conducted using respectively the ABBOT AxSYM HbsAg (v2)[®] and the Core CM ABBOTT AxSYM[®] system. HIV antibody screening was performed using the enzyme immunoassay (EIA) and particle agglutination (GENSCREEN HIV 1/2 version 2, BIORAD[®]; SFD HIV 1/2

PA, BIORAD[®]; FUJIREBIO[®]; in Uruguay the screening was performed using ABBOTT AxSYM SISTEM HIV 1/2gO) methods with Western blot confirmation (WB HIV: NEW LAB BLOT I, BIORAD[®]). HCV testing was performed using HCV version 3.0, ABBOTT AxSYM SYSTEM (ABBOTT[®] GmbH Diagnostika). For syphilis, the Venereal Disease Research Laboratory slide test was utilized (VDRL test, Wiener lab[®]).

Study Sample

Out of the initial 871 NICUs taking part in the project, 824 were selected for the present study. The following criteria were adopted: subjects should be either HBV/HCV seronegative or be infected by HBV only. For HBV seropositivity, we considered anti-HBc (previous infections) with or without anti-HBsAg (actual infection). Based on the hypothesis test for comparing proportions and an error α of 0.05, the sample was estimated to be representative of over 95% of cases, taking into consideration that HBV prevalence among NICUs varies between 9.0% (Rossi et al., 2006; Rossi et al., 2008) and 20.7% (Rich et al., 2006).

Statistical Analysis

A potential association between discrete variables was evaluated by means of either the chi-square test or Fisher's exact test, whenever necessary. The extent of these associations was estimated by the odds ratio (OR), using 95% confidence interval (95% CI). A binary logistic model was developed after determining the independent variables in a univariate analysis ($p < .20$), biological plausibility, and epidemiologic relevance (Hosmer and Lemeshow, 1989). The contribution of each variable included in the multivariate model was evaluated by means of the Wald test and variables which did not make significant contribution were discarded. The software SPSS version 11.5 (SPSS Inc., Chicago, USA) was used for all calculations.

This study has been approved by the Ethical Committee of the University of Buenos Aires (UBA), in Buenos Aires, Argentina. In Uruguay, it has been approved by the Ethical Committee of the Viladerbó Hospital in Montevideo and by the Health Department of the Uruguayan Public Health Ministry.

Results

Within the study group, 480 subjects (58.3%) were from Buenos Aires, Argentina and 344 (41.7%) from Montevideo, Uruguay. The NICUs were divided into serologic groups. Most NICUs were seronegative (89.2%), in comparison with subjects infected by HBV (10.8%), similarly distributed across cities, Buenos Aires (50.6%) and Montevideo (49.4%). The subjects were predominantly males (68.3%) with a mean age of 28.3 ± 8.5 years. In this sample mean age were very similar between men and women, respectively 28.29 ± 8.53 and 28.20 ± 8.45 years old. Average education was 9 years (60.2%) and 50.7% was employed; 64.8% had criminal records; however, only 18.1% had been arrested for drugs-related crimes. Table 1 summarizes the sociodemographic characteristics described.

NICUs living in Uruguay showed a higher risk¹ of being previous infected by HBV (OR = 1.42; 95% CI [0.91–2.20]) than Buenos Aires residents. This was also true for male subjects (OR = 1.68; 95% CI [1.00–2.83]), older than 26 (OR = 2.39; 95% CI [1.50–3.81]), who had a job (OR = 1.66; 95% CI [1.06–2.60]) and who had been arrested at some stage

¹To reader: “at-risk” and “protective factors” are usually terms derived from empirical data obtained from epidemiological studies. For further references please see GORDIS, 1996, page 141). Also, according to LAST, 2001 (Dictionary of Epidemiology). Population or group at-risk: individuals belonging to a certain group or community who have the potential to contract a certain condition.

Table 1
Sociodemographic characteristics associated to hepatitis B virus among NICUs, Buenos Aires and Montevideo Cities, 2002

Variables	HBV-/HCV ^a (n = 735)	Hepatitis B ^b (n = 89)	
	n (%)	n (%)	OR ^c (CI 95%) ^d
Gender			
Male	494(67.2)	69(77.5)	1.68(1.00–2.83)**
Female	241(32.8)	20(22.5)	1.00
Age (years)			
≤26	394(53.6)	29(32.6)	1.00
>26	341(46.4)	60(67.4)	2.39(1.50–3.81)***
Schooling			
≤8 years	441(60.0)	55(61.8)	0.90(0.57–1.43)
>8 years	293(39.9)	33(37.1)	1.00
Employed			
Yes	363(49.4)	55(61.8)	1.66(1.06–2.60)**
No	372(50.6)	34(38.2)	1.00
Country			
Argentina	435(59.2)	45(50.6)	1.00
Uruguay	300(40.8)	44(49.4)	1.42(0.91–2.20)*
Ever imprisoned			
Yes	111(15.1)	22(24.7)	1.83(1.08–3.08)**
No	617(83.9)	67(75.3)	1.00
Ever arrested			
Yes	472(64.2)	62(69.7)	1.27(0.79–2.05)
No	261(35.5)	27(30.3)	1.00
Ever arrested due to drugs			
Yes	129(17.6)	20(22.5)	1.24(0.70–2.20)
No	319(43.4)	40(44.9)	1.00
Ever tattooed			
Yes	264(35.9)	23(25.8)	0.70(0.37–1.30)
No	168(22.9)	21(23.6)	1.00

*** $p < .01$; ** $p < .05$; * $p < .20$

^aHBV and HCV seronegative.

^bHBsAg+ and/or Anticore+.

^codds ratio.

^d95% confidence interval.

in their lives (OR = 1.83; 95% CI [1.08–3.08]). No statistically significant association was found between HBV seropositivity and level of education, tattoos, arrest, and arrest for drugs.

Table 2 presents characteristics of drug use and Table 3 shows characteristics related to sexual behavior and serologic status. Taking into consideration the drug use variables analyzed in this study, age at the time when subjects first used cocaine was the only variable which showed strong association with HBV previous infection ($p < .01$).

Subjects whose sexual partners were MSM and HIV seropositive revealed a higher risk of infection, with similar association rate (OR = 2.16 and OR = 2.51 respectively)

Table 2
Drug use characteristics associated to hepatitis B virus among NICUs, Buenos Aires and Montevideo Cities, 2002

Variables	HBV-/HCV ^{-a} (n = 735)	Hepatitis B ^b (n = 89)	
	n (%)	n (%)	OR ^c (CI 95%) ^d
Age at cocaine debut (years)			
> 13	661(89.9)	88(98.9)	8.12(1.11–59.32) ^{***}
≤13	61(8.3)	1(1.1)	1.00
Cocaine			
Sniff/snorted	470(63.9)	61(68.5)	1.23(0.77–1.97)
Smoked	265(36.1)	28(31.5)	1.00
Duration of sniffing/snorting cocaine (years)			
> 14	132(18.0)	21(23.6)	1.38(0.82–2.33)
≤14	590(80.3)	68(76.4)	1.00
Shared straw to sniff/snort cocaine			
Yes	388(52.8)	46(51.7)	0.92(0.59–1.42)
No	332(45.2)	43(48.3)	1.00
Use of drug alone			
Yes	271(36.9)	39(43.8)	1.33(0.85–2.08)
No	462(62.9)	50(56.2)	1.00
Grams of cocaine consumed last use			
>2	229(31.2)	29(32.6)	1.00
≤2	373(50.7)	52(58.4)	0.91(0.56–1.47)
Frequency of drug consumption ^{****}			
Daily to 1/week	429(58.4)	47(52.8)	0.77(0.50–1.20)
1 × 2/weeks to 1/month	295(40.1)	42(47.2)	1.00
Ever tried to quit drugs			
Yes	497(67.6)	34(38.2)	0.77(0.49–1.21)
No	236(32.1)	55(61.8)	1.00
Ever have drug treatment			
Yes	204(27.8)	20(22.5)	0.75(0.45–1.27)
No	528(71.8)	69(77.5)	1.00

*** $p < .01$; ** $p < .05$; * $p < .20$

^aHBV and HCV soronegative.

^bHBsAg+ and/ or Anticore+.

^codds ratio.

^d95% confidence interval.

****refers to the last three months.

Table 3
Sexual behavior, Serology, and report of hepatitis associated to hepatitis B virus among
NICUs, Buenos Aires and Montevideo Cities, 2002

Variables	HBV-/HCV ^{-a} (n = 735)	Hepatitis B ^b (n = 89)	
	n (%)	n (%)	OR ^c (CI 95%) ^d
Sexual partnership (currently)			
Yes	402(54.7)	43(48.3)	0.77(0.49–1.19)
No	329(44.8)	46(51.7)	1.00
Ever had sexual partner			
HSH or both	72(9.8)	17(19.1)	2.16(1.21–3.87)***
Heterosexual	660(89.8)	72(80.8)	1.00
Ever had sexual partner drug user (DU)			
Yes	161(21.9)	13(14.6)	0.63(0.32–1.25)*
No	235(32.0)	30(33.7)	1.00
Ever had sexual partner HIV seropositive			
Yes	88(12.0)	23(25.8)	2.51(1.47–4.26)***
No	575(78.2)	60(67.4)	1.00
Sexual partner			
IDU–/HIV–	479(65.2)	50(56.2)	1.00
IDU–/HIV+	33(4.5)	13(14.6)	3.77(1.87–7.64)***
IDU+/HIV–	51(6.9)	5(5.6)	0.94(0.36–2.46)
IDU+/HIV+	52(7.1)	9(10.1)	1.66(0.77–3.56)*
Condom use			
Vaginal sex			
Always	172(23.4)	34(38.2)	1.00
Never or sometimes	448(60.9)	48(53.9)	0.54(0.34–0.87)***
Anal sex			
Always	140(19.0)	27(30.3)	1.00
Never or sometimes	428(58.2)	47(52.8)	0.57(0.34–0.95)**
Lifetime HIV testing			
Yes	395(53.7)	56(62.9)	1.46(0.93–2.30)*
No	340(46.3)	33(37.1)	1.00
HIV			
Positive	28(3.8)	23(25.8)	8.80(4.80–16.14)***
Negative	707(96.2)	66(74.2)	1.00
Siphilis (VDRL)			
Positive	21(2.9)	12(13.5)	5.30(2.51–11.19)***
Negative	714(97.1)	77(86.5)	1.00
Ever had hepatitis			
Yes	41(5.6)	19(21.3)	4.79(2.41–9.52)***
No	248(33.7)	24(27.0)	1.00

*** $p < .01$; ** $p < .05$; * $p < .20$

^aHBV and HCV soronegative.

^bHBsAg+ and/or Anticore+.

^codds ratio.

^d95% confidence interval.

All sexual behavior variables are lifetime practices.

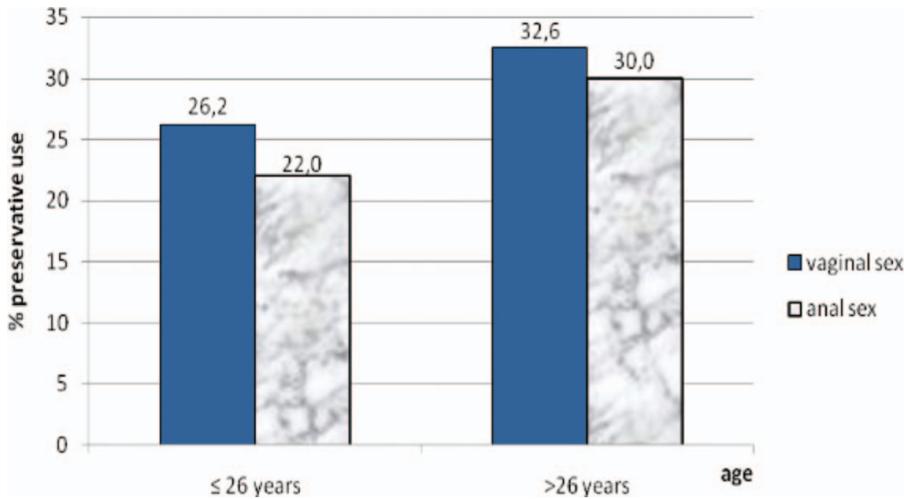


Figure 1. Condom use in vaginal and anal sex according to NICUs' age— Buenos Aires and Montevideo Cities, 2002.

and highly significant ($p < .01$). Subjects whose sexual partners were HIV seropositive and NIDUs showed an even higher risk of HBV seropositivity (OR = 3.77; 95% CI [1.87–7.64]) in relation to those whose sexual partners were IDUs and HIV seropositive (OR = 1.66; 95% CI [0.77–3.56]), when compared to sexual partners who were IDUs and HIV seronegative.

The use of condoms in anal or vaginal intercourse showed a strong association with HBV infection. NICUs who have never or only occasionally used condoms in vaginal (OR = 0.54; 95% CI [0.34–0.87]) or anal intercourse (OR = 0.57; 95% CI [0.34–0.95]) exhibited a lower risk of being HBV seropositive when compared to subjects which reported regular use of condoms. Also, the use of condoms increased with age in both anal and vaginal intercourse (Figure 1).

For NICUs infected by HIV, the risk of being infected by HBV was almost nine times higher (OR = 8.80; 95% CI [4.80–16.14]) than for HIV seronegatives and this association was statistically significant ($p < .01$). Similar situation was seen in relation to VDRL seropositive subjects (OR = 5.30; 95% CI [2.51–11.19]). Accounts of having or having had hepatitis (OR = 4.79; 95% CI [2.41–9.52]) and having been tested for HIV (OR = 1.46; 95% CI [0.93–2.30]) were strongly associated with the response variable.

The bivariate analysis of the variable which combines the use of condoms with anal or vaginal sexual intercourse is presented in Table 4. A dose-response gradient between the use of condoms and the risk of HBV was observed and using the group of subjects who never used condoms either way as reference, subjects who report safe sexual practices in both anal and vaginal intercourses showed a smaller risk of being HBV seropositive in comparison with those wearing condoms in one but not another.

The final logistic model is presented in Table 5. The remained variables in the model were as follows: age, whether the NICU is HIV seropositive, sexual partner who is a non-IDU and HIV seropositive, and the use of condoms in anal or vaginal sexual intercourse. To achieve better control for the confounding effect of age on the association between HBV and other characteristics we performed the analysis considering age as a continuous variable and

Table 4

Bivariate analysis of the relationship between use of condom in vaginal and anal sex and hepatitis B virus among NICUs, Buenos Aires and Montevideo Cities, 2002

Condom use (vaginal/anal) ²	HBV-/HCV ^{-a}	Hepatitis B ^a	
	<i>n</i> (%)	<i>N</i> (%)	OR ^c (CI 95%) ^d
Never/never	375(90.6)	39(9.4)	1.0
Sometimes/sometimes	38(76.0)	12(24.0)	3.04(1.47–6.29)
Always/always	118(84.3)	22(15.7)	1.79(1.02–3.15)

^aHBsAg+ and/or Anticore+.

^bCondom use in lifetime.

^codds ratio.

^d95% confidence interval.

the estimates were similar as well as the adjustments. Also, in another analysis, excluding the HIV positive subjects, we found very similar estimates and confidence intervals. So, considering the multivirus exposure that participants might have, we opted to the model using all individuals.

Table 5

Multivariate logistic regression using hepatitis B infection among NICUs as the response variable. Buenos Aires and Montevideo Cities, 2002

Variables	Crude OR (CI 95%)	Adjusted OR (CI 95%)
Age (years)		
>26	2.39(1.50–3.81)***	1.98(1.10–3.56)*
≤26	1.00	1.00
HIV		
Positive	8.80(4.80–16.14)***	7.76(3.40–17.70)**
Negative	1.00	1.00
Sexual partner		
IDU-/HIV–	1.00	1.00
IDU–/HIV+	3.77(1.87–7.64)***	3.15(1.41–7.07)**
IDU+/HIV–	0.94(0.36–2.46)	0.40(0.09–1.80)
IDU+/HIV+	1.66(0.77–3.56)*	0.93(0.35–2.48)
Condom use vaginal and anal sex		
Never/never	1.00	1.00
Sometimes/sometimes	3.04(1.47–6.29)***	2.90(1.26–6.65)**
Always/always	1.79(1.02–3.15)**	1.26(0.66–2.42)
–2 log likelihood = 336.320		

*** $p < .01$; ** $p < .05$; * $p < .20$

Hosmer & Lemeshow test (model adjusted) $p = .682$.

All sexual behavior variables are lifetime practices.

Discussion

Users of illegal drugs behaved in ways which made them more vulnerable to infections by various pathogens such as, for instance, HBV. Sexual behavior was associated with HBV seropositivity in NICUs. This is in line with the hypothesis that HBV risk within this population may be primarily due to sexual transmission (Rich et al., 2006).

In terms of chronological variables, age remained in the final logistic model, which reinforces its association with HBV endemicity (Alter, 2003). Notwithstanding, this association was not found in another study with NIDUs (Kuo et al., 2004). This variable is also seen to be associated with sexual practices and drugs experienced in life (Hahn et al., 2002; Seal and Edlin, 2000). Although gender did not appear in the final model, it was statistically significant in the bivariate analysis. Male subjects presented a higher chance of being infected by HBV than female ones. A possible explanation could be due to their higher number of unprotected sex, higher number and multiple sexual partners, and more frequent use of drugs. Indeed, in the present study, male subjects reported a higher percentage of multiple sexual partners (61.0%) than female subjects (51.2%). By contrast, Kuo et al. (2004) reported that female NIDUs showed a higher risk of HBV infection and Cintra, Caiaffa, and Mingoti (2006) reported that female IDUs exhibited greater susceptibility to HIV infection, associated with the number of times they had sex under the effect of drugs, among other behaviors.

HBV seropositivity was also associated with HIV seropositive subjects whose sexual partners were not IDUs. This may be interpreted as an evidence of multiple infections in this population (Segurado et al., 2004; Rossi et al., 2006; Howe et al., 2005) and supports the suggestion that these pathogens are sexually transmitted in similar ways (Rich et al., 2006; Wylie, Shah, and Jolly, 2006). Crack-cocaine smokers have a higher chance of being infected by HIV due to their sexually transmitted infections (STI) history and unsafe sexual practices in exchange for money or drugs (Booth, Kwiatkowski, and Chitwood, 2000). Unlike the findings presented in this study, the literature suggests that IDU partners and alcohol users tend to engage in unsafe sexual practices and less likely to use condoms (Booth et al., 2000), makes them more vulnerable to being infected by sexually transmitted diseases.

Inconsistence in the use of condoms, which is another variable that is also related to sexual behavior, was also associated with HBV seropositivity in NICUs. Infrequent or no use of condoms turned out to be a protection factor against HBV, which suggests that the subject may have changed his behavior after becoming aware of his/her positive serologic status for sexually transmitted pathogens (Cardoso, Caiaffa, and Mingoti, 2006; Deslandes, Mendonça, Caiaffa, and Doneda, 2002). In this study, subjects who were aware of their HIV seropositive status tended to use condoms twice more often than those regarded as seronegative.

Unprotected sex is an usual behavior among drug users, who tend to have multiple sexual partners, not to use condoms consistently and have sex in exchange for drugs or money (Booth et al., 2000; Buchanan et al., 2006; Cardoso et al., 2006; Cintra et al., 2006; Deslandes et al., 2002; Galperim et al., 2004; Rich et al., 2006; Wylie et al., 2006). The observed pattern related to the use of condoms in anal or vaginal sexual intercourses suggests that NICUs who engage in safe sexual practices, both anal and vaginal intercourses, are more protected. However, subjects who use condoms inconsistently during sexual relations showed a greater chance of being HBV seropositive in comparison with those who use condoms consistently. This finding, again, may reinforce the idea that the virus is sexually transmitted (Alter, 2003).

The present study did not assess whether HBV seropositivity could be associated with multiple sexual partners or experience in exchanging sex for money or drugs. However, this association has been shown in the literature. Lewis-Ximenez, *et al.* (2002) have reported that HBV seropositive status was linked to multiple sexual partners, which may be interpreted as evidence that, within the population studied, the virus is most commonly transmitted by unsafe sexual practices. However, among NIDUs, no evidence was found about HBV infection in subjects who worked as sexual workers (Kuo *et al.*, 2004). This finding contradicts Gyarmathy *et al.* (2002), who reported that the risk increases among drug users who have never used injecting drugs but were involved in sexual working.

No association was found between the drug use-related characteristics investigated here and HBV infection. This finding reinforces the suggestion made by some studies (Lewis-Ximenez *et al.*, 2002; Rich *et al.*, 2006) that, within this population, the HBV is most likely to be sexually transmitted as opposed to HCV (Bialek *et al.*, 2005; Caiaffa *et al.*, 2006; Segurado *et al.*, 2004).

Study's Limitations

Finally, it is important to mention some limitations of this study. To start with, it was not possible to determine the temporal relation in the observed associations because of its sectional nature. Another point to be made concerns the possibility of obtaining socially desirable responses, especially those related to chronological questions. Given the possibility of sampling error, we should bear in mind that subjects were selected and regarded as NICUs on the basis of their own account of their drug use practices. This means that the study sample may have included IDUs who concealed their use of injecting drugs, even though a comprehensive search was carried out in the database with a view to minimizing this possibility (Caiaffa *et al.*, 2006). Considering that HBV prevalence in this NIDUs' study was found to be within the limits reported in the literature, varying between 9.0% (Rossi *et al.*, 2006; Rossi *et al.*, 2008) and 20.7% (Rich *et al.*, 2006), parenteral exposition to the virus was unlikely to be present; otherwise, the prevalence of HBV as well as other infections, and HCV in particular, would be higher. Information about past vaccination was unavailable. However, the similarity of the anti-HBs prevalence rates with other studies on NICUs (Kuo *et al.*, 2004) and a high rate of seronegative (90%) suggest that this population remains at high risk for HBV infection. Moreover a report of low vaccination rates even in a high-educated gay men cohort in Argentina (6.7%) (Segura *et al.*, 2006) suggests that an urging and integrated HBV immunization effort among venues frequented by populations at risk of HBV infection, such drug users, is necessary.

Despite all limitations described, the present study reports important findings for HBV control and prevention in NICUs. It also contributes to the hypothesis that, among NICUs, HBV is most likely to be sexually transmitted. Thus, prevention measures regarding safe sexual practices are needed since this group shows high-risk sexual behavior (Rich *et al.*, 2006). Sharing of similar transmission means among HBV and HIV seropositives make this population susceptible to multiple infections. This is why HBV vaccination campaigns and health education should be promoted with a view to reducing the risks of infection in this population, especially under the knowledge that several studies have demonstrated that the HBV vaccination rate among drug users is still relatively low (Altice, Bruce, Walton, and Buitrago, 2005; Carey *et al.*, 2005; Kuo *et al.*, 2004; Rich *et al.*, 2006; Seal and Edlin, 2000).

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K. B. F. Zocratto was responsible for the literature review, data analysis, and drafting of the article. W. T. Caiaffa, M. Weissenbacher, and Diana Rossi designed the research and participated in elaborating the manuscript. F. A. Proietti reviewed the manuscript. Estela Muzzio participated in data collection. Sergio Sosa Estani, and Marcela Segura structured the database and analyzed the data. Jorge Rey worked in laboratory analyses. Liliana Martínez Peralta designed and coordinated the laboratory studies. Enrique Vazquez and Paloma Cuchi participated in data analyses. Maria Luz Osimani, Laura Latorre, and Hector Chiparelli participated in data collection and analyses.

Declaration of Interest

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

RÉSUMÉ

L'objectif est d'estimer la supériorité du VHB et les facteurs à risques associés entre les usagers de cocaïne non injectable. Entre 2002 et 2003, un total de 824 usagers de cocaïne non injectable, de Buenos Aires (Argentine) et Montevideo (Uruguay) furent soumis à un questionnaire structuré. Des tests sérologiques pour le virus de l'immunodéficience acquise (VIH), VHB, Syphilis et autres furent pratiqués. La population partagée en deux groupes sérologiques: infectés par le VHB d'une part et séronégatifs d'autre part. Une analyse univariée fût alors réalisée ainsi qu'un modèle logistique binaire. Les résultats suggèrent que la transmission du VHB entre les candidats soumis au questionnaire, a lieu principalement par voie sexuelle. Des mesures de prévention incluant la vaccination sont nécessaires dans le sens de contrôler et minimiser les risques de cette population.

Mots-clés: Hépatite B, maladie sexuellement transmissible, cocaïne non injectable.

RESUMEN

El objetivo es estimar la prevalencia del HBV y factores de riesgo asociados entre usuarios de cocaína no inyectable (UCNI). En 2002-2003, un total de 824 UCNI de Buenos Aires (Argentina) y Montevideo (Uruguay) fueron entrevistados utilizando un cuestionario estructurado. Pruebas serológicas para el virus de la inmunodeficiencia adquirida (HIV), HBV, sífilis y otros fueron realizados. La población fue dividida en dos grupos serológicos: infectados por el HBV y seronegativos. Fue realizado un análisis uni-variado y fue construido el modelo logístico binario. Los resultados sugieren que la transmisión del HBV entre UCNI parece darse, principalmente, por vía sexual. Medidas de prevención, incluyendo vacunación, son necesarias en el sentido de controlar y minimizar los riesgos en esta población.

Palabras-claves: hepatitis B, enfermedad sexualmente transmitida, cocaína no inyectable.

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Glossary

HBV: Hepatitis B virus.

HIV/AIDS: Human immunodeficiency virus/acquired immunodeficiency disease syndrome.

NICU: Noninjecting cocaine users.

NIDU: Noninjecting drug users.

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