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,

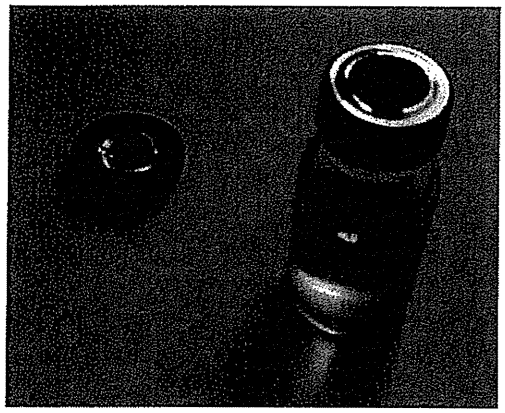

Fig. 1. The so-called Temgesic solution, an addictive solution that is filled into glass vials and has been marketed in Iran for several years.

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.

their peers, and instead tried to develop a context in which IDUs would reach out their peers with the opportunity to participate in a study that has immediate benefits only for the recruits rather than recruiters.

Our findings demonstrate that whilst HIV level is low, HCV infection is highly prevalent amongst IDUs in this city. It has been demonstrated that amongst IDUs, HIV infection is often introduced several years after HCV infection. Populations with a high prevalence of HCV infection and low prevalence of HIV, such as that in this study, may reflect either harm-reduction programs which are effectively preventing the emergence of HIV, or a window of opportunity for the prevention of HIV infections amongst HCV-infected individuals.

Our findings also show that high prevalence of HCV infection is strongly associated with the duration of drug injection in general, and with a history of injecting Temgesic solution in particular. In addition, our analysis showed a dose-dependent relationship between high levels of HCV infection and the frequency and the duration of injecting Temgesic solution in a lifetime. Our qualitative data highlighted several potential ways by which HCV might be transmitted through the Temgesic solution or its vials. Participants provided several accounts indicating that some IDUs in this city collect used vials and refill them, sell the remaining half of the drug liquid, pass or sell the empty vial to more underprivileged IDUs, or share the liquid with previously used needles or syringes. Although, it is not possible to attribute high proportions of HCV infection to injecting Temgesic solution alone, this may be responsible for the additional risk of HCV transmission in this city and other areas in Iran where this addictive solution is heavily marketed.

We are uncertain of the exact components of the addictive solution marketed as Temgesic, but reports from neighbouring provinces and Tehran indicate that it contains heroin and corticosteroids, as well as other chemical compounds. Laboratory analyses on similar vials collected in Tehran have revealed a mixture of diacetylmorphine (heroin), acetylcodein, and pheniramin as the main opioid compound (Azizi et al., 2008). Additionally, these analyses have established that the vials contained high levels of corticosteroid, which is assumed to be responsible for additional adverse health outcomes, including exogenous Cushing's syndrome, amongst people who injected this drug in Tehran. However, no buprenorphine was present in the vials (Azizi et al., 2008).

The association between HCV infection and a history of injecting Temgesic solution in Foulad-shahr and Isfahan is a very important finding, given the widespread marketing of this addictive solution in Iran over the past several years. Although additional investigation could help to support these findings, it is crucial that those making health policy in Isfahan and elsewhere in Iran take these findings into serious consideration in order to prevent the further transmission of HCV amongst the large population of drug users.

Possible limitations to the study could have affected the results. The design of our study was cross-sectional, which precludes us from determining exact temporal relationship between risk behaviours and HCV infection. Our study included some self-reported information gained from interviews, which could be biased by the participants recall ability under the influence of drugs (Latkin, Vlahov, & Anthony, 1993; Shrestha et al., 2006). It is possible that peer-driven sampling may have selectively attracted those IDUs who needed the incentives, which may have biased our small sample. By excluding a secondary incentive, we have missed an opportunity to assess the level of non-response bias, although this is not possible even in other RDS-related studies using dual incentive because many participants do not show up to collect the secondary incentive. As the participants were recruited from one city in a certain area of Iran, the findings of this study cannot be generalised to outside this region. Further studies using larger sample sizes are needed to investigate prevalence and associated factors with HCV infection in other areas in Iran.

In conclusion, our findings suggest that the injection of the Temgesic solution carries a particular risk for HCV infection. Though Isfahan has already enhanced its HIV-related interventions to strengthen HIV surveillance and to improve harm-reduction programs amongst IDUs, such programs should be extended and integrated with an HCV prevention program, including educational components that warn IDUs of the dangers of injecting the Temgesic solution, which has been available for several years in Iran.

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Conflict of interest statement

None.

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Patterns of Drug Use and HIV-Related Risk Behaviors among Incarcerated People in a Prison in Iran

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ABSTRACT *Previous research indicates that prisoners in Iran are at risk of drug-related harm, including acquisition of blood-borne infections. In response, several prevention interventions have been introduced into prisons in Iran, such as methadone maintenance treatment (MMT). MMT is now provided to opioid-dependent prisoners in 142 of the 230 prisons and correctional settings in Iran. A baseline behavioral survey was conducted in Karaj Central prison which mainly holds prisoners with drug-related charges. Overall, 203 male prisoners from randomly selected rooms in two prison blocks were interviewed using a structured questionnaire in 2007, just before the introduction of MMT program in this prison. Among participants, 7% reported never having used illicit drugs in their lifetime, but 51% had used non-injecting illicit drugs, and as high as 42% reported having injected an illicit drug. Up to 79% (160/203) of all participants reported using drugs, and about 6% (12/203) reported drug injecting during their current incarceration term. Same-gender sexual practice during current incarceration term was reported by 2.5% (5/203) of all male prisoners. Comparison between injecting and non-injecting drug-using prisoners indicated that drug injectors had higher rates of previous incarcerations, commenced drug use at a younger age, were more likely to have used illicit drugs in the previous week, were more likely to have been treated by a physician for drug addiction, had higher rates of registration for methadone treatment inside prison, and were more likely to have been tested for HIV infection. These study findings provide a behavioral profile of prisoners in regard to drug-related harm and can be considered in any plan to introduce or improve provision of MMT in prisons in Iran or other countries with similar features.*

KEYWORDS *Drug use, HIV risk behaviors, Prison, Iran*

INTRODUCTION

Several HIV outbreaks seem to have occurred inside Iranian prisons in the mid-1990s[1] in major cities including Shiraz, Kerman, Kermanshah, and the capital, Tehran. Several studies have also reported the risk of HIV transmission in association with shared drug injecting in Iranian prisons.[2] HIV outbreaks among

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drug users in prisons adversely affect HIV prevalence among injecting drug users (IDUs) in the general community,[3,4] and there is still concerning evidence on the elevated risk of HIV incidence among prisoners in Tehran.[5] While biological surveillance data from 14,470 prisoners sampled in different provinces in 2005 showed that 3% of them tested positive for HIV infection, prevalence varied significantly between provinces, ranging from 0.2% in the North-Eastern province of Khorasan to 14% in the Western province of Kermanshah. Prevalence of HIV infection among adult prisoners in Tehran was an average of 4%.[6]

Iranian prisons, like in many other countries, contain a disproportionate number of individuals with drug use problems. It is estimated that a little less than half of the prison population in Iran are convicted of drug-related charges, with the majority of them related to illicit drug use.[7] There was an average of 135,000 prisoners at any point in time in the 230 prisons and custodial settings, and as many as 600,000 individuals entered and exited prisons during the 2004 Iranian fiscal year: between March 2004 and February 2005.[7] The high recidivism rate of prisoners in Iranian prisons and previous outbreaks of HIV infection among prisoners present a challenging situation for health policy makers in preventing HIV infection among injecting drug users and among their drug-using and sexual networks.

Though the response against the danger of HIV outbreaks among drug-injecting prisoners was somewhat unclear at the beginning, the Iran Prison Organization has undertaken comprehensive and progressive control measures in the past several years. Through the adoption of harm-reduction policies, the Iran Prison Organization started implementing several programs for drug-using prisoners.[8,9] Accordingly, the organization has started comprehensive HIV prevention interventions for drug-using prisoners in many provinces throughout the country; its main activities include epidemiological surveillance, education programs, and drug treatment and prevention programs which include methadone maintenance treatment (MMT) and pilot programs for needle and syringe exchange.[7,8]

Treatment of drug-using prisoners has been prioritized in order to deal with the large number of drug-using prisoners and to try to reduce drug-related harm, such as transmission of blood-borne infections in prisons in Iran. While there is a range of drug treatment modalities for drug-using prisoners in Iran, MMT has been a focus of attention for opioid-dependent prisoners. Currently, spread over the 30 provinces of Iran, there are 142 prisons with clinics that provide MMT to opioid-using prisoners. The number of drug-using prisoners under maintenance treatment with methadone has increased from 100 people to more than 25,400 between 2002 and 2008.[6]

Considering the challenges in regard to the prevention of blood-borne infection transmission and the implementation of extensive preventive measures against drug-related harm in Iran, there is still very limited research-based evidence to document the behavioral and health situation of prisoners in the country. This study is part of a larger project initiated by the United Nations Office on Drugs and Crime (UNODC) Country Office of the Islamic Republic of Iran and was conducted to determine baseline measurements before the introduction of the MMT program for opioid-dependent prisoners in Karaj Central prison, Iran. As many prisons in Iran had already introduced MMT program for drug-using inmates, Karaj Central prison was selected for this study, as it was about to start the MMT program when we conducted this baseline survey. Karaj Central prison is a large custodial setting near Tehran, holding an average of 4,000 to 4,800 prisoners at any given time, many of whom are charged with drug-related offenses.

METHODS

The project's protocol stipulates the evaluation of the MMT program in two prisons in Tehran through a longitudinal study, incorporating multiple separate measurements before and after the introduction of the MMT program.[10,11] This report outlines the results of a quantitative survey conducted in 2007, before the introduction of the MMT program in Karaj Central prison near Tehran, Iran.

The prison consists of two large units; each has five blocks with a capacity to hold 480 prisoners each. Unit 1, which usually holds prisoners with more serious convictions and longer incarceration terms, was planned as the place to introduce an MMT program. We conducted a baseline measurement in two blocks in Unit 1, prior to the introduction of the MMT program in September, 2007. Prisoners were selected using a one-stage cluster sampling design. First, rooms of two blocks were randomly selected with equal probability of selection. Then, all prisoners staying in the randomly selected rooms were invited to participate in the study, thereby producing a sample considered to be self-weighted and representative of their recruited prison blocks.

All eligible respondent prisoners participated in individual, anonymous, face-to-face interviews using a structured questionnaire. The questionnaire was developed from a behavioral questionnaire previously tested and used with IDUs and non-IDUs in Iran, and some modifications were made to the questionnaire following the findings of the preliminary qualitative study among 30 prisoners in 2006.[12] Participants were asked up to 80 questions about their demographic details, current and past incarcerations, drug use characteristics, HIV-related risk behaviors, as well as regarding their possible use of methadone inside prison. There were no reported non-respondents in this study.

Three interviewers, psychologists from another prison, were given training on interview techniques for data collection at a 1-day workshop prior to the interviews. The interviewers had experience working with prisoners in general, but they were neither affiliated to the studied prison, nor were they providing any health or treatment care to the prisoners who participated in the study. In order to evaluate the cross-reliability of interviewers, a psychiatrist field supervisor randomly invited 25 prisoners to answer an additional ten questions, including seven questions identical to those in the main questionnaire. There was perfect inter-rater agreement between the interviewers and the supervisor on the seven duplicate questions for the 25 prisoners in the two survey rounds.

Statistical analyses were conducted using SPSS Complex Samples 13.0 (SPSS Inc. Chicago, IL, USA) to adjust for any possible effect of clustering. Summary statistics included frequency and proportions for categorical variables, medians, and means [with standard errors (SE)] for continuous variables. Bivariate analyses for complex samples were performed to examine the association between the history of drug injection and other socio-demographic and behavioral characteristics, as well as to obtain odds ratios (OR) and 95% confidence intervals (CI) for the associated factors with the outcome variables.

The ethics committee of the Iran Prison Organization reviewed the study protocol and, after we had incorporated the comments from the committee, permission was obtained from the organization to undertake the study. Participants' personal identification was not required, and interviews were carried out in an environment that could provide, as much as possible, personal privacy and confidentiality. Refusal to participate in this study did not interfere with the health care and treatment of prisoners. Respondents were informed about the purpose of

the study, the voluntary nature of their participation, and the anonymity of all collected data before providing verbal informed consent for participation. No monetary incentive was given to the participants.

RESULTS

Sample Description

Overall, 203 male prisoners were recruited from randomly selected rooms in Karaj Central prison and interviewed in September, 2007. Univariate analysis incorporating cluster effect on the sample of prisoners shows that the average age of prisoners was 34.8 years. Prisoners had diverse ethnic identities, but the majority (54%) were Fars, 28% were Azeri, and the remainder belonged to other ethnic minorities including Kurd, Lur, and Gilak. About 7% of the participants were illiterate; 4% were able to read and write with no school education, and 26% had reached high school or higher educational levels. About 40% were single; 53% were married at the time of interview, and the remainder (7%) were divorced or separated. As many as 91% of the prisoners reported having had a job before entering prison (Table 1).

Excluding 22 participants who did not respond to the question regarding number of previous incarcerations, respondents had been incarcerated an average of 4.8 times before their current term. All respondents had previous incarceration history, and up to 35% had been incarcerated five times or more before entering this prison. At the time of the interview, almost half of the prisoners (49%) had already served less than 12 months of their term, 69% reported their release to be within 12 months after the interview (Table 1). Just less than 7% reported having taken temporarily leave during their current incarceration term. Up to 69% of the prisoners reported receiving financial support from their family, and the last time they did so was between 2 to 5 weeks before being interviewed. Support from family was also mentioned as the main way to cover expenses while in the prison.

Characteristics Related to Drug Use

As shown in Table 2, of the 203 participants in the survey, 189 (93%) reported having used an illicit drug in their lifetime, where the mean age of starting drug use was 19.5 years of age. Seventy-nine percent (160/203) of prisoners had used illicit drugs during their current incarceration, and as many as 67% (135/203) had used drugs the week before being interviewed (Table 2). High-grade crystal heroin, known as "crack", was the main illicit drug used by prisoners; 95% (128/135) used crack heroin, 2% (3/135) heroin, and 2% (2/135) reported using mainly opium in the week prior to the interview. During the week prior to the interview, smoking was the main route of drug administration, followed by sniffing and ingestion. As this survey was a baseline measurement before the introduction of the MMT program, none of the study participants reported being under MMT.

Among all prisoners, 42% (86/203) reported injecting a drug in their lifetime and are categorized here as IDUs. The mean age for commencing injecting drug use was 23.9 years. Of the 86 IDUs, 82 could remember/report the place of their first injection: 63% of them (52/82) first injected at home, 28% (23/82) in a public place, and 9% (7/82) first injected in a prison.

Twelve people, approximately 6% of all prisoners or 14% of IDUs, reported injecting drugs during their current incarceration term, nine of whom had used a shared injecting device at some time. Of the 12 people who injected drugs during

TABLE 1 Socio-demographic and general characteristics relating to prisoners in Karaj Central prison in Iran in 2007

	n or mean	Percentage (%)	95% CI
Overall number of participants	203	–	–
Mean age, years (SE)	34.8 (0.4)	–	34.0–35.6
Ethnicity			
Fars	110	54.2	46.6–61.5
Azeri	56	27.6	22.7–33.1
Others	37	18.2	13.5–24.2
Education			
Illiterate	14	6.9	4.6–10.1
Able to read and write	9	4.4	2.0–9.7
Primary school	52	25.6	19.0–33.6
Junior high school	76	37.4	32.0–43.2
High school	47	23.2	15.9–32.5
College/university	5	2.5	0.5–10.4
Marital status			
Single (never married)	81	39.9	31.7–48.7
Currently married	107	52.7	45.4–59.9
Divorced/widowed/separated	15	7.4	4.8–11.3
Employment			
Had job before entering prison	184	90.6	85.9–93.9
Jobless before entering prison	19	9.4	6.1–14.1
Number of previous incarcerations (excluding current term)			
None	0	0.0	–
1–2 times	56	27.6	19.2–37.9
3–4 times	54	26.6	18.1–37.3
5 times or more	71	35.0	26.7–44.3
No response	22	10.8	7.9–14.8
Mean number of previous incarcerations (SE)	4.8 (0.4)	–	3.8–5.7
Time elapsed since incarcerated			
<12 month	100	49.3	41.6–57.0
≥12 months	101	49.8	42.7–56.8
No response/do not remember	2	1.0	0.2–4.1
Time remaining until release from prison			
<12 month	140	69.0	61.9–75.2
≥12 months	54	26.6	21.3–32.6
No response/do not know	9	4.4	2.2–8.9
Have relocated within this prison			
No	170	83.7	78.6–87.8
Yes	33	16.3	12.2–21.4
Have taken temporarily leave during current incarceration			
No	189	93.1	87.5–96.3
Yes	14	6.9	3.7–12.5
Have received money from family during current term			
No	63	31.0	24.5–38.4
Yes	140	69.0	61.6–75.5
Time elapsed since last received money, days (SE)	24.1 (5.6)	–	12.0–36.2
Amount of money last received from family (equivalent in US$; SE)	42.4 (7.4)	–	26.5–58.4

CI confidence interval taking account of cluster effect, *SE* standard error of the mean

TABLE 2 Drug use characteristics of prisoners in Karaj Central prison in Iran in 2007

	n or mean	Percentage, %	95% CI
Overall number of participants	203	–	–
Have used illicit drugs in lifetime			
No	14	6.9	4.2–11.0
Yes	189	93.1	89.0–95.8
Mean age at first illicit drug use, years (SE)	19.5 (0.4)	–	18.6–20.4
Have used illicit drug during current incarceration			
No	43	21.2	14.3–30.2
Yes	160	78.8	69.8–85.7
Have used illicit drug during past week in this prison			
No	68	33.5	25.8–42.1
Yes	135	66.5	57.9–74.2
Have injected illicit drug in lifetime			
No	117	57.6	47.5–67.2
Yes	86	42.4	32.8–52.5
Mean age at first illicit drug injection, years (SE)	23.9 (0.9)	–	22.0–25.9
Have injected illicit drug in current incarceration			
No	191	94.1	90.8–96.2
Yes	12	5.9	3.8–9.2
Have injected illicit drug-using shared equipment during current incarceration			
No	194	95.6	91.6–97.7
Yes	9	4.4	2.3–8.4
Have injected illicit drug during past 6 months in this prison			
No	196	96.6	93.5–98.2
Yes	7	3.4	1.8–6.5
Have injected illicit drug during past week in this prison			
No	201	99.0	95.7–99.8
Yes	2	1.0	0.2–4.3
Have physical fought with other inmates in this prison			
No	156	76.8	66.9–84.5
Yes	47	23.2	15.5–33.1
Time elapsed since last physical fight, months (SE)	3.4 (0.8)	–	1.7–5.1
Have been treated by a physician for drug addiction before entering this prison			
No	93	45.8	38.5–53.5
Yes	110	54.2	46.7–61.5
Have registered to be treated with methadone in this prison			
No	193	95.1	89.6–97.7
Yes	10	4.9	2.3–10.4

CI confidence interval taking account of cluster effect, *SE* standard error of the mean

their current incarceration term, three people used needle/syringe and nine used handmade injection tools for their last drug injection. Of the 12 people who injected drugs in this prison, nine reported using shared tools (needle/syringe or handmade injection tools) for their last drug injection. Only two IDUs reported injecting behavior during the week prior to the interview (Table 2).

More than 23% of the participants reported having had a physical fight with another prisoner during their current term. Of all 203 prisoners, 54% reported being treated by a physician for drug addiction before entering this prison. At the time of data collection, less than 5% of the prisoners (10/203) had registered their names to be treated with methadone in this prison (Table 2).

As mentioned, 140 prisoners received money from their family during their current incarceration term. Among these prisoners, 69% (97/140) reportedly used some of the money to buy drugs, with the majority of these people (79/97 or 81%) reported using more than half of the money received from family to buy drugs.

HIV/AIDS-Related Knowledge and Behaviors

The Prison Organization in Iran provides some conjugal rooms in prisons to allow married prisoners to meet and have some private time with their spouses. We asked our study participants if they had ever used these conjugal rooms. In contrast to our expectations, only two prisoners in our sample (1% or 2/203) reported having ever used a conjugal room to meet their spouse. Condoms are freely available in these conjugal rooms, and prisoners are encouraged to use condoms when they meet and have sex with their spouse. One of the two prisoners who had used a conjugal room reported using a condom the last time he had sex with his wife, but the other prisoner had not.

Because there is great social stigma regarding homosexuality in Iran, we included a desensitizing explanation before asking homosexuality-related questions, by stating that other people may have the same experience. Among the 203 male participants, five (2.5%) reported having had sex with another man during their current incarceration term, and none had used a condom for the last same-gender sex (Table 3).

Up to 33% (67/203) of the prisoners reported having been tested for HIV infection in their lifetime; an average of 14.9 months had elapsed since their last HIV test (Table 3). The prisoners' HIV/AIDS-related knowledge was fairly good with an average of six correct answers to eight questions about HIV transmission routes and its prevention. However, misconceptions about HIV transmission were common among the prisoners; as high as 58% and 41% of them did not know that HIV cannot be transmitted from mosquito bites or from sharing a meal with someone who is infected, respectively. In addition, 9% of the prisoners did not know that HIV can be transmitted through shared use of needle/syringes, and over 18% of the prisoners did not know that switching from injecting to non-injecting routes of drug administration can reduce risk of HIV acquisition (Table 3).

Comparison between Non-injecting and Injecting Drug-Using Prisoners

Among the 189 prisoners who reported having used illicit drugs, 86 (46%) stated having injected a drug and are considered here as IDU, and the remaining 103 (55%) considered non-IDUs. Comparison between IDU and non-IDU prisoners showed that the two groups are more or less comparable in age, ethnic background, levels of education, job situation before entering prison, and the length of current term. However, a lower proportion of IDUs were married (OR 0.3; 95%CI 0.2–0.6), and IDUs had more previous incarcerations (OR 3.2; 95%CI 1.4–7.7) compared with the non-IDU prisoners (Table 4).

IDU prisoners started drug use at an earlier age (17.9 years) compared with the non-IDUs (20.8 years; P value<0.001) and higher proportions of IDUs (94% compared with 77%) reported using drugs inside prison during their current term (OR 4.9; 95%CI 1.4–17.0). Higher proportions of IDUs (70%) compared with non-IDU prisoners (48%) reported being medically treated for drug addiction before entering this prison (OR 2.4; 95%CI 1.1–5.4). Significantly higher proportions of

TABLE 3 HIV/AIDS knowledge and other related characteristics of prisoners in Karaj Central prison in Iran in 2007

	n or mean	Percentage (%)	95% CI
Overall number of participants	203	–	–
Have used a conjugal room for meeting with spouse during current incarceration			
No	201	99.0	96.2–99.7
Yes	2	1.0	0.3–3.8
Have had sex with another man in this prison			
No	198	97.5	93.5–99.1
Yes	5	2.5	0.9–6.5
Have tested for HIV infection			
No	136	67.0	59.6–73.7
Yes	67	33.0	26.3–40.4
Time elapsed since last HIV test, months (SE)	14.9 (2.9)	–	8.5–21.3
AIDS-related knowledge			
Have heard of AIDS disease			
Yes	197	97.0	94.0–98.5
No	6	3.0	1.5–5.9
Can people reduce the risk of HIV (AIDS virus) acquisition by having one faithful sex partner?			
Correct answer	136	67.0	60.2–73.1
Incorrect answer/DNK	67	33.0	26.9–39.8
Can people reduce the risk of sexual acquisition of HIV (AIDS virus) by using condom?			
Correct answer	155	76.4	66.8–83.8
Incorrect answer/DNK	48	23.6	16.2–33.2
Can a person with a healthy appearance be infected with HIV (AIDS virus)?			
Correct answer	164	80.8	69.8–88.4
Incorrect answer/DNK	39	19.2	11.6–30.2
Can a person get HIV (AIDS virus) from mosquito bites?			
Correct answer	85	41.9	33.9–50.3
Incorrect answer/DNK	118	58.1	49.7–66.1
Can a person get HIV (AIDS virus) by sharing a meal with someone who is infected?			
Correct answer	120	59.1	49.1–68.4
Incorrect answer/DNK	83	40.9	31.6–50.9
Can a person get HIV (AIDS virus) through using a shared injecting needle/syringe?			
Correct answer	185	91.1	84.1–95.2
Incorrect answer/DNK	18	8.9	4.8–15.9
Can people who inject drugs reduce their risk of HIV (AIDS virus) acquisition by switching the route of drug use from injection to non-injecting drugs?			
Correct answer	167	82.3	74.0–88.3
Incorrect answer/DNK	36	17.7	11.7–26.0
Mean score of AIDS-related knowledge[a] (SE)	6.0 (0.2)	–	5.5–6.4

CI confidence interval taking account of cluster effect, *SE* standard error of the mean, *DNK* do not know

[a]The eight questions about HIV transmission routes and its prevention that are described in this table were summed to assess HIV/AIDS knowledge; correct answers were each given a 1-point score

IDU prisoners have registered to be treated with methadone in the prison (OR 11.9; 95%CI 3.1–45.4).

In regard to other HIV-related characteristics, IDUs were shown to have marginally better knowledge of HIV transmission routes and its prevention. Comparable proportions of non-IDU and IDU prisoners reported having had

TABLE 4 Bivariate analyses for comparing non-IDU and IDU prisoners recruited from Karaj Central prison in Iran in 2007

	Non-injecting drug users (ref), *n* (%)	Injecting drug users, *n* (%)	Odds ratio (95% CI) or *P* value
Overall number	103	86	–
Mean age, years (SE)	34.7 (0.5)	34.3 (0.7)	*P* value not significant
Ethnicity			
Fars	56 (54.4)	52 (60.5)	1.00
Others	47 (45.6)	34 (39.5)	0.78 (0.44–1.39)
Education			
Primary school or less	41 (39.8)	27 (31.4)	1.00
Junior high school or more	62 (60.2)	59 (68.6)	1.44 (0.72–2.91)
Marital status			
Single (never married)	30 (29.1)	49 (57.0)	1.00
Ever married	73 (70.9)	37 (43.0)	0.30 (0.15–0.64)
Employment			
Had job before entering prison	95 (92.2)	75 (87.2)	1.00
Jobless before entering prison	8 (7.8)	11 (12.8)	1.74 (0.76–3.99)
Number of previous incarcerations (excluding current term)			
1–4 times	67 (74.4)	39 (47.6)	1.00
5 times or more	23 (25.6)	43 (52.4)	3.21 (1.35–7.66)
No response	13	4	–
Time elapsed since incarcerated			
<12 month	56 (54.4)	37 (43.5)	1.00
≥12 months	47 (45.6)	48 (56.5)	1.55 (0.74–3.21)
No response/do not remember	–	1	–
Time remaining until release from prison			
<12 month	79 (76.7)	51 (66.2)	1.00
≥12 months	24 (23.3)	26 (33.8)	1.68 (0.90–3.13)
No response/do not know	–	9	–
Age at first illicit drug use, years			
<20	48 (47.1)	58 (68.2)	1.00
≥20	54 (52.9)	27 (31.8)	0.41 (0.22–0.77)
Mean age (SE)	20.8 (0.7)	17.9 (0.3)	*P*<0.001
Used illicit drug during current incarceration			
No	24 (23.3)	5 (5.8)	1.00
Yes	79 (76.7)	81 (94.2)	4.92 (1.42–17.05)
Used illicit drug during past week in this prison			
No	38 (36.9)	16 (18.6)	1.00
Yes	65 (63.1)	70 (81.4)	2.56 (0.91–7.19)
Have physical fought with other inmates in this prison			
No	83 (80.6)	61 (70.9)	1.00
Yes	20 (19.4)	25 (29.1)	1.70 (0.53–5.50)
Have been treated by physician for drug addiction before this incarceration			
No	53 (51.5)	26 (30.2)	1.00
Yes	50 (48.5)	60 (69.8)	2.45 (1.12–5.36)
Have registered to be treated by methadone maintenance in prison			
No	102 (99.0)	77 (89.5)	1.00
Yes	1 (1.0)	9 (10.5)	11.92 (3.13–45.38)
HIV/AIDS knowledge score			
<5 out of 8	34 (33.0)	18 (20.9)	1.00
≥5 out of 8	69 (67.0)	68 (79.1)	1.86 (0.78–4.42)

TABLE 4 ***Continued***

	Non-injecting drug users (ref), *n* (%)	Injecting drug users, *n* (%)	Odds ratio (95% CI) or *P* value
Have had sex with a man in this prison			
No	100 (97.1)	84 (97.7)	1.00
Yes	3 (2.9)	2 (2.3)	0.79 (0.21–2.94)
Have tested for HIV infection in lifetime			
No	77 (74.8)	46 (53.5)	1.00
Yes	26 (25.2)	40 (46.5)	2.57 (1.65–4.03)

IDU injecting drug user, *CI* confidence interval taking account of cluster effect, *SE* standard error of the mean

sex with another man during their current incarceration term (between 2% and 3%). History of being tested for HIV infection was significantly higher among IDU prisoners (47%) compared with non-IDUs (25%; OR 2.6; 95%CI 1.6–4.0; Table 4).

DISCUSSION

Research-based evidence on the health status of prisoners from developing or transitional countries is extremely limited. This study forms a baseline measurement before the introduction of MMT and has documented a detailed profile of prisoners in a custodial setting in Iran. The study findings show that remarkably high proportions of prisoners reported using illicit drugs inside prison and that HIV-related risk behaviors exist among them. These findings justify and underscore the necessity of proper prevention and treatment interventions for incarcerated drug users in this prison.

Despite attempts to prevent the entry of drugs, the study findings show that the majority of prisoners who had been convicted of drug-related offenses continued using illicit drugs inside prison. Up to 67% of the respondents reported using illicit drugs in the prison during the week prior to the interview; opioids were reported to be the most commonly used drugs by the prisoners. High levels of drug use among prisoners have also been reported from other countries. In the UK, it is reported that just less than half of male sentenced prisoners used drugs during their current prison term.[13] It is estimated that at least half of the prison population in Europe has a history of drug use, with many of them being affected by severe drug-related problems.[14]

HIV-related risk behaviors were not uncommon among respondent prisoners. As high as 42% of the respondents reported ever injecting a drug in their lifetime, of which 14% (12/86) reportedly continued injecting drugs while they were in this prison. A high proportion of IDUs (35%) has also been reported in a sample of drug-using prisoners elsewhere in Iran.[15] According to a review of European studies, the percentage of heroin-dependent prisoners who continue to inject in prisons range between 16% and 60%.[16] A more recent review reported a range of 2% to 74% of prisoners injecting while inside prison; however, the majority of studies report between 10% and 30% of injecting practices inside prison.[17] Though literature from prisoners in developing or economically transitional countries is scarce, a study in Thailand shows that up to a quarter of male inmates in Bangkok reported injecting during incarceration.[18]

Importantly, most of the injecting practices inside this prison were reported to have been done using handmade and mainly shared injecting tools. The importance of this finding is underscored considering the fact that several HIV outbreaks have occurred inside Iranian prisons during the mid-1990s in major cities, including Tehran where there is still concerning evidence on the elevated risk of HIV incidence among prisoners.[5] Potential risk of HIV transmission among incarcerated IDUs is not confined only to Iran. There is research evidence from some developed and developing countries indicating that incarcerated IDUs are at risk of HIV infection in the prison environment, especially those who use injected drugs[18–23]; there have been several reports of HIV outbreaks among drug-injecting prisoners.[24,25]

Investigating sexual behavior and related risks for HIV infection among prisoners in Iran is very challenging. Same-gender sex is still very taboo in Iran and could be heavily punished. Answering questions related to same-gender sex is particularly difficult for people who are already incarcerated because of the fear of additional penalties. Despite the sensitivities regarding same-gender practice, on average, 2.5% of prisoners, with no difference between injecting and non-injecting drug users, reported having had sex with another man in this prison. While low rates of same-gender sexual practices have been reported among prisoners in some European countries,[26,27] other studies have reported higher proportions (over 10%) of male prisoners engaging in same-gender sex while in prison.[28,29]

Importantly, the finding that none of those who had had same-gender sex in this prison used a condom for their last sex encounter is worrying and deserves careful consideration by the prison health policy makers. However, condom provision in a prison setting is also a challenging task in other countries. It has been reported that few systems in the United States have adopted condom provision for inmates, in the face of evidence that high-risk sexual behaviors occur in correctional settings.[30]

High levels of opioid use, high proportion of IDUs, as well as existing shared drug injection among prisoners in this custodial setting underscore the need to introduce opioid-substitute treatment, such as MMT. Thus, the introduction of the MMT program for opioid-dependent prisoners in this prison is an important and welcomed effort by the Iran Prison Organization to tackle opioid-related harm among prisoners. Treatment of opioid dependence is an important strategy to deal with the health consequences associated with drug dependency. Opioid substitution treatment using methadone is an effective strategy in reducing illicit drug use, reducing mortality, and reducing the risk of HIV transmission.[31] Meanwhile, it should be considered that no single treatment is effective for all individuals and, therefore, drug treatment services offering various treatment options are suggested in order to respond to the needs of different drug-dependent individuals.[31]

A high proportion of prisoners with a history of drug injecting can have important policy implications regarding the need for coverage of preventative interventions, including MMT program, in this prison. Comparison of the individual and behavioral characteristics between injecting and non-injecting drug users revealed important differences that should be taken into account in the development and implementation of health and treatment services for drug-using prisoners. As shown, higher proportions of IDUs used drugs in the week prior to the interview, a finding that may indicate high numbers of IDUs with heavy levels of drug dependence necessitating appropriate treatment. High proportions of IDUs who had undertaken treatment for their drug addiction, and a willingness to undergo methadone treatment may imply IDUs' openness to drug treatment inside prison.

A history of being tested for HIV infection was significantly higher among IDUs than non-injecting prisoners. This is a welcome finding that significantly higher proportions of IDUs, who are at additional risk of HIV infection, have been tested for the infection; however, the time of testing in relation to entering prison is unknown. Health authorities are, therefore, encouraged to provide additional opportunities for voluntary HIV testing and counseling, particularly in light of the fact that prisoners have plenty of free time and may accept an offer for HIV testing and counseling while in prison.

Some limitations in this study should be noted. Although the research team and prison health staff made substantial efforts to help participants feel comfortable to share their thoughts and experiences, social desirability in responding to survey questions[32,33] remains a potential source of bias in research involving drug-using people, especially those being held in a punitive setting. The studied prison is mainly holding prisoners with drug-related charges and a disproportionate number of drug users; thereby, findings of this study cannot be generalized to the general prisons in Iran. Further research is needed to investigate drug use and HIV-related harm among prisoners in other correctional settings in Iran.

In conclusion, the study findings show that remarkably high proportions of prisoners reported using illicit drugs inside prison and that HIV-related risk behaviors, including shared drug injection, occur among them. Overall, study findings underscore the necessity for provision of adequate drug treatment interventions, as well as HIV prevention interventions for incarcerated drug users in this prison. In this line, the Iran Prison Organization's plan to introduce MMT program in this prison is an important development in dealing with high rates of opioid use and related risk behaviors among prisoners.

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