

Published in final edited form as:

Int J STD AIDS. 2007 January ; 18(1): 41–46. doi:10.1258/095646207779949907.

High prevalence of blood-borne virus infections and high-risk behaviour among injecting drug users in Tallinn, Estonia

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Summary

The HIV epidemic in Estonia is rapidly expanding, and injection drug users (IDUs) are the major risk group contributing to the expansion. A convenience sample of 159 IDUs visiting syringe-exchange programmes (SEPs) was selected to quantify the association of HIV-risk behaviours and blood-borne infections. A high prevalence of HIV, hepatitis B core antibody (HBV_{core}), hepatitis B surface antigen (HbsAg) and hepatitis C virus antibodies (56, 85.1, 21.3, and 96.2%, respectively) was associated with high-risk injections, unsafe sexual behaviour and alcohol abuse. These findings emphasize the importance of evidence-based secondary prevention among the HIV-infected, especially given the uncertain sustainability of antiretroviral and substance abuse treatments.

Keywords

injection drug use; HIV; HBV; HCV; high-risk behaviour; Estonia

INTRODUCTION

In the third decade of the AIDS era, new HIV epidemics continue to emerge. The Newly Independent States (NIS) of the former Soviet Union have undergone tremendous socio-political upheaval, and several related health epidemics have emerged. Morbidity and mortality rates have risen¹ due to increased violence, high-risk sexual behaviour, substance abuse and infectious diseases including HIV, viral hepatitis, sexually transmitted diseases (STDs) and tuberculosis.² An epicentre of the health crisis appears to be in Estonia. This Baltic country has a rapidly expanding HIV/AIDS epidemic, and the highest reported incidence and prevalence of HIV (1.3%) in the European Region.^{3,4} This epidemic is in large part due to injection drug use, a problem common to many countries in the region.^{5–7}

The primary objective of this study was to quantify HIV risk behaviours among injection drug users (IDUs) visiting syringe-exchange programmes (SEPs) and recommend evidence-

based strategies for secondary prevention. The second objective was to determine the prevalence of HIV infection among this population of SEP attendees. Additionally, we collected bridging information on self-reported behaviours to determine the risk of transmitting HIV, hepatitis C virus (HCV) and hepatitis B virus (HBV) from IDUs to others.

METHODS

Study settings: SEPs

Study activities took place at two SEPs in Tallinn:

1. SITE 1, SEP of NGO Convictus, located in the city centre. In 2004, this programme had over 13,500 visits, and over 92,800 sterile syringes were distributed. This SEP is open daily.
2. SITE 2, SEP of NGO AIDS Support Center, located in the northern part of the city. In 2004, this programme had over 4100 visits, and over 33,000 sterile syringes were distributed. This SEP is open daily except Sunday.

Respondents

Between February and August 2004, 200 SEP clients were approached for study participation, and 159 (80%) were enrolled as study subjects. This convenience sample of current IDUs comprised 134 men and 25 women, all over 18 years of age. All participation was anonymous. When potential participants were approached, the study was briefly explained in Estonian or Russian, and the person was screened for eligibility criteria. Those already participating at the other study site were eliminated by cross-checking birth date, gender and residential zip code.

Procedures

After providing informed consent, all participants were asked to complete an interviewer-administered questionnaire. All participants provided blood samples for HIV, hepatitis B and C, and syphilis testing. At end of study participation, the respondents were offered a direct referral to voluntary HIV counselling and testing (same location at dedicated time). After completing study activities, participants received a food coupon worth approximately €7.

We developed a survey based on the Family Health International Questionnaire for IDUs.⁸ Items included in the questionnaire were developed in English and modified with the input of Estonian IDU harm reduction service professionals. The questions were translated into Estonian and Russian, and piloted on a sample of 10 SEP customers. The four-item CAGE questionnaire was added to assess the prevalence of alcohol-related problems.⁹

All study procedures were approved by the Institutional Review Board at SUNY Downstate Medical Center and by the Ethics Board at the University of Tartu.

Laboratory testing

The following commercially available kits were used to test for HIV, hepatitis B and hepatitis C infection markers: HBsAg (V2), CORE (anti-HBc), HCV version 3.0 and HIV-1/HIV-2 III Plus from Abbott Laboratories (Abbott Park, IL, USA). Non-treponemal rapid plasma reagin test (RPR) for syphilis testing was used (RPR, Omega Diagnostics Ltd, Alva, Scotland, United Kingdom).

Statistical analysis

Descriptive statistics, such as mean, median, standard deviation (SD) and/or range, were used for continuous variables in the study. Categorical variables included relative (%) and absolute (*n*) frequencies. The Mann–Whitney two-sample test for group comparisons was used for continuous variables and Fisher’s exact test was used for categorical variables. Statistical analyses were performed with R 2.0.1 for Windows (www.r-project.org) and each used the conventional 5% significance level.

RESULTS

Participant characteristics

Although almost all respondents (88.9%) were born in Estonia, 92.6% were non-ethnic Estonians (82.2% ethnic Russians, 10.5% members of other Russian speaking ethnic groups). Two-thirds (67%) were less than 25 years and the majority (70.4%) of participants had never been married. About a quarter of the respondents were students (25.3%), while the remainder were almost evenly split between the 39.5% employed (21.6% full time, 17.9% part time) and 41.4% neither working nor studying. Close to the half of the respondents (42.7%) reported no monthly income and 6.7% earned less than the state-estimated subsistence minimum (approximately €3). Only 3.3% of participants reported income in excess of the average monthly wage (approximately €450).¹⁰

Substance abuse

Initiation, frequency and sharing behaviour—The age at initiation of any illicit drug use among the respondents ranged from seven to 30 years. The mean age at initiation of the particular illicit drug and the frequencies of their use are presented in Table 1. Of those who reported marijuana use, 13.4% began to inject drugs within one year after starting smoking marijuana, and the majority (77.7%) did so within two years. At their last injection, the majority (85.8%, *n* = 139) reported using a sterile needle for injection. The sources for obtaining sterile/new syringes for participants were reported as follows: SEP (59%), pharmacy (28%) and shooting gallery (7.4%). Ethnic Estonians reported significantly more cocaine use (*P* = 0.01), but such use was not associated with higher income (*P* = 0.9).

Sexual behaviour

Seven respondents were sexually inexperienced, while 13.8% reported having over 50 lifetime sexual partners (12% of men, 19% of women, *P* = 0.44). Within the past year, more than one-third (36.1%) of the IDUs reported one sexual partner, 21.5% two to four partners, and 25.7% five or more partners.

Of the 137 males, 88.9% reported having sex with only female partners, 2.2% reported bisexual behaviour, and 8.9% (*n* = 12) refused to answer this question. Of those sexually active, 52.5% used some method to protect against either pregnancy or STD; male condom was used most frequently (50%), followed by birth control pills (8.6%).

Approximately one-sixth of respondents (16.6%, *n* = 26) reported receiving money for sex (72% of women, 6% of men, *P* < 0.001), and twice as many (34%, all male respondents) paid for sex.

Close to one-third (27%, *n* = 44) of the sample reported having been diagnosed by a doctor with an STD at some point in their lives, and 15.4% (*n* = 25) had an STD diagnosed during the past year.

Bridging behaviour—With regard to sexual networks, 19.6% of sexually active respondents reported having sexual encounters with other IDUs exclusively, while 44.9% reported sex with non-IDUs exclusively. Overall, 77.4% of those sampled had non-injecting sexual partners. The ethnic composition of sexual relationships was mixed insofar as only 52% of Russians reported always having sex with a partner of the same ethnicity. With regard to injecting networks, 70.7% of the Russian IDUs were injecting with Russians only. Estonian IDUs, in contrast, always or almost always injected with Russians.

Travel

Slightly more than half (52%) of the respondents reported travel outside of Estonia, averaging two trips in the past year. The most frequent destinations were the Russian Federation ($n=36$) and other states of the former Soviet Union ($n=5$), followed by neighbouring countries in Scandinavia (Finland and Sweden, $n=19$) and the Baltics (Latvia and Lithuania, $n=10$). Although the frequency of trips did not differ by gender, the destination did. Women were more likely to travel into Scandinavian countries ($P=0.01$) while men visited the former Soviet Union ($P=0.006$).

Health status, access to health care and HIV testing

Of those participating, 67% judged their own health status to be less than good (fair 47.5%, poor 16.7%). While 57.4% ($n=93$) of the respondents had been covered by state social health insurance one year prior to the date of their interview, only 38.9% ($n=63$) were health insurance beneficiaries at the time of the interview.

Of those who had ever donated blood (9.2%, $n=15$), few did so within the past two years ($n=2$), and most (60%, $n=9$) did so to find out their HIV status. Of the total sample, 49.3% ($n=80$) had been previously tested for HIV, and 20.9% ($n=34$) reported being tested positive for HIV.

HIV prevalence among IDUs

The HIV prevalence among respondents was 56% ($n=89$). Bivariate relationships between the selected variables and HIV prevalence are presented in Table 2. There was a significant association between HIV prevalence and ethnicity, with non-ethnic Estonian IDUs more likely to be HIV positive ($P=0.03$). There were no significant associations between HIV infection and injection drug use habits, with one exception, duration of heroin use. HIV-positive respondents generally reported longer heroin injection careers. Neither duration of sexual activity nor number of sexual partners was significantly correlated with HIV infection.

Prevalence of other infections

Hepatitis serologies were as follows: 131 of 154 those tested (85.1%) were positive for antibodies to HBV core antigen, 33 of 155 serums tested (21.3%) were positive for HBV surface antigen and 153 of 159 serums tested (96.2%) were positive for antibodies to HCV. Four (2.5%, $n=159$) sera were positive for syphilis by RPR testing. Of the four people with positive syphilis serology, three were HIV infected. HIV and HBV infections were associated: 96.4% of individuals infected with HIV were positive for HBV core antibodies in comparison with 71.4% of the HIV-negative participants ($P<0.001$).

DISCUSSION

This is the first assessment of correlation between high-risk sexual and injecting behaviours and prevalence of blood-borne infections among Estonian IDUs. This seminal study is

particularly relevant given the recent expansion of HIV in this region.¹¹ As has been described in other reports on IDUs from Estonia,^{10,12} the vast majority of IDUs recruited in Tallinn were non-ethnic Estonians (mostly ethnic Russians). Elevated rates of high-risk behaviour and greater HIV infection among ethnic minority drug users have been noted in multiple settings.^{13–15} In Estonia, the non-Estonian ethnic minority (95% Russian speaking) comprises 30% of the total population, and the majority (83%) of the Russian speaking populations live in the Northeast or in the capital area of the county.¹⁶ The HIV seroprevalence in our sample was 25.0% among ethnic Estonians, 58.8% among ethnic Russians, and 56.3% among other ethnic groups (all Russian speaking). Non-ethnic Estonian ancestry and heroin use were the only statistically significant factors related to HIV seropositivity. Notably, none of the following risk factors appeared significant: age, gender, length of injection drug or alcohol abuse, injection equipment sharing and sexual high-risk behaviours.

Employment for the Russian-speaking population was largely concentrated in segments of the economy that collapsed after the restoration of Estonia's independence, deepening the problem of unemployment¹⁷ and social marginalization. Geographical proximity of the Estonian North-East county (the highest HIV/IDU levels in Estonia) to St Petersburg (Russian Federation) – an area with high rates of HIV/IDU¹⁸ – could be an important confounding factor for the observed correlation of HIV/IDU with ethnic origin. Nevertheless, ethnically discrepant patterns have emerged in drugs used (cocaine and amphetamines are preferred to heroin and opiates by ethnic Estonians), modes of drug use (preferably non-injecting drug use by ethnic Estonians) and initiation of drug use (non-ethnic Estonians are more likely to start their drug using career with injecting).¹⁹ Additional sociological studies to investigate the association between ethnicity and higher disease prevalence are clearly needed.

Our brief descriptive study does allow us to highlight the temporal hierarchy in substance abuse patterns among Estonian IDUs. Although our study revealed a sequential pattern that begins with tobacco and is followed by marijuana, home-made opiate injection and heroin injection in that order, these data neither support nor refute a gateway drug theory. Since all participants were IDUs, there is no causal evidence that initiation of any one or any particular series of psychoactive or addictive substances led to subsequent injection drug use.

Further study is needed to investigate the relationships among injection drug use, alcohol use and unsafe sex. Over a half of the population had a CAGE score indicating alcohol-related problems. Problem drinking is associated with an increased risk of STDs across a wide variety of populations.²⁰ Our observation of the high level of alcohol abuse suggests that identification and treatment of alcohol abuse may be an important and desirable component of HIV prevention in Estonia. Further studies are needed to ascertain the precise relationships between these variables.

High rates of bacterial sexually transmitted infections among disenfranchised population groups in Moscow were recently reported by Shakarishvili *et al.*²¹ While the overall HIV infection prevalence was below 3% among those surveyed, the authors noted that the high prevalence of STDs in these groups may foreshadow a dramatic increase in HIV infections in the Russian Federation.²¹ In the current study, most participants reported being sexually active, with over one-fourth having more than five sexual partners within past 12 months, and one-third of the men paying for sex. All these factors are associated with high HIV prevalence and frequent symptomatic STDs. The finding that more than three-quarters of current IDUs report non-IDU sexual partners underscores the urgent need for sex risk reduction and prevention research in the IDU community. Further understanding the high-

risk networks (sexual, drug using) of IDUs and between IDUs and the general population will be important for developing targeted HIV transmission prevention activities.

There are worrisome signs of ongoing marginalization of the young IDUs, as indicated by the high proportion of young persons neither working nor studying (41.4%) and a decreasing proportion of persons covered by state health insurance (57% in 2003, 39% in 2004). As has been suggested by Wallace, marginalization leads to the changes in lives of individuals and families, and also in the social construction of a neighbourhood. Youth behaviours such as doing well in school, getting a regular job, avoiding substance abuse and maintaining stable relationships become more difficult as the neighbourhood structures that value such attainments dissolve. Negative acts such as violent behaviour, multiple sexual conquests and drug taking are messages that tend to be more easily disseminated in a dissolving community.^{22,23}

Last but not least, we observed a very high prevalence of HIV and other blood-borne infections among our respondents. Similarly, high HIV seroprevalence has been reported from other cities/regions of former Soviet Union.^{18,24} The high infection levels increase the urgency of secondary prevention. The extremely frequent co-infections among the HIV-infected IDUs will complicate the treatment for HIV, if and when it becomes available. Information on HIV prevalence within the IDU population in the other two Baltic countries (Lithuania and Latvia) is scarce, and warrants further exploration. According to the surveillance data, 71% of HIV cases reported from Latvia and 80% from Lithuania can be attributable to IDU.²⁵

It is worth reviewing the limitations of the study. The nature of a cross-sectional study permits only prevalence measures and does not allow for incidence measures. Further, cross-sectional studies do not permit us to establish causal relationships or directions of causality. Another limitation of the study design is the use of a convenience sample instead of probability or adaptive sampling. However, convenience sampling is particularly well suited to studying populations without a sampling frame and which are hard to target, such as IDUs. We realize that the characteristics of IDUs can differ from site to site, and we do not suggest that our findings are entirely generalizable to other Estonian IDUs or even those IDUs visiting other Estonian SEPs.

Another limitation of the study is lack of confirmation for HIV enzyme immunoassay (EIA) testing. We used one test system (HIV-1/HIV-2 III Plus from Abbott Laboratories) to detect HIV-1/HIV-2 antibodies for study purposes. Given the high number of positive HIV test results and high cost, it was not feasible to perform confirmatory testing. However, the excellent characteristics of the test system used – both sensitivity and specificity close to 100%²⁶ – and the high prevalence of HIV, suggest that the percentage of false-positive or -negative results were likely to be minimal and had no impact on the results of the study.

Despite these limitations, several inferences can be made. First, the problem of higher rates of HIV infection and injection drug use among racial/ethnic minorities may be a general pattern in many areas. Whether such higher rates can be reduced must be considered a critical question in the international epidemiology of HIV among IDUs. Second, as a summary of the current epidemic outlook in Estonia, our work demonstrates the intersection of several epidemics, including drug use, HIV and viral hepatitis. These epidemics are further characterized by high infection rates and the exceptionally young age of those affected. Third, the contribution of heavy alcohol use to amplify the course of epidemics could be substantial. Fourth, complicated questions for international prevention efforts are raised by the degree to which these young people frequently travel both to former Soviet Union states and to Western Europe (especially Scandinavian countries). The appropriate

responses to these issues should be focused on scientifically validated, evidence-based approaches to secondary prevention among the HIV infected, especially given uncertainties surrounding the availability, cost and sustainability of antiretroviral and substance abuse treatments. This descriptive study of Estonian IDUs portends an enormous burden on health systems and economic productivity.

Acknowledgments

We thank the staff of NGOs AIDS Support Center and NGO Convictus Eesti for their valuable contribution. This study was supported by a grant no. 5526 by Estonian Science Foundation, and grant no. 3 D43 TW00233 from the Fogarty International Center, NIH, USA.

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Table 1

The mean age at initiation of the particular illicit drug and the frequencies of their use

Drug	Marijuana	Cocaine*	Heroin	Street methadone	Home-made opiates	Amphetamines
Used at the last injecting episode No. (%) ^{‡,*}	NA	1 (0.6%)	96 (59.3%)	1 (0.6%)	5 (3.1%)	50 (30.9%)
No. (%) of respondents who have used a particular drug	156 (96.3%)	64 (39.5%)	157 (96.6%)	14 (8.9%)	118 (72.8%)	76 (64%)
Age at initiation (mean, range)	15.5 (7–30)	20 (13–33)	18.9 (10–47)	21 (13–35)	17.8 (10–30)	19 (10–43)
Proportion of frequent users No [‡] (%)	51 (32.5%)	1 (0.6%)	107 (68.2%)	3 (21%)	41 (35%)	NA

* Cocaine, any means of administration

[‡] Twenty-five (15.4%) respondents reported fentanyl use at the last injecting episode

[‡] Frequent use: from several times a week to repeated daily use over past three months

Table 2

HIV seroprevalence by selected variables

The whole sample	Group variable	HIV+ (No.=89)	HIV- (No.=70)	P value
23 (SD 6.1)	Age (years, mean, SD)	23.6 (SD 5.2)	24.8 (SD 7.2)	NS
15.4% (25)	Gender (% , No. of women)	15.9 % (14)	15.7 % (11)	NS
92.6% (147)	Ethnicity (% , No. of non-ethnic Estonians)*	96.6% (86)	87.1% (61)	P=0.03
	Drug using behaviour			
6 (0–30)	Duration of injection home-made opiates use, years (median, range)	6 (0–29)	5 (0–30)	NS
5 (0–41)	Duration of injection heroin use, years (median, range)	5 (0–41)	4 (0–17)	P=0.02
39.5% (63)	Syringe sharing within past three months (% , No.)	42.7% (38)	35.7% (25)	NS
8.8%, always				
46.3%, ohalf of occasions				
23.8%, never				
	Alcohol use			
59.3% (81)	Clinically significant CAGE score (% , No.)	52.8% (47)	48.6% (34)	NS
12.5	Age at initiation of alcohol use (years, mean)	13	12.5	NS
	Sexual behaviour			
15 (9–22)	Age at first sexual encounter (years, range)	15 (9–22)	15 (11–21)	NS
10 (0–1600)	No of lifetime sexual partners (median, range)	10 (0–1600)	12.5 (0–1000)	NS
1 (0–300)	No of last year sexual partners (median, range)	1 (0–60)	1 (0–300)	NS
19.7% (32)	Marginalization (not working or studying* without medical insurance either 2004 or 2003) (% , No.)	21.3% (19)	18.6% (13)	NS
49.3% (80)	Ever been tested for HIV (% , No.)	47.2% (42)	52.9% (37)	NS

* HIV seroprevalence: 25.0% (3/12) among ethnic Estonians, 58.8% (77/131) among ethnic Russians, and 56.3% (9/16) among other ethnic groups (all Russian speaking)