Table 3 Number of Beach Boys/Boat Boys who had sexual contacts with female Japanese clients during the past year in a southern province

Sexual behaviors	Number	Percent
Engaged in sex		
Ever	30	39.0
Never	47	61.0
Total	77	100.0
Condom use		
Always	20	66.7
Sometimes	8	26.7
Never	2	6.6
Total	30	100.0
Performed Oral Sex		
Never	9	30.0
Ever	21	70.0
Total	30	100.0
Received Oral Sex		
Never	5	16.7
Ever	25	83.3
Total	30	100.0
Anal sex experiences		
Never	21	70.0
Ever	9	30.0
Total	30	100.0
Number female Japanese clients of beach/boat boys		
1-2 persons	22	75.9
3-4 persons	6	20.6
≥5 persons	1	3.5
Total (* Missing: 1 respondent)	29*	100.0

Journal of Public Health and Development
Vol. 8 No. 1 January - April 2010

Information from tour guides

The study team conducted focus group discussions or in-depth interviews with tour guides in several tourist locations in Thailand. The data from tour guides illustrated that some of the male and young Japanese female tourists had engaged in high risk sexual behavior during their sojourn in Thailand. Tour guides provided the following comments with respect to their Japanese male and female clients:

"...Most of the women are around 20-30 years old or more than 30 years of age. Some Japanese teenagers come here with their parents, but at night they go off on their own...." *(P - province)*

"...Approximately 80% of the young Japanese female tourists conduct themselves in this manner... We [tour guides] are also women and feel uncomfortable answering these questions, but this is the truth. The numbers of female Japanese tourists exhibiting this type of behavior may even be higher than our estimates...."*(P - province, several TGs)*

"...if you ask the male tourists what they would like to see and do in this province, all will answer "enjoy" the sea, sand, and sun. They will not talk about being interested in engaging in "sexual activities". *(P - province, several TGs)*

"...Most of the males take a night tour, especially those tourists who are over 40 years of age...."

"...Most of my customers, over 40 years of age, like to have Thai women go to their hotel rooms to engage in sexual activities. They will pay "joiner-fees" of about 400-600 baht to the hotel. When he needs a girl the tourist makes a signal by beckoning his guide with his little finger..." *(C&Ch&P – province, several TGs*

"...when a group of 3-5 male tourists stay in separate rooms it is obvious that they intend to engage in sexual activities..." *(S - province)*

"....In general Japanese female tourists request that condoms be used during their first sexual encounter. However once they have had sex with a particular individual it is no longer necessary to use condoms for subsequent sexual acts together. Consistent condom usage drops to only 50%...." *(P - province)*

"....Most Japanese female tourists enjoy engaging in oral sex. They do not use any condoms when performing oral sex. They perform oral sex for up to an hour at a time..." *(P - province, several TGs)*

DISCUSSION

The results of the present study indicate that male Japanese tourists over 40 years of age, when traveling with a group, were very likely to engage in sexual activities with commercial sex workers. Studies from Japanese researchers [10,7] also made similar observations. This finding was especially true if these male Japanese tourists visited the major tourist cities in the country. Although the rate of consistent condom usage was high, this finding was partially the result of Thai sex workers forcing their Japanese clients to use condoms. According to the Thai sex workers, participating in this study, approximately 20% of their Japanese clients initially did not want to use condoms. The study also illustrated that male Japanese clients liked to perform oral sex without using any protection against STIs and/or HIV/AIDS. Although the chance of transmitting/contracting STIs or HIV/AIDS is lower from oral sex than from vaginal or anal sex, this is not a safe sex practice.

Some of the younger female Japanese tourists had sexual contacts with tour guides, beach boys, boat boys, and male sex workers. The prevalence of this type of behavior was substantially higher than the research team had expected to find (see Table and 2&3).

Moreover, as shown by others Vorakitphokatorn and Belliveau[8,11], although some of the female Japanese tourists used condoms during their first sexual contact with a particular individual they frequently stopped using condoms during subsequent sexual acts with the same person. The rate of condom usage during the so-called "first sexual contact" was quite high, but it dropped to less than 50% for later sexual contacts.

According to information from all of key informants in this study, both qualitative and quantitative approaches, reflected risk behaviors in the same direction. It showed that our results might display practical manners of these groups of tourists. In this study the researchers did not explore the determinants of these sexual behaviors. These included a sense of freedom and anonymity during traveling in a foreign country, a sense of loneliness or feeling in need of companionship, and peer influence.[10]

The findings from this study demonstrate that at least two types of educational initiatives should be undertaken in both Japan and Thailand. In Japan the program should focus on STI & HIV/AIDS prevention, by increasing public awareness about the importance of consistently using condoms to reduce high-risk sexual behavior; especially emphasizing the need to use condoms when performing oral sex.

In Thailand the program should similarly focus on consistent condom use to reduce high-risk sexual behavior; also emphasizing the need to use condoms for active and passive oral sex. A special initiative should be undertaken for male sex workers in some major tourist cities and beach/ boat boys. There clearly needs to be additional interventions undertaken to make those individuals potentially entering vocations that can put them at a high risk to contract/transmit STIs & HIV/AIDS. This study has clearly demonstrated that informal and formal commercial sex workers [i.e. female sex worker, male sex worker, tour guides, beach boys/boat boys, etc.] do not consistently use condoms, nor do some of these individuals/ groups have adequate knowledge and awareness concerning various high-risk behaviors associated with the transmission of STIs & HIV/AIDS.

Accordingly the researchers would like to recommend that provincial and district health authorities design and disseminate appropriate and more relevant information concerning the prevention of STIs and HIV/AIDS for the general population, as well as any groups who serve as a source of workers who eventually become part of the informal/ formal commercial sex networks located at tourist destinations in Thailand. Although the latter frequently includes the rural and urban poor, our study has nevertheless identified certain sections of the country as well as specific categories of people who comprise a significant segment of the informal/formal commercial sex network. Thus there appears to be a higher number of women and men from the north, northeast, and south, as well as specific ethnic groups such as Shan migrants from northeastern Myanmar who serve as sex workers working at karaoke bars, male sex workers working at gay bars, and those working as beach boys/boat boys. In general provincial and district health offices throughout the country, but especially in those geographic areas that serve as major tourist destinations, need to design and implement more relevant STI & HIV/AIDS prevention programs in secondary schools, universities, vocational institutes, as well through mainstream mass media. These efforts can take the form of online counseling, appropriate printed materials for literate and semi-literate populations, as well as special educational dissemination approaches for men and women working at karaoke bars, gay bars, and other venues that cater to the entertainment needs of international

Journal of Public Health and Development
Vol. 8 No. 1 January - April 2010

tourists. This study is not without limitations. The research team realized that it would not be able to cover all groups of people engaging in sexual relations with Japanese tourists. The team nevertheless was able to interview the major target groups having sexual relations with Japanese tourists. The research team used the information collected from tour guides (both male and female), and reviewed other relevant data prior to the commencement of the study. This information was helpful in identifying those individuals/ groups of people to be interviewed in an in-depth manner.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the young men and women who agree to be interviewed. We would like to thank the Japanese Foundation for AIDS Prevention for support to conduct this study.

REFERENCES

1. Cabada MM, Maldonado F, Bauer I, Verdonck K, Seas C, Gotuzzo E. Sexual behavior, knowledge of STI prevention, and prevalence of serum markers for STI among tour guides in Cuzco/ Peru. J Travel Med. 2007; 14:151-7.
2. Taylor JS. 2001. Dollars are a girl's best friend? Female tourists' sexual behaviour in the Caribbean. Sociology 2001; 35:749-64.
3. Bellis MA, Hughes K, Thomson R, Bennett A. Sexual behaviour of young people in international tourist resorts. Sex Transm Infect. 2004; 80:43-7.
4. Orisatoki RO, Oguntibeju OO, Truter EJ. The contributing role of tourism in the HIV/AIDS epidemic in the Caribbean. Niger J Med. 2009; 18:143-8.
5. Office of Tourism Development 2008. International Tourist Arrivals to Thailand. [online].2008[cited 2009 May 26]: Available from URL:http://www.tourism.go.th/index.php?option = com_ content&ask=view&id=2610&Itemid=25
6. Cash, R.A. Heterosexual behavior related to risk of HIV infection among Japanese men in Bangkok, Thailand. Paper presented at international AIDS conference, August 7-12, in Yokohama, Japan, 1994.
7. Nemoto T, Yokota F, Hanafusa K, Wada K. HIV-related risk behaviors among Japanese tourists in the Khaosan Road area, Bangkok, Thailand. AIDS and Behavior. 2002; 6:245-53.
8. Vorakitphokatorn, S. Sexual behavior of young Japanese women tourists. In Southern Thailand and risk for HIV infection. Paper presented at international AIDS conference, August 7-12, in Yokohama, Japan, 1994.
9. Israel, G.D. Determining Sample Size. PEOD6. University of Florida.[online] 2006 [cited 2009 May 24]: Available from http://edis.ifas.ufl.edu/PD006#TABLE_2.
10. Yokota F. Sex behaviors of male Japanese tourists in Bangkok, Thailand. Cult Health Sex. 2006; 8:115-31.
11. Belliveau J. Romance on the road : Traveling women who love foreign men. Baltimore : Beau Monde Press; 2006.

Ono-Kihara et al. BMC Public Health 2010, 10:106
http://www.biomedcentral.com/1471-2458/10/106

BMC Public Health

RESEARCH ARTICLE Open Access

Demographic and behavioral characteristics of non-sex worker females attending sexually transmitted disease clinics in Japan: a nationwide case-control study

Masako Ono-Kihara[1,2*†], Tatsuya Sato[3†], Hideko Kato[1,2], Sonia P Suguimoto-Watanabe[1], Saman Zamani[1,2,4], Masahiro Kihara[1,2]

Abstract

Background: Although number of sexually transmitted infections (STIs) reported in STI surveillance increased rapidly for women in Japan during the 1990s, the sexual behavior of women potentially at risk of STI infection remains unknown.

Methods: In order to determine the demographic and behavioral characteristics of non-sex worker (SW) females attending STI clinics, female attendees (n = 145), excluding SW, from nine clinics across Japan and female controls from the general population (n = 956), both aged 18-50 years, were compared using two data sets of nationwide sexual behavior surveys conducted in 1999.

Results: Although the occupation-type and education level were unrelated to STI clinic attendance in multivariate analysis, non-SW females attending STI clinics were younger (adjusted odds ratios [AOR] = 0.94, 95%CI: 0.89, 0.99), and more likely to be unmarried (AOR = 4.11, 95% CI: 1.73, 9.77) than the controls from the general population. In the previous year, STI clinic attendees were more likely to have had multiple partnerships (AOR = 3.09, 95% CI: 1.42, 6.71) and unprotected vaginal sex with regular partners (AOR = 3.59, 95% CI: 1.49, 8.64), and tended to have had their first sexual intercourse at a younger age (AOR = 1.77, 95%CI: 0.89, 3.54) and more unprotected vaginal and/or oral sex with casual partners (AOR = 2.08, 95%CI: 0.75, 5.71). Identical sexual behavior patterns were observed between the female attendees with a current diagnosis of STI (n = 72) and those before diagnosis (n = 73) and between those with a past history of STI (n = 66) and those without (n = 79).

Conclusion: These results indicate that not only multiple partnerships or unprotected sex with casual partners, but also unprotected vaginal sex within a regular partnership is prevalent among non-SW female STI clinic attendees. The identical sexual behavior patterns observed between female attendees with a current STI diagnosis and those without, and between those attendees with a past history of STI diagnosis and those without, indicate that the result are unlikely confounded with the cases of non-STI infection. This sexual behavior pattern may be predictive of STI infection among young Japanese women and could have contributed to the STI epidemic in women in Japan during the 1990s.

* Correspondence: masako.kihara@kx7.ecs.kyoto-u.ac.jp
† Contributed equally
[1]Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan

Background

National sexually transmitted infection (STI) surveillance in Japan witnessed a rapid increase in the reported number of STIs among women, especially in non-viral STIs such as chlamydial and gonococcal infections, beginning in the mid-1990s and reaching peaks in 2002 in both genders [1,2]. In women, average annual numbers of reported cases per designated clinic or hospital increased from 10.0 in 1995 to 27.8 in 2002 for genital chlamydia and from 1.3 to 4.7 for gonorrhea over the same period. Although the reported numbers of chlamydial and gonococcal infections have shown some decline in recent years (in 2006 the average numbers of reported cases per designated clinic or hospital were 19.2 and 2.4 for genital chlamydia and gonorrhea, respectively), they still remain high and other types of STIs such as genital herpes, condyloma acuminatum and syphilis have continued to increase over the same period [3].

Surveillance provides useful information regarding trends in STIs. It shows that genital chlamydia and gonorrhea are the most common types of STI among female patients, and that patients of 30 years old or younger account for 66% of all female cases [4]. However, since the demographic information collected in the surveillance is limited to age, gender and residential area, questions remain about what kind of sexual behaviors in what subpopulations have led to the recent increases in STIs in Japan. Such information is vital for developing effective STI/HIV prevention programs. In a recent case-control study using the data sets of nationwide surveys conducted in 1999, we determined the STI infection risk profiles of male STI clinic attendees in Japan [5]. Using the same data sets, this study attempts to describe demographic and behavioral characteristics of non-sex worker (SW) females attending STI clinics in Japan to gain insight into the sexual behavior patterns that drove the STI epidemic among women during the 1990s and subsequently contribute to the development of effective STI/HIV prevention programs to avert such epidemics.

Methods

Study design

The study employed a case-control design in which cases and controls were selected from two data sets of sexual behavior surveys conducted in Japan in 1999. One was from a sample of STI clinic attendees and the other from a probability sample of the general population. Both studies were designed by the authors of this study (MOK, MK) using the same set of questions, other than those specific to each study.

Sexual behavior survey of the general population

The sexual behavior survey of the general population was conducted during June-July of 1999 [6]. A sample of 5000 individuals, aged 18-59 years, was selected from the general population using a two-stage cluster sampling procedure. Briefly, the entire country was divided into 11 regions. Each region was further divided into five population density bands, yielding 57 strata. A total of 5000 samples (2559 males and 2441 females) were allocated to each stratum in proportion to the population size. Within each stratum, sampling wards were selected in a probability proportional to size using ward lists prepared for the census survey. Around 20 samples were drawn systematically from the residents' basic register or electoral register from each ward. Each subject was visited by trained staff, four times at most if absent, and asked to complete an anonymous self-administered questionnaire. To maximize the response rate, visits were arranged at the time and day most convenient for the subject, as identified during the multiple visits. 1762 males and 1800 females were sampled without replacement, yielding final response rates of 68.8% and 73.7%, respectively.

Nationwide STI clinic survey

The nationwide STI clinic survey was conducted during July-September of 1999 [5]. STI clinic attendees were recruited from 21 private STI clinics, including 9 clinics that reported female attendees, in six large cities (Sapporo, Sendai, Tokyo, Osaka, Hiroshima, and Fukuoka) within six districts (Hokkaido, Tohoku, Kanto, Kansai, Chugoku, and Kyushu) of Japan. The clinics were recruited through consultation with local STI physicians' associations and chosen based on their proximity to the largest entertainment district in each city. Subjects were selected from attendees at the clinics who were currently diagnosed with STIs or before diagnosis displaying STI-related symptoms during the study period. STIs included chlamydial infection, gonorrhea, syphilis, non-chlamydial non-gonococcal urethritis, genital herpes, condyloma acuminatum, chancroid, phthirus pubis, and STI-related symptoms included unusual genital discharge (flow), sores, warts, burning with urination, and redness or itching around the genitals. Eligible attendees were consecutively recruited and asked to complete an anonymous, self-administered questionnaire in a waiting room. A total of 1119 subjects participated in the survey, yielding a final response rate of 84.9 percent (791 males, 304 females, 24 unknown gender). As the survey was anonymous, not all participants responded, and information from the clinics could not be linked to the survey, the distribution of the exact

diagnosis of STIs and STI-related symptoms among participants was not determined.

Integration of the data sets

The data sets in the two surveys were combined for female subjects who lived in the six districts mentioned above. Subjects who had sexual intercourse during the previous year, met age criteria (18-50 year old) and denied involvement in commercial sex were included in the analysis. The merged data set included information about age, gender, occupation, educational background, marital status, HIV/STI-related knowledge, age at first sex, number of sexual partners in the previous year, types of sexual partners (regular, casual, or commercially-related), and condom use with each type of sexual partner in the previous year or during their last sexual experience. For STI clinic attendees, information on the presence of a current diagnosis of STI and a past history of STI infection excluding current diagnosis was included for subgroup analysis.

Sample characteristics

The control group was somewhat older than that found in the 2000 census data [7]. The proportion of subjects in the age group of 18-29, 30-39 and 40-50 was 25, 37, and 38 percent respectively for the control group, and 37, 30 and 33 percent respectively for the female census population. Controls were more likely to be married than the census population (78 percent vs. 58 percent), and were better educated (50 percent vs. 42 percent for at least a college/university education). Occupational patterns were similar between the populations. Regarding STI clinic attendees, only age was available for comparison with the 1999 national sentinel STI surveillance data [8]. STI cases in this study were slightly younger than the STI surveillance population. The proportion of subjects in the age group of 18-29, 30-39, 40-50, was 79, 18, and 3 percent respectively, for STI clinic attendees, and 70, 24 and 6 percent respectively, for the STI surveillance population.

Ethical issues

In both surveys, verbal informed consent was obtained from participants. They were then asked to complete the questionnaire and return it in a sealed envelope, in person or by mail. This research study was approved by the Committee for Research on Human Subjects at Kyoto University in Japan.

Statistical analysis

All statistical analyses were performed using SPSS for windows (version 12.0; SPSS Inc., Chicago, Illinois, USA). Bivariate analyses were performed to determine the association between STI clinic attendance and demographic and behavioral variables. Logistic regression was conducted to calculate adjusted odds ratio (AOR) and 95 percent confidence intervals (CI). Answers to HIV/STI knowledge questions were transformed into scores by giving 1 for a correct answer and 0 for an incorrect answer. Behavioral variables were combined to create variables that coded presence (= 1) or absence (= 0) of unprotected sex for each type of partner. These variables were compulsorily entered into a multivariate model, together with age at first sex, number of sexual partners in the previous year, and demographic variables, except for the variables of behaviors practiced by too few participants and those strongly interrelated. All statistical tests were two-tailed and results were considered significant when $p < 0.05$.

Results

The study examined data relating to 145 STI clinic attendees and 956 controls. Subjects in the control group who reported having had an STI in the previous year (n = 16) were excluded from the study.

Table 1 compares the demographic characteristics and HIV/STI-related knowledge of the two groups. STI clinic attendees were much younger than the control group (average age 24.9 vs. 36.3, $p < 0.001$). There was significant difference in the type of occupation between the groups ($p = 0.012$), with more employed individuals and less housewives among the STI clinic attendees than among the controls. Marital status varied between the groups with 78% of the controls being married while only 15% of the STI clinic attendees were married ($p < 0.001$). Education level was almost equivalent between the groups, with about 50% of both the STI clinic attendees and controls having at least a college/university education. Average scores on HIV/STI-related knowledge were higher for STI clinic attendees than for controls (11.9 vs. 9.6, $p < 0.001$).

Table 2 compares sexual behavior characteristics between the groups. STI clinic attendees experienced their first sexual intercourse almost three years earlier than the controls. Also, there was a remarkable difference in the number of sexual partners in the previous year. While only 8% of the controls reported that they had multiple partners in the previous year, 44% of STI clinic attendees reported multiple partners in the previous year. 40% of STI clinic attendees reported having had casual partners in the previous year, compared to only about 4% of controls.

Significant difference was observed between the groups in the prevalence of unprotected sexual practice. While the proportion of STI clinic attendees who experienced unprotected vaginal and oral sex with regular partners was 82% and 84%, respectively, the figures were 65% and 55% respectively, among the controls.

Table 1 Demographic profile of Japanese non-sex worker female STI*clinic attendees compared with population-based female controls

	STI* clinic attendees (n = 145)		Population-based controls (n = 956)		
Characteristic	n	%	n	%	*p* value†
Age at survey					< 0.001§
18-19	19	13.1	18	1.9	
20-29	96	66.2	225	23.5	
30-39	26	17.9	353	36.9	
40-50	4	2.8	360	37.7	
Missing	0	0	0	0	
Mean(SD*)	25.0(5.9)		36.1(8.7)		
Median	23		36		
Employment					< 0.001
Self-employed	7	4.8	86	9.0	
Management	0	0	6	0.6	
Employee	88	60.7	467	48.8	
Unemployed, full time student	40	27.6	57	6.0	
Housewife	5	3.4	326	34.1	
Missing	5	3.4	14	1.5	
Marital status					< 0.001
Married	21	14.5	746	78.0	
Not married	123	84.8	201	21.0	
Missing	1	0.7	9	0.9	
Education level					0.43
High school or below	66	45.5	471	49.3	
College/university or above	79	54.5	482	50.4	
Missing	0	0	3	0.3	
HIV/STI-related knowledge score¶					<0.001§
Mean(SD)	11.9(3.0)		9.6(3.6)		
Median	12		10		

* STI, sexually transmitted infection; SD, standard deviation

†*p* values for chi-square test unless otherwise noted

¶Score for HIV/STI-related knowledge is the total number of 18 questions answered correctly.

§*P* values for Student's *t*-test

Also, while the proportion of STI clinic attendees who experienced unprotected vaginal and oral sex with casual partners were 30% and 28%, respectively, with the figures only 2% for both among the controls. The proportions of those having had anal intercourse with either regular or casual partners were low in both groups without statistical difference between them.

Subgroup analysis of the female STI clinic attendees having self-reported current STI diagnosis (n = 73) and those before diagnosis (n = 72) revealed that the sexual behavioral patterns were identical between the groups with *p*-values of Chi-square tests for group difference all ranging between 0.77-1.00, except for unprotected oral sex with regular partners ($p = 0.16$). Subgroup analysis of the female STI clinic attendees with a past history of STI diagnosis (n = 66) and those without (n = 79) yielded similar results.

Multivariate analysis was performed to evaluate the independent association of demographic and behavioral variables with STI clinic attendance (Table 3). While age at the time of the survey was entered into the model as a continuous variable, occupation, educational level, marital status, age at first sexual intercourse, and number of partners in the previous year were entered collectively into the model, together with other behavioral variables that represent the presence of unprotected sex with regular or casual partners, all as dichotomous variables. HIV/STI-related knowledge scores and unprotected anal sex with casual partners were excluded from the analysis. Variables representing unprotected oral and vaginal sex with casual partners were combined to create a single dichotomous variable that represents the presence or absence of unprotected oral and/or vaginal sex, since these variables were closely correlated (r = 0.79).

Results of the multivariate analysis showed that female STI clinic attendees were younger (AOR = 0.94, 95% CI: 0.89, 0.99) and more likely to be unmarried (AOR = 4.11,

Table 2 Sexual behavior profile of Japanese non-sex worker female STI clinic attendees compared with population-based female controls

	STI* clinic attendees (n = 145)		Population-based controls (n = 956)		
Characteristic	n	%	n	%	p value†
Age at first sexual intercourse (years)					<0.001
<19	105	72.4	244	25.5	
19 or older	38	26.2	641	67.1	
Missing	2	1.4	71	7.4	
Mean(SD*)	17.6(2.7)		20.5(3.3)		
Median	17		20		
No. of partners (previous year)					<0.001
1	56	38.6	871	91.1	
2 or 3	33	22.8	65	6.8	
4 or more	30	20.7	12	1.3	
Missing	26	17.9	8	0.8	
Type of sex partner (previous year)					
Regular partner					0.011
Yes	139	95.9	942	98.5	
No	6	4.1	10	1.0	
Missing	0	0	4	0.4	
Casual Partner					<0.001
Yes	58	40.0	35	3.7	
No	86	59.3	908	95.0	
Missing	1	0.7	13	1.4	
Sex with regular partners (previous year)					
Had unprotected vaginal sex					
Yes	119	82.1	622	65.1	<0.001
No	17	11.7	268	28.0	
Missing	9	6.2	66	6.9	
Had unprotected oral sex					
Yes	122	84.1	524	54.8	<0.001
No	18	12.4	375	39.2	
Missing	5	3.4	57	6.0	
Had unprotected anal sex					
Yes	10	6.9	42	4.4	0.31
No	130	89.7	851	89.0	
Missing	5	3.4	63	6.6	
Sex with casual partners (previous year)					
Had unprotected vaginal sex					
Yes	44	30.3	20	2.1	<0.001
No	94	64.8	922	96.4	
Missing	7	4.8	14	1.5	
Had unprotected oral sex					
Yes	40	27.6	17	1.8	<0.001
No	97	66.9	925	96.8	
Missing	8	5.5	14	1.5	
Had unprotected anal sex					
Yes	0	0	1	0.1	1.00
No	138	95.2	941	98.4	
Missing	7	4.8	14	1.5	

* STI, sexually transmitted disease; SD, standard deviation

†p values for chi-square test unless otherwise mentioned

Table 3 Bivariate and multivariate analyses on the demographic and sex behavioral correlates of STI infection among non-sex worker Japanese women.

Characteristic	Crude odds ratio	95%CI*	Adjusted odds ratio†	95%CI
Socio-demographic factors				
Age (years)	0.83	0.80-0.86	0.94	0.89-0.99
Occupation				
Unemployed, full time student or housewife	0.69	0.47-1.01	0.61	0.30-1.25
Others	1.00		1.00	
Education				
High school education or less	0.86	0.60-1.21	0.76	0.39-1.48
University education or above	1.00		1.00	
Marital status				
Unmarried	21.74	13.34-35.40	4.11	1.73-9.77
Married	1.00		1.00	
Behavioral factors				
First sexual experience (years)				
≦18	7.26	4.87-10.82	1.77	0.89-3.54
≧19	1.00		1.00	
Number of sexual partners (previous year)				
≧2	12.72	8.29-19.54	3.09	1.42-6.71
1	1.00		1.00	
Sex with regular partners (previous year)				
Had unprotected vaginal sex				
Yes	3.02	1.78-5.11	3.59	1.49-8.64
No	1.00		1.00	
Had unprotected oral sex				
Yes	4.85	2.91-8.10	1.34	0.57-3.18
No	1.00		1.00	
Had unprotected anal sex				
Yes	1.56	0.76-3.18	0.83	0.23-2.95
No	1.00		1.00	
Sex with casual partners (previous year)				
Had unprotected vaginal and/or oral sex				
Yes	23.16	13.51-39.68	2.08	0.75-5.71
No	1.00		1.00	

* CI, confidence interval

†Odds ratio was adjusted by multiple logistic regression analysis for districts (Hokkaido/Tohoku, Kanto-Koshinetsu, Chubu/Kinki, Chugoku/Kyushu)

95% CI: 1.73, 9.77), while educational and occupational categories showed no significant association with STI clinic attendance. Female STI clinic attendees were more likely to have had multiple partners in the previous year (AOR = 3.09, 95%CI: 1.42, 6.71), and have had unprotected vaginal sex with regular partners (AOR = 3.59, 95% CI: 1.49, 8.64). Though not statistically significant, they tended to have experienced their first sexual practice at younger ages (AOR = 1.77, 95% CI: 0.89; 3.54), and have more unprotected vaginal and/or oral sex with casual partners in the previous year than the controls (AOR = 2.08, 95% CI: 0.75, 5.71). In order to eliminate any confounding effects of age, the same analysis was performed in the groups of STI clinic attendees (n = 139) and controls (n = 139) that were exactly frequency matched for age using one year intervals from 18 to 50 years old. Marital status and the same set of behavioral variables were found to be associated with STI clinic attendance in similar magnitudes as in the original unmatched analysis with statistical significance except for the age at first sexual intercourse and unprotected vaginal and/or oral sex with casual partners that were associated at the p-value level of between 0.1- 0.2.

Discussion

This is the first study to evaluate the sexual-behavior profile of Japanese, non-SW females attending STI clinics utilizing the data sets collected in 1999. Using population-based controls, rather than hospital-based controls that bring a risk of over-controlling [9], our

study shows that female STI clinic attendees are more likely to be younger, unmarried, have unprotected vaginal sex with regular partners in the previous year, and have multiple sex partners in the previous year. They also tended to have their first experience of sexual intercourse at a younger age and have more unprotected vaginal and/or oral sex with casual partners. These results however cannot be immediately translated into the risks for STI infection because the results may be confounded by attendees with non-STI infections such as vulvaginal candidasis, bacterial vaginosis or urinary tract infection. Confounding of such cases may well be why our study found unprotected sex with a regular partner was generally high among our subjects. However, this is unlikely to be the case because identical sexual behavioral patterns were identified between female attendees with a current diagnosis of STI and those before diagnosis, and between those with and without a past history of STI diagnosis. It is, therefore, likely that these sexual behaviors are predictive of STI infection among young women in Japan and could have contributed to the STI epidemic in women which Japan witnessed during the 1990s.

Case-control or cross-sectional studies that assess the possible STI infection risk of women using population-based controls are limited. These include a British study that compared females who attended STI clinics in the previous year (n = 250) with those who did not (n = 9584) among the probability samples of the general population using the data set of the British National Surveys of Sexual Attitudes and Lifestyles (NATSAL) conducted in 1990 [10]. Another British study, using the 2000 NATSAL samples, also compared females who had STIs in the previous five years (n = 416) with those who had not (n = 5459) [11]. In the U.S., two population-based studies were performed in North Carolina; one study compared black women with a lifetime history of gonococcal infection (n = 27) with women without such histories (n = 120) [12]; and the other study compared women in a low-income neighborhood with herpes simplex type 2 infections (n = 534) with those who had no such infection (n = 1101) [13]. In China, a national population-based study was conducted in 1999-2000 comparing women testing positive for chlamydia (n = 41) with negative controls (n = 1194) [14]. Finally, in Slovenia, a national population-based study was performed in 2000 that compared women with a lifetime history of STI infection (n = 41) and those without (n = 737) [15]. Although there are other studies that attempt to assess the correlates of STI infection in females, they either do not include the results of multivariate analysis for women or lack information on sample size [9,16,17].

The results of our study are consistent with all of the studies cited above, indicating that multiple partnerships is a strong correlate with STI infection or STI clinic attendance, though the time frame of the question and the stratification of multiple partners varies between the studies. While our study and the China study adopted the previous one year as the time frame for the questions on sexual behaviors, lifetime or the previous five years were used in other studies. Similarly, while the number of partners was used as a dichotomous variable of one or more in our study, it was used as a dichotomous variable with different categorization, a continuous variable or polychotomous variables in other studies. Our findings that STI clinic attendees are more likely to be unmarried or experienced sex at an earlier age are also consistent with the results of some of these studies in STI patients or STI clinic attendees [9,10,12].

Our study, however, differs importantly from other studies in analytic strategy. Though types of partners, types of sex or condom use are usually introduced as separate variables in analysis, we structured the questions so that we could construct dichotomous variables that represent the presence or absence of unprotected sex in each type of sex (vaginal, oral or anal) with each type of partner (regular, casual or paid). This enabled us to more accurately evaluate the potential risk of sexual behaviors for STI infection, especially the sexual behavior with regular partners that has not been adequately addressed because regular partnerships are usually used as a reference for other types of partnerships. Our analysis clearly showed that unprotected vaginal sex with a regular partner is an independent correlate of STI clinic attendance or STI infection. About 60% of female STI clinic attendees in our study experienced sex only with regular partners in the previous year, suggesting that not only multiple partnerships or unprotected sex with casual partners, but also unprotected sex with regular partners may pose a risk of STI infection for young women in Japan. It may be important to note the difference in the type of regular partnership between STI clinic attendees and controls. While 78% of the regular partners for controls were husbands, 77% of the regular partners of STI clinic attendees were boyfriends, who may be potentially short-term, which is consistent with the increased number of partnerships for STI clinic attendees.

The risk of sexual transmission through a regular partnership has been suggested in a number of studies on STIs or HIV [18-21]. These studies are, however, either case studies or cross-sectional studies that only show the proportion of people who are monogamous or have only a regular partner. To our knowledge, our study is the first to quantitatively assess the possible risk of unprotected sex with regular partners among women. The China study introduced variables that represent the level of income or socialization of the male steady

partner and showed that women with chlamydial infection are more likely to have steady partners with higher incomes and displaying frequent socialization [14]. Since 98% of women having chlamydial infection had only a steady partner, it was suggested that infection from a steady partner is the single most important risk factor for STI infection for women in China. In view of the importance of the prevention of STI among women, more evidence on the risk of regular partnerships should be accumulated.

It is interesting to interpret the findings of the present study in relation to those of our previous study that analyzed the demographic and sexual behavioral risk profile of male STI clinic attendees using the same data sets and adopting the same analytic strategy [5]. That study showed that male STI clinic attendees are more likely to be unmarried, have multiple partnerships in the previous year, have unprotected vaginal sex with regular partners, have unprotected vaginal and/or oral sex with casual partners, and unprotected vaginal and oral sex with paid partners in the previous year. These findings, together with the results of the present study, suggest that Japanese women may be at risk of STI infection not only through casual or multiple partnerships but also potentially through regular partnerships with men who have frequent genital and/or oral sexual contact with paid or casual partners. Japanese women, especially unmarried women, may be at a greater risk of STI infection from male partners who buy sex than women in other developed countries because it was shown in our previous study [5] that the proportion of men who paid women for sex was 62.0% of male STI patients and 10.5% of probability male controls, while it is only a few percent among the general male population in other developed countries [22-24].

The results of the present study should be interpreted with caution. Although the case-control design utilized here is pertinent for rare diseases such as STIs, the analytic value may be compromised compared with cross-sectional studies utilizing a representative sample with nested cases and controls. In the present study, STI cases were sampled from private clinics. This is because over 90% of medical institutions in Japan are privately operated and because almost all Japanese people are covered by medical insurance programs, which are applied equally to both private and public institutions. Though selection bias should be considered, important characteristics of the female STI clinic attendees in the current study are shared with the 16 women with STIs in the previous year who were excluded from the control group. Like the STI clinic attendees in the current study, these women were, though to a lesser extent, more likely to have had experienced sex earlier, had unprotected vaginal or oral sex with regular partners or with casual partners and had multiple sex partners in the previous year than the women who had no history of STI infection in the previous year. Among control subjects, although the response rate for our survey (73.7%) was similar to other general population sexual behavior surveys [24-27], our samples were more likely to be married and better educated compared to the census population as described in the Methods section. Since marital status, but not education level, was strongly associated with sexual behavior, this could have affected the results of the bivariate comparison. It is, however, unlikely to have affected the results of multivariate analysis because results were adjusted for both education level and marital status. The control group could have also been biased in that the highly sexually-active subpopulation may have avoided the survey. However, our experience with a nationwide survey of students from 30 universities in 1999 using a similar questionnaire showed little association between the answers to the questions related to sexual behaviors and response rates, which ranged between 16.4-100% [28]. It is also possible that other unmeasured factors could have confounded the results, although in an attempt to avoid this four demographic and four district variables were included in the analysis. Finally, limitations in the results also exists in the fact that our data are 10 years old, making the extrapolation of the findings into the current STI epidemic among women difficult. The present study, however, remains valid because it aimed to analyze the possible background of the STI epidemic among women during the 1990s and this is the only data set available in Japan for this purpose.

Despite the possible limitations, the results of this study are important in showing the possible STI risk profile of non-SW females in Japan for the first time. Together with the results of male STI clinic attendees in our previous analyses, the present results suggest that the epidemic of STIs in young men and women which Japan has experienced since the mid-1990s may have been driven by the sexual network that has expanded among the younger population, linking sex workers and casual and regular partners, and increased in intensity due to multiple partnerships and the prevalent practice of oral sex. These finding should be translated into prevention programs. Of particular importance will be the education campaign to inform the public of the possible risk contained in regular partnerships for both men and women that has been long neglected. Reducing unprotected sex with sex workers by men that may bring STIs into casual and regular partnerships is also important.

Finally, in view of the rapid cultural globalization, the message from the present study may extend to other Asian countries experiencing similar changes in the sexual norms and behavior of young people [29,30].

Conclusion

In a case-control design using population-based controls, our study described demographic and behavioral characteristics of non-sex worker (SW) females attending STI clinics. The results suggested that not only casual sex or multiple partnerships, but also unprotected vaginal sex with regular partners are predictive of STI infection among the non-SW, female population in Japan. HIV/STI prevention programs should focus on both the risk of frequent casual partnerships and the possible risk from regular partnerships that has been long-neglected.

Acknowledgements

This research was supported by a grant-in-aid for AIDS research from the Ministry of Health, Labour and Welfare, Japan. The survey of the general population in 1999 was conducted by the Central Research Service Inc., Tokyo. Hidehito Chida was the study director. The authors thank Dr. Mikio Koroku, Dr. Takehiro Miyagishi, Dr. Hiroshi Yoshio, Dr. Shoichi Kimura, Dr. Shigeaki Sato, Dr. Shiro Mitsukawa, Dr. Masanori Saito, Dr. Masaya Kurosawa, Dr. Kou Majima, Dr. Hiroyuki Kojima, Dr. Masayuki Sawamura, Dr. Yasuhiko Ogami, Dr. Jirou Maruyama, Dr. Kazuhisa Ohsato, Dr. Harukuni Urabe, Dr. Kikuo Kaimi, Dr. Masahiro Yamamoto, Dr. Hiroshi Yamanaka, Dr. Hiromi Tanaka, Dr. Toru Sumii, and Dr. Taiji Kitano for conducting the survey among attendees at their clinics.

Author details

[1]Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan. [2]Joint United Nations Programme on HIV/AIDS Collaborating Centre for Socio-epidemiological HIV Research, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan. [3]Faculty of Medicine, Kyoto University School of Medicine, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan. [4]Japan Foundation for AIDS Prevention, 1-3-12 Misaki-cho, Chiyoda-ku, Tokyo 101-0061, Japan.

Authors' contributions

All authors contributed to this study. MOK designed and conducted the field surveys and was responsible for the analytical design. TS analyzed data and drafted the manuscript. HK and SZ helped with the statistical analysis and revised the manuscript. SPSW assisted subgroup analyses and age-matched analysis MK guided the overall study procedure including the data analysis and drafting and revising of the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Received: 22 September 2009 Accepted: 1 March 2010
Published: 1 March 2010

References

1. Kumamoto Y, Tsukamoto T, Kagabe T, Akaza H, Nogichi M, Kamidono S, Usui T, Kagawa S, Naitoh S, Minowa M, Tanihata T: Epidemiological survey of sexually transmitted diseases prevalence in Japan-sentinel surveillance of STIs in 2000. *Jpn J Sex Transm Dis* 2001, 12:32-67.
2. Watts J: "Japanese face reality about sexually transmitted diseases."(Article). *Lancet* 1999, 354:2059.
3. Infectious disease surveillance center: Surveillance data table 1999-2008. [http://idsc.nih.go.jp/idwr/ydata/report-E.html].
4. National Institute of Infectious Diseases: The topic of this month: Genital Chlamydia trachomatis infection 1999-2003. (in Japanese). *Infectious Agents Surveillance Report* 2004, 25:198-9.
5. Homma T, Ono-Kihara M, Zamani S, Nishimura YH, Kobori E, Hidaka Y, Ravari SM, Kihara M: Demographic and behavioral characteristics of male sexually transmitted disease patients in Japan: a nationwide case-control study. *Sex Transm Dis* 2008, 35:997-8.
6. Ono-Kihara M, Kihara M: The first nationwide sexual behavioral survey in Japan. the results of "HIV & Sex in Japan" survey 1999. *J Asian Sexology* 2001, 2:65-7.
7. National Statistics Bureau: The 2000 Population census. 2000. [http://www.stat.go.jp/english/data/kokusei/index.htm], in Japanese.
8. National Institute of Infectious Diseases: 1999 files of Annual data summary 1999-2004(*in Japanese*).http://idsc.nih.go.jp/idwr/ydata/index-e.html.
9. Manhart LE, Aral SO, Holmes KK, Critchlow CW, Hughes JP, Whittington WLH, Foxman B: Influence of study population on the identification of risk factors for sexually transmitted diseases using a case-control design: the example of gonorrhea. *Am J Epidemiol* 2004, 160:393-402.
10. Johnson AM, Wadsworth J, Wellings K, Field J: Who goes to sexually transmitted disease clinics? Results from a national population survey. *Genitourin Med* 1996, 72:197-202.
11. Fenton KA, Mercer CH, Johnson AM, Byron CL, McManus S, Erens B, Copas AJ, Nanchahal K, Macdowall W, Wellings K: Reported sexually transmitted disease clinic attendance and sexually transmitted infections in Britain: prevalence, risk factors, and proportionate population burden. *J Infect Dis* 2005, 191(Suppl 1):127-38.
12. Doherty IA, Adimora AA, Schoenbach VJ, Aral SO: Correlates of gonorrhea among African Americans in North Carolina. *Int J STI AIDS* 2007, 18:114-7.
13. Buchacz K, McFarland W, Hernandez M, Klausner JD, Page-Shafer K, Padian N, Molitor F, Ruiz JD, Bolan G, Morrow S, Katz MH: Prevalence and correlates of herpes simplex virus type 2 infection in a population based survey of young women in low-income neighborhoods of Northern California. *Sex Transm Dis* 2000, 27:393-400.
14. Parish WL, Laumann EO, Cohen MS, Pan S, Zheng H, Hoffman I, Wang T, Ng KH: Population-based study of chlamydial infection in China: a hidden epidemic. *JAMA* 2003, 289:1265-73.
15. Grgič-Vitek M, Švab I, Klavs I: Prevalence of and risk factors of self-reported sexually transmitted infections in Slovenia in 2000. *Croat Med J* 2006, 47:722-9.
16. Habel LA, Eeden Van Den SK, Sherman KJ, McKnight B, Stergachis A, Daling JR: Risk factors for incident and recurrent condylomata acuminata among women. A population-based study. *Sex Transm Dis* 1998, 25:285-92.
17. Wilson TE, Uusküla A, Feldman J, Holman S, Dehovitz J: A case-control study of beliefs and behaviors associated with sexually transmitted disese occurrence in Estonia. *Sex Transm Dis* 2001, 28:624-9.
18. Van Duynhoven YT, Laar van de MJ, Schop WA, Mouton JW, Meijden van der WI, Sprenger MJ: Different demographic and sexual correlates for chlamydial infection and gonorrhoea in Rotterdam. *Int J Epidemiol* 1997, 26:1373-85.
19. Gangakhedkar RR, Bentley ME, Divekar AD, Gadkari D, Mehendale SM, Shepherd ME, Bollinger RC, Quinn TC: Spread of HIV infection married monogamous women in India. *JAMA* 1997, 278:2090-92.
20. Dolcini MM, Catania JA: Psychosocial profiles of women with risky sexual partners: the national AIDS behavioral surveys (NABS). *AIDS Behav* 2000, 4:297-308.
21. Diaz T, Chu SY, Conti L, Sorvillo F, Checko PJ, Hermann P, Fann SA, Frederick M, Boyd D, Mokotoff E, Rietmeijer CA, Herr M, Samuel MC: Risk behaviors of persons with heterosexually acquired HIV infection in the United States: results of a multistate surveillance project. *J Acquir Immune Defic Syndr* 1994, 7:958-63.
22. Carael M, Slaymaker E, Lyerla R, Sarkar S: Clients of sex workers in different regions of the world: hard to count. *Sex Transm Infect* 2006, 82(Suppl 3):26-33.
23. Anderson JE, Wilson RW, Barker P, Doll L, Jones TS, Holtgrave D: Prevalence of sexual and drug-related HIV risk behaviors in the U.S. adult population: results of the 1996 National Household Survey on Drug Abuse. *J Acquir Immune Defic Syndr* 1999, 21:148-56.
24. Hubert M: Studying and comparing sexual behavior and HIV/AIDS in Europe. *Sexual behaviour and HIV/AIDS in Europe* London: UCL PressHubert M, Bajos N, Sandfort 1998, 3-34.
25. Fenton KA, Korovessis C, Johnson AM, McCadden A, McManus S, Wellings K, Mercer CH, Carder C, Copas AJ, Nanchahal K, Macdowall W, Ridgway G, Field J, Erens B: Sexual behaviour in Britain: reported sexually transmitted infections and prevalent genital Chlamydia trachomatis infection. *Lancet* 2001, 358:1851-4.

26. ACSF investigators: AIDS and sexual behaviour in France. *Nature* 1992, 360:407-9.
27. Mosher WD, Chandra A, Jones J: Sexual behavior and selected health measures: men and women 15-44 years of age, United States, 2002. Advance data from vital and health statistics; no 362. Hyattsville, MD: National Center for Health Statistics 2005.
28. Ono-Kihara M, Kihara M, Amano K, Nakaune N, Kimura H, Ichikawa S, Ohya H, Ochiai K, Yamamoto T, Uchino H: Sexual behavior survey among students of national universities. *Annual Report of Japanese Study Group on HIV Epidemiology and Prevention (in Japanese)* Ministry of Health, Labour and Welfare 2000, 584-93.
29. Ono-Kihara M: Sexual behavior of teenagers in contemporary Japan: The WYSH Project. Sanko Publisher, Tokyo, Japan 2010.
30. Ma Q, Ono-Kihara M, Cong L, Xu G, Zamani S, Ravari SM, Kihara M: Sexual behavior and awareness of Chinese university students in transition with implied risk of sexually transmitted diseases and HIV infection: a cross-sectional study. *BMC Public Health* 2006, 6:232.

Pre-publication history
The pre-publication history for this paper can be accessed here: http://www.biomedcentral.com/1471-2458/10/106/prepub

doi:10.1186/1471-2458-10-106
Cite this article as: Ono-Kihara *et al.*: Demographic and behavioral characteristics of non-sex worker females attending sexually transmitted disease clinics in Japan: a nationwide case-control study. *BMC Public Health* 2010 10:106.

International Journal of Drug Policy 21 (2010) 493–500

Contents lists available at ScienceDirect

International Journal of Drug Policy

Journal homepage: www.elsevier.com/locate/drugpo

Research paper

Prevalence of HIV/HCV/HBV infections and drug-related risk behaviours amongst IDUs recruited through peer-driven sampling in Iran☆

Saman Zamani[a,*], Ramin Radfar[b], Pardis Nematollahi[c], Reza Fadaie[c], Marjan Meshkati[c], Shahrzad Mortazavi[a], Abbas Sedaghat[d], Masako Ono-Kihara[a], Masahiro Kihara[a]

[a] Department of Global Health and Socio-epidemiology, Kyoto University School of Public Health, Yoshida-Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan
[b] Health and Culture Institute, Isfahan, Iran
[c] Isfahan University of Medical Sciences and Health Services, Isfahan, Iran
[d] Center for Communicable Diseases Control, Ministry of Health and Medical Education, Tehran, Iran

ARTICLE INFO

Article history:
Received 12 January 2010
Received in revised form 10 April 2010
Accepted 19 April 2010

Keywords:
Blood-borne infection
IDUs
Peer-driven sampling
Iran

ABSTRACT

Background: The control of blood-borne infections including HIV and hepatitis C (HCV) amongst injecting drug users (IDUs) is a challenge for health authorities in Iran. Hence, more reliable estimates of the levels of blood-borne infections and their associated factors are critically needed.
Methods: Active IDUs were recruited using peer-driven sampling in a bio-behavioural survey in 2008. Over 8 weeks, data were collected from adults living in a city in Isfahan Province who had injected drugs in the past month. Participants provided a whole blood sample and answered questions on sexual and drug-related risk characteristics. Participants were provided post-test counselling and a non-monetary incentive for their participation. Excluding two inactive cases, the initial recruits resulted in 2–8 waves of recruitment.
Results: Overall, 118 IDUs including three females participated. The estimated population proportions of HIV, hepatitis B, and HCV infections were 0.7% (95% CI, 0.6–2.3), 0.7% (95% CI, 0.1–2.1), and 59.4% (95% CI, 47.4–68.7), respectively. Responses indicated that 31% (95% CI, 20–44.5) of the IDUs ever shared a needle/syringe for drug injection, and 77% (95% CI, 65–84) had ever injected an addictive solution marketed widely as Temgesic. Multivariate analyses revealed that the high prevalence of HCV infection amongst IDUs is associated with the lifetime duration of drug injection (AOR, 1.17; 95% CI, 1.01–1.34) and with having injected Temgesic (AOR, 4.73; 95% CI, 1.52–14.69).
Conclusion: Our experience in Iran indicates that IDUs can be recruited effectively in a bio-behavioural survey through peer-driven sampling and using only a single primary incentive. The high prevalence of HCV associated with injecting Temgesic is important evidence for harm-reduction policies in Iran.

Introduction

The control of blood-borne infections including HIV and hepatitis C (HCV) infections amongst people who inject drugs has been a challenging task for the health authorities in Iran. The prevalence of HIV infection amongst injecting drug users (IDUs) recruited in 10 urban cities during the first round of the bio-behavioural surveillance survey in 2007 averaged 15.3%, ranging from 2.1% in a south-eastern province to as high as 35.7% in a western province (Center for Communicable Diseases Control Iran, 2008). The report revealed that the prevalence of HIV infection amongst IDUs in half of these cities exceeded 14% (Center for Communicable Diseases Control Iran, 2008). The prevalence of HCV infection is also very high amongst IDUs in Iran, and ad hoc studies have shown that it ranges from 50 to 75% depending on the area of study (Alizadeh, Alavian, Jafari, & Yazdi, 2005; Hajiani, Masjedizadeh, Hashemi, Azmi, & Rajabi, 2006; Imani, Karimi, Rouzbahani, & Rouzbahani, 2008; Zamani et al., 2007).

IDUs in Isfahan Province in the central area of Iran are believed to have a lower HIV prevalence compared to those living in other major cities such as Shiraz and Tehran. It is reported that HIV prevalence amongst IDUs in Isfahan province is generally low (about 1%) (Radfar, Nematollahi, & Tayeri, 2007). However, injecting drug use has been reported as the main route of HIV transmission amongst the reported cases of HIV and AIDS in this province. To date, 345 cases of HIV/AIDS have been detected in Isfahan province,

☆ *Sponsorship*: This research is sponsored jointly by a grant from the Fujiwara Foundation of Japan and a support from the Health and Culture Institute, Isfahan, Iran.
* Corresponding author. Tel.: +81 075 7534350; fax: +81 075 7534359.
E-mail addresses: szamani@sph.mbox.media.kyoto-u.ac.jp, saman.zamani@gmail.com (S. Zamani).

0955-3959/$ – see front matter © 2010 Elsevier B.V. All rights reserved.
doi:10.1016/j.drugpo.2010.04.006

and an additional 84 people have died from AIDS. Up to 93.6% of the reported HIV/AIDS cases were male, and the main route of transmission was injecting drug use (78%), followed by sexual transmission (12.6%).

On the other hand, it is believed that the prevalence of HCV infection amongst IDUs in this province is high, ranging from 35 to 60% in different studies (Ataei, Kassaian, Tayeri, & Farajzadegan, 2009; Radfar, Nematollahi, et al., 2007; Radfar, Pooya, Meshkaty, Fadai, & Soltanolkotaby, 2007; Radfar, Sadeghy, Meshkaty, & Fadai, 2007; Tayeri, Kasaee, Fadaei Nobar, & Ataei, 2009). For improved control measures against blood-borne infections in Isfahan, our research team aimed to provide health authorities with more accurate estimates on the prevalence and factors associated with blood-borne infections amongst IDUs.

For this purpose, IDUs were recruited through respondent-driven sampling (RDS), which has shown several advantages over other conventional sampling methods in bio-behavioural surveys amongst hard-to-reach populations. Accessing IDUs, as well as other hard-to-reach populations, is a challenge in HIV prevention and related research. RDS has been used extensively in international settings, and it has shown merits with regard to feasibility and to producing more reliable population estimates (Frost et al., 2006; Johnston, Malekinejad, Kendall, Iuppa, & Rutherford, 2008; Johnston, Sabin, Mai, & Pham, 2006; Malekinejad et al., 2008; Wattana et al., 2007).

RDS, however, has not been used widely and adapted to the context in Iran. This research study intended to assess the feasibility of RDS with some modifications related to the existing context amongst IDUs in Iran. This report presents the approaches used to implement RDS to recruit IDUs in Foulad-shahr city in Isfahan province, Iran. In particular, this article presents estimates of the prevalence of HIV, HCV, and hepatitis B (HBV) infections and other drug-related risk characteristics, and defines the risk factors associated with HCV infection amongst IDUs in this city. The report intends to provide additional evidence of some preventable harm amongst IDUs in Iran.

Materials and methods

This was a cross-sectional quantitative study to estimate the prevalence of blood-borne infections, as well as the drug-related risk behaviours of IDUs in Foulad-shahr city. IDUs in this city are known to have excellent social networks and often share needles or inject with other IDUs. Active IDUs who had injected an illicit drug in the past month were recruited into this study through RDS, which has demonstrated merit in recruiting hard-to-reach populations compared to other sampling methods (Abdul-Quader, Heckathorn, McKnight, et al., 2006; Abdul-Quader, Heckathorn, Sabin, & Saidel, 2006; Magnani, Sabin, Saidel, & Heckathorn, 2005).

Foulad-shahr, a small city with a population of 55,000 residents, was originally developed to accommodate domestic and international technical staff of Isfahan Steel Company. After the Islamic Revolution in Iran in 1978, major social changes have occurred in the city. Foreign nationals have left the city, but domestic migration has increased from two neighbouring provinces where residents were displaced during and after the Iran–Iraq War. The disproportionate number of migrants, coupled with several other problems such as unemployment, has resulted in many additional social problems including high rates of drug misuse, especially in the form of injecting.

In May 2008, a formative qualitative study including interviews and discussions with key informants, drug-using people, and health care providers, as well as field observation was conducted. Potential participants were approached and recruited with the help of health care providers affiliated with a drop-in centre that provides a range of services to female and male drug users, including a needle- and syringe-exchange program and a progressive methadone maintenance treatment (MMT) program (Radfar, Pooya, et al., 2007; Radfar, Sadeghy, et al., 2007). The specific goals of this qualitative study were to explore the characteristics of social networks amongst IDUs (including network size), identify subpopulations of IDUs who then helped select initial recruits, and explore the appropriate incentive for the subsequent quantitative study. In addition to seven care providers or key informants who participated in interviews, 30 injecting drug users from Foulad-shahr and Isfahan participated in seven focus-group discussions. The findings of the qualitative study were incorporated into the design of the main quantitative study, including the identification of an appropriate incentive for participation, development of a structured questionnaire, and the refinement of some ethical issues.

After completing logistic preparations, obtaining ethical approval, and training the staff, the main quantitative part of the study was conducted between October and December 2008 (8 weeks). Based on pre-existing contact with the study group, 10 initial study participants (seeds) were selected from the target population in Foulad-shahr. Initial recruits with diverse socio-demographic characteristics (gender, age, ethnic background, and living places) and HIV and HCV status were selected from the needle/syringe-exchange program, clients of the MMT program, or through contacts made by outreach workers. Only one of the initial recruits was a woman.

The initial recruits and all subsequent participants received only a single incentive (*primary incentive*) for completing a 30-min interview and then providing a whole blood sample. Once the seeds or the recruits had completed data collection, they received a warm jacket, with a value of about US$ 5, as the primary incentive when the weather was getting cold. They were then provided with three recruitment coupons to distribute randomly amongst their peers regardless of their gender, age or health status, and were asked to encourage their peers to participate in the study. Each coupon was uniquely coded to link the recruiters with recruits. Participants could recruit up to three peers, who then received an incentive if they fulfilled the eligibility criteria and completed the interview and blood sampling.

Inclusion criteria were defined as aged 18 years or older, having injected a drug in the past month, and living and/or working in Foulad-shahr at the time of our investigation. Candidates for enrollment were assessed for eligibility by project staff; except in a few cases, the duplication of respondents was not a major concern in this study.

The only drop-in centre in Foulad-shahr was used for interviewing participants. Following a short warm-up phase and granting of consent, respondents were interviewed face-to-face by project staff. Female participants were interviewed by a female interviewer. All participants were asked to complete a 30-min assessment of their demographic background, drug use and sexual characteristics, HIV/AIDS-related knowledge, and health service utilisation. Questions about the participant's network structure and relationship and knowledge about his/her recruiter were embedded in the questionnaire. As a part of RDS methodology, respondents were asked about the size of their personal networks. Specifically, participants were asked how many people they know personally from Foulad-shahr who used injecting drugs (*i.e.*, you know who they are, they know who you are, you saw them yesterday).

Following the interview, project staff collected whole blood samples, which were shipped in batches to a laboratory, where they were tested for HIV (4th Generation EIA, Adaltis Inc., Montreal, Canada) and HCV antibodies [EIAgen HCV Ab (v.4), Adaltis, Inc.], as well as for the presence of HBsAg (Enzygnost® HBsAg 5.0, Marburg, Germany). The collected specimens were linked anony-

Table 1
Estimated measures of demographics, drug- or infection-related characteristics amongst injecting drug users (IDUs) recruited through peer-driven sampling (RDS) in Fouladshahr city of Iran in 2008.

Characteristics	Sample proportion	Estimated population proportion (95%CI)
Number of participants	118	–
Male gender	115/118 (97.5%)	95.7% (89.8–98.5)
Age less than 30 years old	74/118 (62.7%)	68.9% (58.6–83.6)
Educational level of junior high school or less	65/118 (55.1%)	60.5% (48.7–68.9)
Never married	81/118 (68.6%)	64.8% (55.3–75.8)
Fars ethnicity	66/118 (55.9%)	57.8% (48.8–68.2)
Jobless	50/118 (42.4%)	37.8% (28.5–52.7)
Currently under MMT	35/118 (29.7%)	26.4% (16.8–38.6)
Ever used a shared needle/syringe for drug injection	33/118 (28.0%)	31.2% (20.5–44.5)
Ever used a shared cooker for drug injection	51/117 (43.6%)	43.0% (31.4–52.7)
Used a shared needle/syringe for drug injection in the past month	11/118 (9.3%)	8.2% (2.6–19.4)
Ever injected handmade Temgesic	93/118 (78.8%)	76.7% (65.5–84.2)
Ever incarcerated	87/118 (73.7%)	71.2% (64.0–80.0)
Ever experienced sexual intercourse	104/118 (88.1%)	83.9% (74.8–91.5)
Ever exchanged money/drug for sex	32/118 (27.1%)	24.9% (16.8–35.6)
Ever had sex with another man (only for male participants)	21/115 (18.3%)	11.3% (6.0–21.4)
Ever been tattooed	67/118 (56.8%)	55.8% (44.6–66.1)
Ever tested for HIV infection	54/118 (45.8%)	46.9% (35.0–55.5)
HIV antibody positive	2/117 (1.7%)	0.7% (0.6–2.3)
HBsAg positive	2/117 (1.7%)	0.7% (0.1–2.1)
HCV antibody positive	71/117 (60.7%)	59.4% (47.4–68.7)

CI: confidence intervals; MMT: methadone maintenance treatment.

mously using unique individual codes that were known exclusively to the individual participants.

The sample-size calculation was based on the estimated prevalence of HCV (50%), taken as the highest prevalence amongst HIV/HCV/HBV blood-borne infections. Using the Epi Info™ Statcalc for population surveys, a sample size of about 130 IDUs was calculated appropriate for this study, considering a significance level of 95% and a design effect of 1.5. The data were analysed using RDS Analysis Tool version 5.4 (RDSAT) software. Standard statistical methods were also performed using SPSS for Windows (version 13); these included bivariate and multivariate analyses of the association of the positive HCV antibody test result and demographic and behavioural characteristics. A multivariable logistic regression analysis was used to examine the associations between independent variables and outcome, simultaneously adjusting for potential confounders, and to estimate adjusted odds ratios (AORs) and 95% confidence intervals (CIs). Variables related to age, network size, frequency of drug injection, lifetime length of drug injection, lifetime histories of having used a shared needle/syringe, having used a shared cooker for drug injection, having been tattooed inside prison, and having injected Temgesic solution were entered into this model. These variables had association level of $P<0.20$ with positive HCV antibody test result or they were considered epidemiologically important.

The study protocol was approved by the Committee for Research on Human Subjects at the Faculty of Medicine of Kyoto University in Japan, and permission was obtained from the Deputy of Health in the Isfahan University of Medical Sciences to conduct the study. Through review of the literature as well as findings from our formative qualitative study, we identified some ethical concerns for our study amongst IDUs in Iran and addressed them by modifying the incentives (DeJong, Mahfoud, Khoury, Barbir, & Afifi, 2009; Scott, 2008; Semaan, Santibanez, Garfein, Heckathorn, & Des Jarlais, 2009). In particular, a concern was raised that the use of two incentives, especially one in the form of cash, might lead some IDUs to force their peers to participate in the study. We were also concerned that IDUs might non-randomly recruit those peers who are more cooperative and are more likely to participate. Thus, we excluded the secondary incentive and provided only a single non-monetary primary incentive to the IDUs for their participation. The participants were then given three coupons to distribute randomly amongst their peers, and we tried to create a sense of connectedness amongst peers through the suggestion that they were reaching out and helping each other rather than using the power of money for recruiting peers. Once the seeds or the recruits completed data collection, they received a jacket, with a value of about US$ 5, as the primary incentive. Participants were also provided with refreshment (cake and juice) during the interview and received HIV pre-test counselling and other health information before a whole blood sample was taken. Participants were also offered post-HIV test counselling upon showing their individual anonymous testing code.

Results

Between October and December 2008, 118 eligible injecting drug users participated in this study, and all except one male IDU gave a blood sample for HIV/HCV/HBV testing. From 10 initial recruits, two did not recruit any peers, but recruiting activities by the other eight resulted in 2–8 waves of recruitments. Four of the initial recruits initiated five or more waves of recruitment. For the main socio-demographics variables (gender, age, level of education, and ethnicity), as well as a history of incarceration or having been under methadone treatment, the number of waves needed to reach equilibrium did not exceed three waves. Amongst recruits, 15.7% (17/108) reported having received the study coupon from a stranger.

Table 1 describes the characteristics of the study population, as well as the RDS-estimated population proportions for IDUs in Foulad-shahr. The sample consisted predominately of male IDUs (115/118), with only three female IDUs recruited for the survey. These estimates suggest that IDUs in this city are generally young, with 69% (95% CI, 59–84) under 30 years of age at the time of study. Up to 60% (95% CI, 49–69) reported an education level of junior high school or less, and 65% (95% CI, 55–76) had never been married. The majority of the population was estimated to be of Fars ethnicity (58%; 95% CI, 49–68), and more than a third (38%, 95% CI, 28.5–53) were jobless at the time of interview (Table 1).

The population estimates indicated that 26% (95% CI, 17–39) of the IDUs were under MMT. Respectively, about one-third 31% (95% CI, 20.5–44.5) and 43% (95% CI, 31–53) reported ever using a shared needle/syringe or sharing a cooker for drug injection in their lifetime. Only 8% (95% CI, 3–19%) reportedly used a shared needle/syringe for drug injection in the past month. Up to 71% (95% CI,

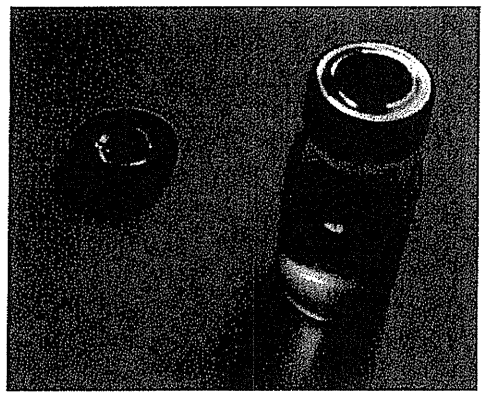

Fig. 1. The so-called Temgesic solution, an addictive solution that is filled into glass vials and has been marketed in Iran for several years.

64–80) had ever been incarcerated during their lifetime. As high as 77% (95% CI, 65.5–84) had ever injected the so-called Temgesic solution, an addictive solution that is filled into glass vials and has been marketed in Iran for several years. This addictive solution probably contains heroin and corticosteroids, as well as other chemical compounds (Fig. 1) (Table 1) (Azizi et al., 2008).

The majority of the IDUs (84%, 95% CI, 75–91.5) had experienced sexual intercourse, and one-quarter (25%, 95% CI, 17–36) reported ever exchanging money or drugs for sex. Amongst male IDUs, it was estimated that 11% (95% CI, 6–21) had ever had sex with another man in their lifetime. Up to 56% (95% CI, 45–66) had ever been tattooed, and 47% (95% CI, 35–55.5) had been tested for HIV prior to our investigation. The estimated population proportions of HIV, HBV, and HCV positivity were 0.7% (95% CI, 0.6–2.3), 0.7% (95% CI, 0.1–2.1), and 59% (95% CI, 47–69), respectively (Table 1).

Factors associated with HCV infection

Table 2 shows the bivariate and multivariate analyses of the association between positive HCV status and socio-demographic and behavioural characteristics amongst the 117 IDUs who gave a blood sample for biological testing. Amongst the socio-demographic characteristics examined, only age showed a significant association with HCV infection; HCV-positive IDUs were significantly older [mean, 30.1 years; standard deviation (SD), 7.2] than HCV-negative IDUs (mean, 27.2 years; SD, 5.0) ($P = 0.020$). However, HCV-positive and HCV-negative IDUs were comparable in terms of gender, educational level, marital status, ethnicity, and job situation.

Amongst drug use-related characteristics, no association was found between HCV positivity and age at commencing drug injection, individual's network size, or frequency of drug injection in the past month; however, HCV-positive status was positively associated with the length of drug injection ($P < 0.01$). Bivariate analyses indicated that the levels of HCV prevalence were marginally higher amongst IDUs who had used a shared needle/syringe or shared cooker for drug injection than amongst those who had not (Table 2).

Bivariate analyses also showed that a history of injecting the addictive solution called Temgesic was strongly associated with HCV positivity (OR, 4.20; 95% CI: 1.62–10.90). The total length of lifetime Temgesic injection was found to be associated with a higher prevalence of HCV infection in a dose-dependent manner, as this association was moderate in IDUs who had injected Temgesic for less than 6 months (OR, 2.9, 95% CI: 1.0–8.6) but stronger amongst those who had injected it for six months or more (OR, 5.5, 95% CI: 1.9–15.4). A similar pattern of association was found between HCV prevalence and the frequency of Temgesic injection compared to IDUs who reported having never injected Temgesic (33%). The proportion of HCV positivity was significantly higher amongst IDUs who had injected Temgesic 1–3 times a day (64%) (OR, 3.6, 95% CI: 1.3–9.9), and was the highest amongst those who reported having injected Temgesic four times a day or more (73%) (OR, 5.4, 95% CI: 1.8–16.5) (Table 2). Dose-dependent association between frequency of Temgesic injection and HCV positivity remains significant in a multivariate regression model adjusted for the socio-demographics and other risk characteristics, as the adjusted odds ratio increased from 4.2 amongst IDUS who were injecting Temgesic less than four times a day to 5.7 in those who injected Temgesic four times or more a day compared with those who never injected this solution (not shown in the Table).

None of the variables related to sexual characteristics that we asked IDU participants were associated with positive HCV antibody test results. Ever having been tattooed inside a prison setting was associated with a higher proportion of HCV-positive IDUs only in bivariate analysis (OR, 3.84; 95% CI, 1.05–14.11). With low levels of HIV and HBV prevalence amongst our study sample, we could not detect any significant co-infection between HCV and either HIV or HBV infections similar to those reported in other cities in Iran (Rahimi-Movaghar, Razaghi, Sahimi-Izadian, & Amin-Esmaeili, 2009; Zamani et al., 2007).

Table 2 shows a multivariate analysis that included variables that were associated with HCV infection at significant or marginal levels or were considered to be important. A dichotomous variable related to a history of having injected the Temgesic solution was entered into the model without considering categories related to the length or frequency of its injection. The multivariate analysis showed that a high prevalence of HCV infection was associated with having injected Temgesic solution (AOR, 4.73; 95% CI, 1.52–14.69), as well as with the duration of lifetime drug injection (AOR, 1.17; 95% CI, 1.01–1.34).

Discussion

This study is amongst the first to report on the level of blood-borne infections and sexual and drug injection risk behaviours in a probability sample of IDUs using a modified version of RDS in Iran. Our experience indicates that recruiting IDUs through peers is a feasible option even without offering a secondary incentive. Additionally, the study findings shed light on a dose-dependent association between the high prevalence of HCV infection and the injection of Temgesic solution.

Currently, RDS is being applied in many international settings as an effective method to recruit hard-to-reach populations that are connected through social networks (Frost et al., 2006; Johnston, Khanam, et al., 2008; Johnston et al., 2006; Malekinejad et al., 2008; Stormer et al., 2006; Yeka, Maibani-Michie, Prybylski, & Colby, 2006). However, little is known about the effect of incentives on the populations or whether the random recruiting of peers is applicable in countries where a large proportion of the population is extremely underprivileged. Random recruitment is an essential assumption in the RDS methodology, although it may not be achievable when some underprivileged study participants are asked to recruit their peers into a study and were rewarded for such recruitment. As we are unaware of a better way to solve this problem, we tried to reduce the possibility of non-random recruitment of peers by excluding the secondary incentive. However, further research is needed to verify whether this strategy can actually enhance the random recruitment of IDUs in bio-behavioural studies.

Another problem with using a secondary incentive, especially in the form of a monetary incentive, is an ethical problem created if certain IDUs coerce their peers to participate in a study. By excluding a secondary incentive, we tried to prevent coercion of IDUs by

Table 2
Characteristics of injecting drug users (IDUs) recruited through peer-driven sampling in Foulad-shahr city of Iran, in 2008, by HCV infection test result.

Characteristics	Totaln (%)	HCV antibody negative[a] n (%)	HCV antibody positive n (%)	P value	Odds ratio (95% CI)	
					Crude	Adjusted
Overall number of the participants	117	46(39.3)	71(60.7)	–	–	–
Gender						
Male	114	45(39.5)	69(60.5)		1.00	
Female	3	1(33.3)	2(66.7)	1.000	1.30 (0.11–14.81)	–
Age at interview (years)						
Mean (SD) (Median)	29.0 (6.6) (28.0)	27.2 (5.0) (26.5)	30.1 (7.2) (28.0)	0.020	1.08 (1.01–1.16)	1.03 (0.95–1.13)
Education						
Junior high school or less	64	27(42.2)	37(57.8)		1.00	
High school or more	53	19(35.8)	34(64.2)	0.485	1.31 (0.62–2.76)	–
Marital status						
Single (never married)	81	33(40.7)	48(59.3)		1.00	
Ever married	36	13(36.1)	23(63.9)	0.636	1.22 (0.54–2.74)	–
Ethnicity						
Fars	66	29(43.9)	37(56.1)		1.00	
Others	51	17(33.3)	34(66.7)	0.244	1.57 (0.73–3.35)	–
Job situation						
Have a job	67	28(41.8)	39(58.2)		1.00	
Jobless	50	18(36.0)	32(64.0)	0.526	1.28 (0.60–2.71)	–
Age at first injection (years)						
Mean (SD) (median)	23.6 (5.3) (23.0)	23.9 (5.4) (24.0)	23.4 (5.3) (22.0)	0.644	0.98 (0.92–1.06)	–
Lifetime length of drug injection (years)						
Mean (SD) (median)	5.4 (5.5) (4.0)	3.3 (3.6) (2.0)	6.7 (6.1) (5.0)	0.002	1.19 (1.07–1.32)	1.17 (1.01–1.34)
Individual's network size						
Mean (SD) (median)	7.9 (11.1) (4.0)	7.9 (9.8) (5.0)	7.9 (11.9) (4.0)	0.993	1.00 (0.97–1.03)	0.99 (0.95–1.03)
Frequency of drug injection in past month						
Every other day or less frequent	37	14(37.8)	23(62.2)		1.00	1.00
Everyday	79	32(40.5)	47(59.5)	0.784	0.89 (0.40–1.99)	0.88 (0.33–2.36)
Currently under MMT						
No	82	29(35.4)	53(64.6)		1.00	1.00
Yes	35	17(48.6)	18(51.4)	0.181	0.58 (0.26–1.29)	0.67 (0.25–1.81)
Ever used a shared needle/syringe for drug injection						
No	85	37(43.5)	48(56.5)		1.00	1.00
Yes	32	9(28.1)	23(71.9)	0.128	1.97 (0.82–4.76)	1.36 (0.48–3.88)
Ever used a shared cooker for drug injection						
No	65	30(46.2)	35(53.8)		1.00	1.00
Yes	51	16(31.4)	35(68.6)	0.106	1.88 (0.87–4.04)	0.60 (0.21–1.73)
Ever injected handmade Temgesic						
No	24	16(66.7)	8(33.3)		1.00	1.00
Yes	93	30(32.3)	63(67.7)	0.002	4.20 (1.62–10.90)	4.73 (1.52–14.69)
Length of injecting Temgesic in lifetime						
Never	24	16(66.7)	8(33.3)		1.00	
<6 months	37	15(40.5)	22(59.5)	0.049	2.93 (1.00–8.58)	–

Table 2 (*Continued*).

Characteristics	Totaln (%)	HCV antibody negative[a] n (%)	HCV antibody positive n (%)	P value	Odds ratio (95% CI)	
					Crude	Adjusted
≥6 months	56	15(26.8)	41(73.2)	0.001	5.47 (1.94–15.38)	–
Frequency of injecting Temgesic						
Never	24	16(66.7)	8(33.3)		1.00	
1–3 times/day	56	20(35.7)	36(64.3)	0.013	3.60 (1.31–9.88)	–
≥4 times/day	37	10(27.0)	27(73.0)	0.003	5.4 (1.77–16.49)	–
Ever incarcerated						
No	31	11(35.5)	20(64.5)		1.00	–
Yes	86	35(40.7)	51(59.3)	0.610	0.80 (0.34–1.88)	
Ever exchanged money/drug for sex						
Never had sex before	13	5(38.5)	8(61.5)		1.00	–
Sexually active but never exchanged money/drug for sex	73	28(38.4)	45(61.6)	0.994	1.00 (0.30–3.38)	–
Sexually active and ever exchanged money/drug for sex	31	13(41.9)	18(58.1)	0.831	0.87 (0.23–3.26)	–
Ever been tattooed						
No	51	18(35.3)	33(64.7)		1.00	
Yes	66	28(42.4)	38(57.6)	0.434	0.74 (0.35–1.57)	–
Ever been tattooed inside prison						
No	99	43(43.4)	56(56.6)		1.00	1.00
Yes	18	3(16.7)	15(83.3)	0.032	3.84 (1.05–14.11)	2.68 (0.49–14.58)
HIV antibody test result						
Negative	115	45(39.1)	70(60.9)		1.00	–
Positive	2	1(50.0)	1(50.0)	1.000	0.64 (0.04–10.54)	
HBsAg test result						
Negative	115	45(39.1)	70(60.9)		1.00	–
Positive	2	1(50.0)	1(50.0)	1.000	0.64 (0.04–10.54)	

[a] *Reference category*. HCV: hepatitis C virus; CI: confidence interval; SD: standard deviation; HBsAg: hepatitis B surface antigen.