Research Paper

Drug use and risk behaviour profile, and the prevalence of HIV, hepatitis C and hepatitis B among people with methamphetamine use in Iran

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ABSTRACT

Background: Stimulants substances use, particularly methamphetamine use, is increasing globally, including in Iran. This study assessed the drug use and risk behaviour profile, and prevalence of HIV, hepatitis C virus (HCV), and hepatitis B virus (HBV) among a large population using methamphetamine as their primary drug in Iran.

Methods: This cross-sectional study was conducted in eight provinces of Iran. Individuals using methamphetamine for ≥3 months during the past three years, with no life-time history of injecting opioid drugs were enrolled. Drug use and risk behaviour data were collected through interviews. Blood samples were tested for HIV antibodies (HIV Ab), HCV antibodies (HCV Ab), and HBV surface antigen (HBs Ag).

Result: Among 567 participated, 84% were men and mean age was 36 years. Smoking with pipe was the most common method of methamphetamine use (53%), while 13% had a history of injecting methamphetamine, among whom 30% shared needles or syringes. Among those having sex during intoxication phase ($n = 270$), 48% never used condom. The prevalence of HIV Ab, HCV Ab and HBs Ag was 6.7% (95%CI: 4.7–9.1), 19.4% (95%CI: 16.2–22.9) and 1.4% (95%CI: 0.6–2.7), respectively. Age ≥ 30 years (adjusted OR [aOR]: 2.10, 95%CI: 1.18–3.76), lower education (high school vs. tertiary education, aOR: 13.95, 95%CI: 1.90–102.60), and injecting methamphetamine (aOR: 1.92, 95%CI 1.10–3.35) were significantly associated with HCV exposure. No factor was found associated with HIV infection. Among those reporting no potential injecting or sexual risk factors, 19.8% and 6.8% have HCV Ab positive and HIV Ab positive, respectively.

Conclusion: High prevalence of injecting and sexual risk behaviours, HIV infection and HCV exposure were found among individuals using methamphetamine as their primary drug, demonstrating them as an emerging population at risk of HIV and HCV in Iran. Targeted screening and harm reduction programs for this population are required.

Introduction

Illicit drug use is one of the major economic, social and health challenges in many countries across the world, including several developing countries (Uchtenhagen, 2004). The pattern of illicit drug use has changed particularly over the last two decades towards an increased tendency to recreational use of stimulant substances (Tettey et al., 2013). Amphetamine-type stimulants, specifically methamphetamine, are among the most commonly used stimulants with 34 million people using amphetamines in 2016 across the world (UNODC, 2018). Several studies indicated the association of methamphetamine use with high-risk sexual and/or injecting behaviours which consequently increased the transmission risk of sexually transmitted infections and blood born viruses such as HIV and viral hepatitis

(Buchacz et al., 2005; Meade et al., 2016; Plankey et al., 2007; Ritchwood, Ford, DeCoster, Sutton & Lochman, 2015).

In Iran, recreational use of amphetamine-type stimulants, particularly crystal methamphetamine has increased over the past two decades (Mehrpour, 2012; Shariatirad, Maarefvand & Ekhtiari, 2013), with an estimated 440,000 individuals using crystal methamphetamine in 2013 (Nikfarjam et al., 2016). Several Iranian studies investigated drug use patterns, risk behaviours and prevalence of blood born viruses among people with traditional drug use, mainly heroin and opium (Amin-Esmaeili et al., 2017; Khajehkazemi et al., 2013; Malekinejad et al., 2015; Rahimi-Movaghar, Amin-Esmaeili, Shadloo, Noroozi & Malekinejad, 2015). However, given the increasing trend in methamphetamine use (Mehrpour, 2012; Shariatirad et al., 2013), comprehensive data are required to characterize the population, drug use, and risk behaviour profiles of people using methamphetamine.

In the previous studies among people using methamphetamine in Iran, the study population were restricted to specific cities/suburbs, gender or age groups (Alam Mehrjerdi, Abarashi, Noroozi, Arshad & Zarghami, 2014; Bagheri, Mirzaee, Jahani, Karamouzian & Sharifi, 2017; Barati, Ahmadpanah & Soltanian, 2014; Shokoohi et al., 2018) or the definition of methamphetamine use were broadened to include those occasionally using methamphetamine (Bagheri et al., 2017). In a national survey recruiting 3246 young adults, aged 19–29 years, 7% reported a life-time history of any methamphetamine use while 2% reported injecting methamphetamine among whom 27% reported syringe sharing (Bagheri et al., 2017). In another study among 209 individuals who reported injecting methamphetamine during the past 12 months, 47% reported sharing injecting equipment. Self-reported HIV, hepatitis C virus (HCV), and hepatitis B virus (HBV) infections was 3%, 27%, and 10%, respectively (Mehrjerdi, Abarashi, Noroozi, Arshad & Zarghami, 2014).

Moreover, several studies demonstrated that about 50–80% of people using methamphetamine also reported actively using heroin or other opioid drugs, many of whom had a history of past or current injecting opioids (Akbari et al., 2019; Amin-Esmaeili et al., 2016; Barati et al., 2014; Shokoohi et al., 2018). However, the data of drug use pattern and risk behaviour profile of a relatively smaller, but growing sub-population of individuals who primarily use methamphetamine are scarce. This multi-province study was conducted among a large population who recently used methamphetamine as their primary drug to characterize their drug consumption profile, and injecting and sexual risk behaviours and to determine the prevalence of HIV, HCV, and HBV infections in this population. Factors associated with HIV infection and HCV exposure were also assessed.

Methods

Study design and participants

A cross-sectional study was conducted in 2017 with the participants enrolled from eight provinces from different geographical regions of Iran, including Tehran (capital, Central-North), Kurdistan (West), Lorestan (West), Isfahan (Central), Khuzestan (South-West), Golestan (North), Alborz (Central-North), and Fars (South).

Participants were enrolled if they: were over 18 years old, used methamphetamine at least for three months during the past three years (at least once per month), and had no life-time history of injecting traditional drugs, including any opioid drugs. Given that it is a hard-to-reach population, using probability sampling methods was challenging. Therefore, a facility-based convenience sampling approach was used, enrolling participants through various facilities, including mental health clinics, behavioural counseling centers, drop in centers, methadone maintenance treatment clinics, and triangular clinics (providing counselling services for marginalized women).

Study assessments

Eligible individuals who accessed services in the study sites were provided with information about the study and those who were willing to participate were enrolled into the study. Participants were interviewed, using a questionnaire including questions about their demographic characteristics (i.e., sex, age, and formal education), duration and methods of methamphetamine use, injecting behaviours (i.e., history of injecting and needle or syringe sharing), and sexual behaviours (i.e., history of having sex with a casual partner, having sex and condom use during intoxication phase after methamphetamine use, and history of same-sex relationship among men). The interviewers had received specific training for interviewing people who use drugs, and for asking sensitive questions. Validity and reliability of the questionnaire had been measured in previous studies (Navadeh et al., 2013). Participants received a gift with a value of USD $3 to compensate for their time.

Venous blood samples were collected via venipuncture for HBV surface antigen (HBs Ag), HCV antibodies (HCV Ab), and HIV antibodies (HIV Ab) testing. HBs Ag and HCV Ab testing were performed by Enzyme-linked Immunosorbent Assays (ELISA; Dia. Pro kits, Diagnostics Bioprobes s.r.l, Italy). Validation of the tests were carried out by calibrators, positive controls and negative controls, supplied by producers, using a protocol according to the manufacturer's manual. Positive and negative samples were determined according to their optical density (OD) and calculation of the cut off. HIV Ab testing was performed by ELISA (MP Biomedicals, Illkirch, France) with confirmatory Western blot (Diaplus, San Francisco, USA).

Statistical analysis

Distribution of demographic and methamphetamine use characteristics, injecting behaviours, and sexual behaviours was expressed as frequency and percentage for categorical variables, and as mean and standard deviation for continuous variables. Prevalence of HIV infection (HIV Ab positive), HBV infection (HBs Ag positive), and HCV exposure (HCV Ab positive) and corresponding 95% confidence intervals (CI) were calculated, overall and by background characteristics (i.e., sex, age, and education levels), methamphetamine use behaviours, and sexual behaviours. Logistic regression was used to assess the factors associated with HCV exposure, and HIV infection. In the case of having zero event in a subgroup, penalized maximum likelihood estimation was used. Factors associated with HBV infection were not assessed given the small number of HBs Ag positive participants. The variables with $P < 0.2$ in the univariate logistic regression analysis, were included into the adjusted logistic regressions models. Data analyses were performed using STATA software version 13 (College Station, TX, United States).

This study was approved by the Ethics Committee of Kurdistan University of Medical Sciences (IR.MUK.REC.1396/1). All participants provided written informed consent before participating in the study.

Results

A total of 567 individuals participated in the study, among whom 84% were men with a mean age of 36 years. The mean duration of methamphetamine use was 6.3 years. Smoking with pipe was the most common method of methamphetamine use (53%), while 13% had a history of injecting methamphetamine, among whom 30% shared needles or syringes (Table 1).

Among 313 participants who have ever had sex with a casual partner, 86% had sex during intoxication phase after methamphetamine use, among whom 48% never used condom (Table 1).

Considering ever injecting methamphetamine, having sex with a casual partner during intoxication phase, or having same-sex

Table 1
Background characteristics, methamphetamine use behaviours, and sexual behaviours among participants.

Variable	Frequency
Sex, *n* (%)	
Male	479 (84)
Female	88 (16)
Age, mean (SD), years	36.0 (0.4)
Age, *n* (%), year	
18–29	136 (24)
30–39	260 (46)
40–49	128 (22)
> =50	43 (8)
Education, *n* (%)	
High school diploma or less	518 (91)
Tertiary education	49 (9)
Province, *n* (%)	
Tehran	70 (12)
Esfahan	50 (9)
Alborz	71 (13)
Kurdistan	73(13)
Fars	50 (9)
Lorestan	119 (21)
Golestan	82 (14)
Khuzestan	52 (9)
Age at the first use of methamphetamine, mean (SD), year	29.0 (0.4)
Duration of methamphetamine use, mean (SD), year	6.3 (0.2)
Method of methamphetamine use at the first time, *n* (%)	
Smoking	269 (47)
Inhaling	210 (37)
Injecting	21 (4)
Orally ingesting	42 (7)
Other	21 (4)
No response	4 (1)
Most common method of methamphetamine use, *n* (%)	
Smoking	303(53)
Inhaling	198 (35)
Injecting	6 (1)
Orally ingesting	35 (6)
Other	25(5)
History of injecting methamphetamine, *n* (%)	
No	491 (87)
Yes	76 (13)
History of pipe sharing, *n* (%)	
No	153 (27)
Yes	404 (71)
No response	10 (2)
History of needle or syringe sharing, *n* (%)[a]	
No	53 (70)
Yes	23 (30)
Life time history of having sex with a casual partner[b], *n* (%)	
No	254 (45)
Yes	313 (55)
History of having sex with a casual partner during intoxication phase after methamphetamine use, *n* (%)[c]	
No	40 (13)
Yes	270 (86)
No response	3 (1)
Using condom in sexual intercourse with a casual partner[c] during intoxication phase after methamphetamine use, *n* (%)[d]	
Never	130 (48)
Always/Sometimes	137 (51)
No response	3 (1)
Life time history of same-sex relationship among men, *n* (%)	
No	445(93)
Yes	34(7)

SD: Standard deviation.

[a] Among those with a history of injecting methamphetamine (*n* = 76).

[b] Someone other than their spouse or regular partner.

[c] Among those with a life time history of sex with a casual partner (*n* = 313).

[d] Among those with a history of sex with a casual partner during intoxication phase after methamphetamine use, *n* = 270).

relationship among men as potential risk factors for HIV, HCV, and HBV transmission, six participants (1.1%) had three risk factors, 66 participants (11.6%) had two risk factors, 273 participants (48.2%) had one risk factor, and 222 participants (39.2%) had no risk factor. A total of 345 participants (60.8%) had at least one risk factor.

One hundred and ten participants had HCV exposure, equating to an overall prevalence of 19.4% (95%CI: 16.2–22.9). The highest prevalence was observed among participants who injected methamphetamine with a history of sharing needles or syringes (39.1%, 95%CI: 19.7–61.5; Table 2). HCV prevalence was 19.1% (95%CI: 15.1–23.7, *n* = 66/345) among participants with at least one risk factor, comparable with 19.8% (95%CI: 14.8–25.7, *n* = 44/222) among those reporting no risk factor. In adjusted logistic regression analysis, Age ≥ 30 years (adjusted OR: 2.10, 95%CI: 1.18–3.76), lower education (tertiary vs. high school or less; adjusted OR: 13.95, 95%CI: 1.90–102.60), and a history of injecting methamphetamine (adjusted OR: 1.92, 95%CI 1.10–3.35) were significantly associated with higher odds of HCV exposure (Table 3).

Thirty-eight participants had HIV infection, equating to an overall prevalence of 6.7% (95%CI: 4.7–9.1). HIV prevalence was 6.7% (95%CI: 4.3–9.8, *n* = 23/345) among participants with at least one risk factors, comparable to 6.8% (95%CI: 3.8–10.9, *n* = 15/222) among those reporting no risk factor. In logistic regression analysis, no factor was significantly associated with increased odds of HIV infection (Table 4).

Eight participants had HBV infection, equating to an overall prevalence of 1.4% (95%CI: 0.6–2.7). HBV prevalence was 1.5% (95%CI: 0.5–3.4, *n* = 5/345) among participants with at least one risk factors, and 1.4% (95%CI: 0.3–3.9) among those reporting no risk factor.

Seventeen participants had HCV-HIV co-infection, one participant had positive tests for both HCV and HBV, and one participant had HIV-HBV co-infection.

Discussion

This study is the first study in Iran (and one of the few studies in developing countries), providing data of drug consumption and risk behavior profile, and prevalence of HIV, HCV, and HBV among a large population who primarily used methamphetamine. The restrictive inclusion criteria in this study, excluding people with a life-time history of injecting opioid drugs (as the most prevalent drugs used in Iran), provided an opportunity to collect data of a specific sub-population who used methamphetamine as their primary drug, a growing but less explored sub-population among people who use drugs in Iran. High proportion of participants reported injecting or sexual risk behaviours. High prevalence of HIV and HCV were also found among participants, with an increased risk of HCV exposure among older participants, those with lower level of formal education and those who injected methamphetamine. While people who inject opioid drugs are traditionally considered as the core population at risk of HCV or HIV infection in Iran (Hajarizadeh et al., 2016; Sharifi et al., 2018), the findings of this study identified the people using methamphetamine as an emerging population at risk of HCV and HIV. Harm reduction programs with a specific focus on this population are urgently required to control the HCV and HIV epidemics.

Our data showed that 19% of participants had exposure to HCV (HCV Ab positive) in overall, including 32% (24/76) among those reporting injecting, and 17% among those reporting never injecting methamphetamine. Injecting methamphetamine was also identified as a factor significantly associated with HCV exposure. A meta-analysis of studies among general people who use drugs in Iran reported pooled HCV Ab prevalence of 45% and 8% among people who used drugs with and without a history of injecting, respectively (Malekinejad et al.,

Table 2

Prevalence of HIV infection, HCV exposure and HBV infection among participants, overall and by background characteristics, and methamphetamine use and sexual risk behaviours.

Variable	HIV Ab positive		HCV Ab positive		HBs Ag positive	
	Number	Prevalence, % (95%CI)	Number	Prevalence,% (95%CI)	Number	Prevalence,% (95%CI)
Total	38/567	6.7 (4.7–9.1)	110/567	19.4 (16.2–22.9)	8/567	1.4 (0.6–2.7)
Sex						
Male	35/479	7.3 (5.1–10.0)	98/479	20.5 (16.9–24.4)	6/479	1.3 (0.5–2.7)
Female	3/88	3.4 (0.7–9.6)	12/88	13.6 (7.2–22.6)	2/88	2.3 (0.3–0.8)
Age (Years)						
<30	7/136	5.2 (2.1–10.3)	16/136	11.8 (6.9–18.4)	0/136	0.0 (0.0–2.7)
≥30	31/431	7.2 (4.9–10.1)	94/431	21.8 (18.0–26.0)	8/431	1.9 (0.8–3.6)
Education						
High school diploma or less	38/518	7.3 (5.2–9.9)	109/518	21.0 (17.6–24.8)	8/518	1.5 (0.7–3.0)
Tertiary education	0/49	0 (0.0–7.3)	1/49	2.0 (0.05–10.9)	0/49	0 (0.0–7.3)
History of injecting methamphetamine						
No	35/491	7.1 (5.0 −9.8)	86/491	17.5 (14.3–21.2)	6/491	1.2 (0.4–2.6)
Yes, no history of sharing needles/syringes	2/53	3.8 (0.5–13.00)	15/53	28.3 (16.8–42.3)	2/53	3.8 (0.5–13.00)
Yes, with a history of sharing needles/syringes	1/23	4.3 (0.1–21.9)	9/23	39.1 (19.7–61.5)	0/23	0.0 (0.0–14.8)
History of having sex with a casual partner[a] during intoxication phase						
No	15/294	5.10 (2.9–8.3)	57/294	19.4 (15.0–24.4)	5/294	1.7(0.6–3.9)
Yes, always/sometimes used condom	12/137	8.8 (4.6–14.8)	27/137	19.7 (13.4–27.4)	0/137	0.0 (0.0–2.7)
Yes, never used condom	11/130	8.5 (4.3–14.6)	26/130	20.0 (13.5–27.9)	3/130	2.3 (0.5–6.6)
No response	0/6	0.0 (0.0–45.9)	0/6	0.0 (0.0–45.9)	0/6	0.0 (0.0 – 45.9)
History of pipe sharing						
No	11/153	7.2 (3.6–12.5)	31/153	20.3 (14.2–27.5)	2/153	1.3 (0.2–4.6)
Yes	26/404	6.4 (4.2–9.3)	79/404	19.6 (15.8–23.8)	6/404	1.5 (0.5–3.2)
No response	1/10	10.0 (0.3–44.5)	0/10	0.0 (0.0–3.8)	0/10	0.0 (0.0–3.8)
Life time history of same-sex relationship among men						
Yes	0/34	0 (0.0–10.3)	8/34	23.5 (10.7–41.2)	0/34	0 (0.0–10.3)
No	35/445	7.9 (5.5–10.8)	90/445	20.2 (16.6–24.3)	6/445	1.3 (0.5–2.9)

[a] Someone other than their spouse or regular partner.

Table 3

Factors associated with HCV exposure (HCV Ab positive) among participants.

Variable	Unadjusted analysis OR (95%CI)	*P*-value	Adjusted analysis OR (95% CI)	*P*-value
Sex				
Female	1.00		1.00	
Male	1.63 (0.85–3.11)	0.140	1.67 (0.86–3.25)	0.127
Age (years)				
<30	1.00		1.00	
≥30	2.09 (1.18–3.70)	0.011	2.10 (1.18–3.76)	0.012
Education				
Tertiary education	1.00		1.00	0.010
High school diploma or less	12.79 (1.75–93.72)	0.012	13.95 (1.90–102.60)	
History of injecting methamphetamine				
No	1.00		1.00	
Yes	2.17 (1.27–3.72)	0.005	1.92 (1.10–3.35)	0.021
Having sex with a casual partner[a] during intoxication phase				
No	1.00			
Yes	1.15 (0.48–2.75)	0.751		
Life time history of same-sex relationship among men				
No	1.00			
Yes	1.21 (0.53–2.77)	0.646		

OR: Odds ration; CI: Confidence interval.

[a] Someone other than their spouse or regular partner.

2015). One potential explanation for our findings of higher prevalence among participants never injecting and lower prevalence among those injecting in our study, could be the possible under-reporting of injecting by our participants due to stigmatizing injecting drugs in the community. This hypothesis is backed up by our other findings, showing a high HCV prevalence (20%) among participants who reported neither injecting nor sexual risk behaviours. This finding has important implication in designing HCV screening policies in Iran, supporting a broad screening policy, screening all individuals with a history of drug use, including methamphetamine use, rather than screening only those with a history of injecting.

In this current study, participants were not tested for HCV RNA, then no data of chronic HCV infection (HCV viremia) in our participants can be provided. However, given the currently low HCV treatment uptake in Iran (Hajarizadeh et al., 2016), as well as low rate of HCV spontaneous clearance (Grebely et al., 2014), it is reasonable to assume that the majority of participants with HCV Ab positive were viremic and required HCV treatment. Locally manufactured generic direct-acting

Table 4
Factors associated with HIV infection (HIV Ab positive) among participants.

Variable	Unadjusted analysis OR (95% CI)	P-value	Adjusted analysis OR (95% CI)	P-value
Sex				
Female	1.00			
Male	1.95 (0.64–6.0)	0.243		
Age				
< 30	1.00			
≥ 30	1.36 (0.60–3.08)	0. 465		
Education				
Tertiary education	1.00		1	
High school diploma or less	7.93 (0.48–131.11)	0.148	8.62 (0.52–142.86)	0.133
History of injecting methamphetamine				
No	1.00			
Yes	0.61 (0.20–1.89)	0.393		
Having sex with a casual partner[a] during intoxication phase				
No	1.00		1	
Yes	1.71 (0.88–3.33)	0.112	1.80 (0.92–3.50)	0.082
History of same sex relationship among men				
No	1.00			
Yes	0.17 (0.01–2.79)	0.213		

OR: Odds ration; CI: Confidence interval.

[a] Someone other than their spouse or regular partner.

antiviral (DAA) regimens for HCV treatment are available in Iran with demonstrated high efficacy (Merat et al., 2017). There is also robust evidence of favorable response to DAA therapy among people who use or inject drugs (Hajarizadeh et al., 2018). However, only an estimated 35% of Iranian people living with HCV infection were diagnosed (Hajarizadeh et al., 2016). High-coverage HCV screening programs among people who use drug, including those using methamphetamine, are required to use the opportunity of availability of generic DAA and to control HCV epidemics in Iran.

Our study showed an overall HIV prevalence of 6.7% among participants, including 3.9% (3/76) among those reporting injecting, and 7.1% among those reporting never injecting methamphetamine. A large national study among people who injected any drugs (the majority injected opioid drugs) reported a HIV prevalence of 14% (Sharifi et al., 2018). The lower HIV prevalence in people injecting methamphetamine, compared to people injecting opioids in Iran is indicative of an opportunity to implement well-designed and targeted harm reduction program to control HIV transmission among people who use methamphetamine. Among 38 people with HIV infection, 17 (45%) had HCV co-infection. A high proportion of HCV co-infection among people with HIV (88%) have been also reported among general people who use drugs (Platt et al., 2016), indicating a need for integrated HIV and HCV care facilities for Iranian people who use drugs, including those using methamphetamine.

In our study, smoking with pipe was the most common method of methamphetamine use (53%) among participants. However, 13% of participants reported injecting methamphetamine, among whom 30% had a history of sharing needles or syringes. In a study among Iranian young adults 19–29 years old, 31% of those with a life-time history of methamphetamine use, reported ever injecting (Bagheri et al., 2017). In another study among people who injected methamphetamine in the past 12 months, 47% reported sharing needles or syringes (Alam Mehrjerdi et al., 2014). Our study also showed that 48% of participants who had casual sex during intoxication phase after methamphetamine use never used condom. In another study, 54% of people who used methamphetamine reported condom-less sex during the previous year (Mehrjerdi et al., 2014). The frequency of injecting and sexual risk behaviour found in this study, although still high, could be the subject of an underestimation. As previously explained, the prevalence of HCV and HIV were comparable between participants reporting at least one risk behaviour and those reporting no risk

behaviours. This important finding is indicative of a low sensitivity of self-reporting-based risk behaviour evaluation among people who use drugs in Iran, important particularly in designing the harm reduction programs targeting people at greater risk of blood born and sexual infections.

Among 34 men who had a history of sex with men, none had HIV infection. The data of epidemiology of blood born viruses, including HIV among Iranian men who have sex with men are very limited. The available studies were also biased towards specific sub-populations of men who have sex with men, and therefore reported very different results. In one study among men who injected drugs, HIV prevalence was 22% among those who had sex with men (Zamani, Ono-Kihara, Ichikawa & Kihara, 2010). In a national survey among incarcerated people, HIV prevalence was 4% among men who have sex with men (Navadeh et al., 2013). The HIV prevalence among men who had sex with men in our study could be interpreted conservatively, given the possibility of underreporting, small study population, and the wording of the question which asked about "life-time" history of having sex with men.

Limitations

Although this study provided important data of a growing but lesser-known Iranian population who used methamphetamine as their primary drug, it has several limitations. Convenience sampling methods rather than random sampling methods were used in this study. Given the hard-to-reach target population, using probability sampling methods was not practical. In order to reduce the risk of potential selection bias due to using convenience sampling, we recruited participants from a wide range of settings, including mental health clinics, behavioural counseling centers, drop in centers, methadone maintenance treatment clinics, and triangular clinics. However, this study population would not still be representative of the people not accessing these facilities. People with a life-time history of injecting opioid drugs were excluded from this study to given that the focus of this study was on a specific sub-population who used methamphetamine as their primary drug. Given this exclusion criteria, this study population were not representative of the overall population who use methamphetamine in Iran, particularly people with poly-drug use many of whom use or inject opioid drugs (Akbari et al., 2019; Amin-Esmaeili et al., 2016). The blood samples were not tested for HCV RNA, limiting the HCV data to

HCV exposure (not active HCV infection). The possibility of recall bias and social desirability bias should also be considered in interpreting the findings.

Conclusion

In conclusion, this study identified high frequency of injecting and sexual risk behaviours, and high prevalence of HIV infection and HCV exposure among individuals using methamphetamine as their primary drug, demonstrating this population as an emerging population at risk of HIV and HCV in Iran. Screening and harm reduction programs with a specific focus on this population are required.

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Declaration of Competing Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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