

Review

Transition to injecting drug use in Iran: A systematic review of qualitative and quantitative evidence



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ABSTRACT

Background: Injection drug use, a behavior associated with significant adverse health effects, has been increasing over the past decade in Iran. This study aims to systematically review the epidemiological and qualitative evidence on factors that facilitate or protect the transition to injection drug use in Iran.

Methods: We conducted electronic searches in five international (Medline, Web of Science, EMBASE, CINAHL, PsycINFO), one regional (IMEMR) and three Iranian (Iranmedex, Iranpsych, IranDoc) databases, as well as contacting experts in the field. Two trained researchers screened documents to identify relevant studies and independently dual-extracted data following pre-specified protocol. We applied principles of thematic analysis for qualitative data and applied a random effect meta-analysis model for age of first injection.

Results: A total of 38 documents from 31 studies met eligibility criteria, from which more than 50% were implemented from 2006 to 2008. The weighted mean age of first injection was 25.8 (95% Confidence Interval: 25.3–26.2). Between 1998 and 2011, the age of first injection was relatively stable. Overall, drug users had used drugs for 6–7 years before they started injection use. Heroin was the first drug of injection in the majority of the cases. We identified factors influencing the initiation of or transition to injection use at various levels, including: (1) individual (pleasure-seeking behavior, curiosity and development of drug dependency commonly reported), (2) social and environmental (role of peer drug users in the first injection use, the economic efficiency associated with injections and the wide availability of injectable form of drugs in the market).

Conclusion: Harm reduction policies in Iran have almost exclusively focused on drug injectors in Iran. However, given the extent of the non-injection drug use epidemic, evidence from this study can provide insight on points of interventions for the prevention of the transition to injection use.

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Introduction

With the highest per capita opioid use, Iran suffers from a very high burden of diseases attributed to substance use. According to the 2011 Iranian Mental Health survey, at least 2.1% of the population aged 15–64 were problem users of illicit drugs (Sharifi et al., 2015). Medicinal and recreational opium smoking is rooted

in the Iranian culture and considered less stigmatized compared with heroin use and drug injection. However, in the last decade, Iran has witnessed major changes in the pattern of substance use. In three subsequently conducted national studies on drug users from 1998 to 2006, the proportion of those who use heroin or *Kerack* (a crystallized form of heroin) increased considerably (Narenjiha et al., 2005, 2009; Razzaghi, Rahimi-Movaghar, Hosseini, Madani, & Chatterjee, 1999).

In 2008, it was estimated that there were approximately 260,000 people who inject drugs (PWID) in Iran (Rahimi-Movaghar, Amin-Esmaeili, Haghdoost, Sadeghirad, & Mohraz,

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Better understanding of factors affecting drug users' decisions about transition to injection use and the context in which such transitions take place, as well as identifying substance users at high risk of transition, can inform drug-related policies on effective preventive strategies to reduce rate of injection. This systematic review is the first of its kind, summarizing the existing evidence on

We also contacted other researchers in the field of substance use in Iran, and hand-searched the reference section of relevant

^a Ovid MEDLINE(R) in-process & other non-indexed citations and ovid MEDLINE(R) 1946 to present with daily update.

review studies or national program reports to identify studies with firsthand data.

Screening of scientific documents

Two co-authors reviewed and screened retrieved scientific documents, applying pre-specified criteria to identify relevant studies through a step-wise process. First, at the title and abstract level, one of the co-authors (BS) reviewed and included studies that were conducted: (1) in Iran or among the Iranian population; (2) on drug users; and (3) on the “behavioral” pattern of drug use and/or transitional stages of drug use (e.g., from sniffing heroin to injecting it). Studies conducted on physiological, hormonal, and pathological changes related to drug use were excluded. Another co-author (MA) reviewed titles and abstracts of studies that the initial reviewer was uncertain about their inclusion.

At the full text level, two reviewers (MA & BS) screened studies independently and included studies that provided data in one the following categories: (1) factors affecting the initiation of drug injection use, and (2) factors influencing the transition from a non-injection mode of drug use to injection use. A senior researcher (ARM) reviewed and adjudicated studies with discordant decisions from reviewers. No restriction was implemented on study design, language, or publication year.

Data extraction

Two of the co-authors (MA & BS) independently extracted data from included studies using structured forms (separately designed for qualitative and quantitative studies), and discussed disagreements with the third co-author (ARM) as indicated. In cases of ambiguity in the data, we contacted authors for further clarification. If a document reported on more than one research project, each research project was considered as an independent study and cited separately. For research projects reported in different forms (i.e., technical report, peer-review paper, and conference abstract), we considered the most comprehensive and accessible format and used other documents to supplement missing information. We obtained databases and conducted data analysis on four studies (Malekinejad, 2008; Mohraz et al., 2009; Narenjiha et al., 2009; Rahimi-Movaghar, Razaghi, Amin-Esmaeili, Sahimi Izadian, & Baghestani, 2008).

Data synthesis

We created tables in Microsoft Excel® to organize and synthesize data. Given that reported data on factors influencing the transition to injection use were geographically, methodologically, and contextually sparse, we conducted formal quantitative meta-analysis only on the age of initiation of injection use. We calculated a summary mean and standard error for age of initiation of injection use, weighted by inverse of variance using a random-effect meta-analysis model in Stata version 13 and illustrated data in the form of forest plot.

We applied principles of thematic analysis for qualitative data on the factors facilitating or protecting injection drug use. We summarized the findings of different studies under thematic headings, aggregated them into categories, and presented them collectively in a table.

Results

Description of studies

Fig. 1 presents the number of studies identified at each step of searching, screening, and data extraction.

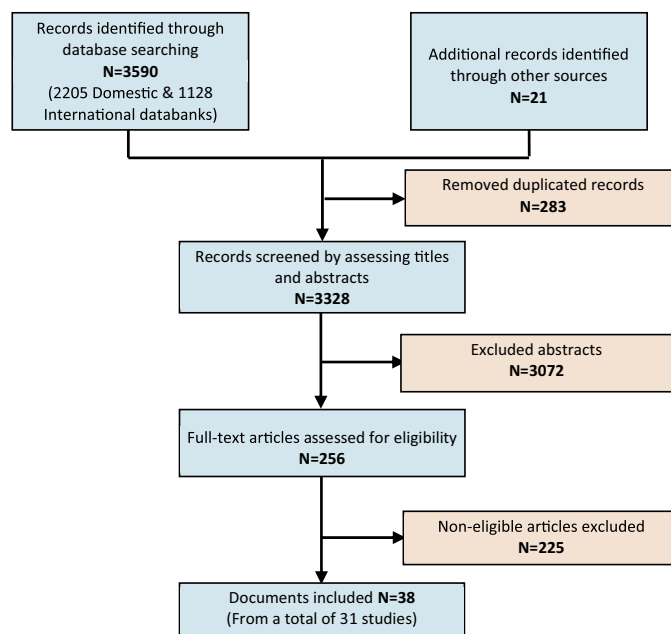


Fig. 1. Number of studies identified at each step of searching, screening, and data extraction.

From a total of 3328 retrieved documents from our searches (after de-duplication) we identified and included 38 relevant documents reporting on a total of 31 original research studies. From the 38 documents, 18 (47%) and 20 (53%) were in English and Persian, respectively. With respect to the publication type, 20 (53%) of the documents were peer-reviewed articles, 14 (37%) technical reports, two (5%) dissertations, and two (5%) books. We also analyzed and included unpublished data from five studies.

Table 2 presents characteristics of the 31 included studies. Included studies were carried out within a 14-year time span (1998 to 2011), with more than half being implemented between 2006 and 2008. With respect to the geographic location, 12 (39%) studies were conducted only in Tehran (the capital city), 11 (35%) in cities other than Tehran, and eight (26%) in multiple cities including Tehran. Only four studies (13%) included population from rural areas in Assaluyeh, Darab, and Bam (Farhoudian, Rahimi-Movaghar, Rad Goodarzi, Younesian, & Mohammadi, 2006; Jafari, Movaghar, Baharlou, Spittal, & Craib, 2008; Jafari, Rahimi-Movaghar, Craib, Baharlou, & Mathias, 2010; Saberi-Zafarghandi et al., 2008). Eleven (35.5%) studies reported quantitative data on the transition to injection drug use, 23 (74.2%) qualitative data, and three had a mix of both (Narenjiha et al., 2005; Razzaghi et al., 1999; Vazirian et al., 2006). All studies, except for one longitudinal study (Jafari et al., 2010), implemented cross-sectional designs, two of which applied respondent-driven sampling (RDS) for participant recruitment. The main objective of most included studies was different than investigating factors influencing transition to injection, and thus data relevant to this review were limited.

Age of first injection

From the 20 studies that reported on age at the first injection (AFI), we were able to retrieve the mean and standard error for 18 (mean range: 24–28.5). Summary (weighted) mean and 95%CI for all studies was 25.8 (25.3–26.2) (Fig. 2). There was no significant difference in summary mean age of participants in studies conducted in Tehran and outside of Tehran. From a total of 7252 IDU participating in six different studies that reported on the proportion of young initiators in their samples (Haghdoust, Osouli,

Table 2
Characteristics of 31 studies on transition to injecting drug use conducted in Iran.

Study	Type of publication	Year of study	Study site	Study population & design	No. of PWID studied	No. of female PWID	Definition of PWID	Age of PWID	Settings PWID recruited	Data on initiation of injection drug use
Rahimi-Movaghar, Noroozi, et al. (2013)	English report	2011	Tehran	Qualitative study: DUs aged ≤ 32 , KIs	16	2	LT	Mean ($\pm$ SD): 25.7 (± 3.9)	DTCs & DICs	Age & place of first injection, drug of first injection, factors of initiation
Haghdoost, Osouli, et al. (2012)	Persian Report	2010	10 provinces	PWID	2546	66	L12M	Mean ($\pm$ SD): 34.6 (± 8.9) Range: 18–72	Outreach services, DTCs, DICS & shelters	Age & place of first injection
Haghdoost, Sadjadi, Mirzazadeh and Navadeh (2012)	Persian Report	2010	3 cities	PWID & sex partners	262	41	L12M	Mean: 37.0 Range: 19–65	DICs & methadone clinics	Age of first injection
Motazakker, Shokate Naghadeh and Anosheh (2012)	Persian PRA	2010	Urmia	384 Drug users	58	1	Injection as main route of DU	NS	A methadone clinic	Age of first injection
Jamali (2009)	Persian Report	2009	Foladshahr	Qualitative study: drug addicts, KIs & people HCV* PWID	26	2	LT	Range: 18–40	DTCs	First drug of injection, factors of initiation
Samimi-Rad et al. (2012)	English PRA	2008–9	Tehran		126	2	LT	Mean ($\pm$ SD): 34.4 (± 10.1) Range: 19–65	A hepatitis clinic & a methadone clinic	Age & year of first injection, duration of DU before first injection
Shoghli et al. (2011)	Persian PRA	2008	Zanjan	PWID	61	0	NS	Mean ($\pm$ SD): 30.1 (± 5.8) Median: 23 Range: 21–46	PWID gathering sites in communities	Age of first injection
Zamani et al. (2010c)	English PRA	2008	Folad Shahr	RDS PWID aged ≥ 18	118	3	LM	Mean ($\pm$ SD): 29 (± 6.6) Median: 28.0	Initial seeds from NSP & methadone clinics	Age of first injection
Dolan et al. (2011)	English PRA	2007–8	Tehran	78 female DUs	9	9	LT	NS	A methadone clinic	Age of first injection
Farhodian, Rahimi-Movaghar, Mohammadi and Fekri (2010) ^b	Persian Report	2007–8	Tehran	Qualitative study: norjisak users, family members & KIs	9	0	Current use	Range: 19–41	DTCs	Factors of initiation
Meidani, Farzaneh, Ajami Baferani and Hassan Zade (2009)	Persian PRA	2007–8	Isfahan	PWID	150	2	NS	Mean ($\pm$ SD): 30.7 (± 7.1)	Hospital & a DTC	Age of first injection
Mobaein and Nasab Farhadi (2011)	Persian PRA	2007–8	Hamedan	PWID	270	9	NS	Mean ($\pm$ SD): 33.6 (± 6.3) Range: 19–60	Triangular clinics	Age of first injection
Afsar Kazerooni et al. (2009)	Persian PRA	2007	Shiraz	PWID	360	0	NS	Mean ($\pm$ SD): 33 (± 7.3)	DTCs, DICS, & public places	Age of first injection
Narenjiha et al. (2009); Rafiey et al. (2009) ^b	English PRA Persian PRA Unpublished data	2007	26 provinces	7766 DUs	2071	NS	LT	Mean ($\pm$ SD): 31.3 (± 8.3)	DTCs, prisons & streets	Age & place of first injection, factors of initiation
Saberi- Zafarghandi et al. (2008)	Persian Report	2007	Assaluyeh	Qualitative study: DUs, staff, KIs & people PWID	5	0	Injection as main route of DU	NS	DTCs & streets	Factors of initiation
Rahimi-Movaghar et al. (2008); Rahimi-Movaghar, Razaghi, Sahimi-Izadian and Amin-Esmaili (2010)	Persian Report English PRA Unpublished data	2006–7	Tehran		904	38	L2M	Mean ($\pm$ SD): 33.9 (± 9.4) Median: 32.0	DTCs, DICs & public places	Age & year of first injection, duration of DU before first injection, first drug of injection
Malekinejad (2008)	English dissertation Unpublished data	2006–7	Tehran	RDS PWID	548	2	LM	Mean ($\pm$ SD): 36.5 (± 9.2) Range: 20–70	Chain of referrals from DIC	Place & factors of initiation

Table 2 (Continued)

Study	Type of publication	Year of study	Study site	Study population & design	No. of PWID studied	No. of female PWID	Definition of PWID	Age of PWID	Settings PWID recruited	Data on initiation of injection drug use
Zamani (2008)	English Report	2006–7	11 provinces	PWID	2853	77	L12M	Mean ($\pm$ SD): 33.4 ($\pm$ 9.2) Median: 32.0	DTCs, DICs & locations PWID frequently found	Age of first injection
Jafari et al. (2008)	English PRA	2006	Darab	76 DUs	22	NS	LM	NS	A DTC	Age & place of first injection, drug of first injection, factors of initiation
Kheirandish et al. (2009); Mohraz, Kheirandish, Jahani, Shirzad and Ahmadian (2009)	English PRA Persian report Unpublished data	2006	Tehran	PWID	452	0	Current use	NS	A detention center	Age of first injection
Razani et al. (2007)	English PRA	2006	Tehran	Qualitative study: PWID & KIs	22 interview 66 in FGDs	5	NS	Interviews: Median: 36.5 Range: 19–55 FGDs: Median: 32.2 Range: 20–61 NS	Out-patient treatment centers for HIV, DICs & various types of DTCs	Factors of initiation
Zamani et al. (2010a)	English PRA	2006	Tehran	Qualitative study: Prisoners & prison staff	NS	NS	NS	NS	A prison	Factors of initiation
Mohammad et al. (2008)	Persian PRA	2005	Kermanshah	437 DUs	367	0	NS	Mean: 33.4 Range: 19–53	DICs	Age of first injection & duration of DU before first injection
Narenjiha et al. (2005)	Persian Report	2004–5	28 provinces	4930 DUs	1041	NS	LT	NS	DTCs, prisons & streets NS	Age & place of first injection, factors of initiation Factors of initiation
Farhoudian et al. (2006)	Persian PRA	2004	Bam	Qualitative study: KIs & families of DUs	0	0	NA	NA		
Vazirian et al. (2006)	English Report	2004	Tehran	54 drug dependents 281 DUs	7 185 & 24	NS NS	LT NS	NS NS	DTCs & streets NS	Year of first injection Duration of DU before first injection Factors of initiation
Zamani, Ono-Kihara, Ichikawa and Kihara (2010b)	English PRA	2003–4	Tehran	Qualitative study: DUs, KIs 611 DUs	24 307 sexually active	NS 0	NS LT	NS Mean ($\pm$ SD): 33 ($\pm$ 8) Median: 32.0	NS DICS & neighboring parks & streets DTCs	Age of first injection
Rahimi-Movaghar et al. (2003)	Persian Report	2002	5 cities	213 PWID Qualitative study: Prisoners & KIs	NS	NS	NS	NS	Large prisons	Factors of initiation
Jafari et al. (2010)	English PRA	2001–5	Darab	Longitudinal study of 211 drugs users	66	1	Injection as main route in LM	Mean ($\pm$ SD): 26.6 ($\pm$ 5.2)	A DTC	Factors of initiation
Razzaghi and Rahimi-Movaghar (2005)	English Book	2001	Tehran	Qualitative study: PWID & KIs	154	23	NS	NS	DTCs, streets & self-help groups	Duration of DU before first injection, drug of first injection ^a , factors of initiation

Table 2 (Continued)

Study	Type of publication	Year of study	Study site	Study population & design	No. of PWID studied	No. of female PWID	Definition of PWID	Age of PWID	Settings PWID recruited	Data on initiation of injection drug use
Rahimi-Movaghar (2002); Rahimi-Movaghar, Mohammad and Razzaghi (2002); Razzaghi, Rahimi-Movaghar, Hosseini, Madani and Chatterjee (2005); Razzaghi et al. (1999)	English Report Persian Book Persian PRA Persian dissertation	1998–1999	10 provinces	1500 DUs Qualitative study: DUs, KIs & families of DUs	323 NS	10 NS	LT NS	Mean ($\pm$ SD): 31.7 ($\pm$ 8.7) NS	DTCs, prisons & streets DTCs, prisons & streets	Age & year of first injection Duration of DU before first injection, factors of initiation

^a Quantitative data from participant PWID.

^b The study utilized combination of methods. The method that provided information on transition to injection drug use is described in this table.

DIC: Drop-in center; DTC: drug treatment center; DU: drug use; DUs: drug users; KIs: key informants; L12 M: injection drug use in last 12 months; LM: injection drug use in the last month; LT: any history of injection drug use in lifetime; NA: not applicable; NS: not specified; PRA: peer reviewed article; RDS: respondent-driven sampling.

et al., 2012; Mohammad et al., 2008; Narenjiha et al., 2005, 2009; Rahimi-Movaghar et al., 2008; Razzaghi et al., 1999) 1322 (18.2%, range: 12.8–24.4%) had started injecting before age 20.

A few studies provided mean AFI by various subgroups of PWID. With respect to the recruitment site, while there was no difference in mean AFI between PWID recruited from community, treatment centers, and prisons in two studies (Narenjiha et al., 2005, 2009), another study conducted in the same city found the AFI was considerably higher in PWID recruited from treatment centers versus those from community and drop-in centers (DTCs) (30.3 vs 24.7, $p < 0.001$) (Rahimi-Movaghar et al., 2008). While one study reported no difference in mean AFI between those who have shared needles and syringes and those who have not (Rafiey et al., 2009), another study (Mohammad et al., 2008) reported significant difference in mean AFI (shared 20.3 vs. not shared 26.4, $p < 0.001$). Finally, only one study reported no significant difference in AFI for PWID by HCV sero-status (Zamani et al., 2010c).

Duration of drug use before first injection

Six studies reported on the length of time between the initiation of drug use and the transition to injection use. Due to the heterogeneity of studies and reported outcomes, we did not calculate a summary mean for the length of time for this transition. Four studies reporting on the mean of duration of drug use before the first injection found that, on average, drug users were using illicit drugs for 6–7 years before their first injection (Rafiey et al., 2009; Rahimi-Movaghar et al., 2008; Razzaghi & Rahimi-Movaghar, 2005; Samimi-Rad et al., 2012). Two studies reported that 50% of subjects had initiated injection within 4 years of starting their drug use career (Rahimi-Movaghar et al., 2008; Vazirian et al., 2006), and one study reported that most subjects started injection somewhere between 5 and 15 years after the initiation of their drug use.

Four studies reported on the proportion of PWID who initiated their drug use with injections (Jafari et al., 2010; Mohammad et al., 2008; Rahimi-Movaghar, Noroozi, et al., 2013; Vazirian et al., 2006). From a total of 630 PWID participating in these studies, conducted in three different cities, 17.6% (range: 1.5–23%) first used drugs via injection.

The place and situation of the first injection

Seven studies have provided information on the place or context of the first injection (Haghdoost, Osouli, et al., 2012; Jafari et al., 2008; Malekinejad, 2008; Narenjiha et al., 2005, 2009; Rahimi-Movaghar, Noroozi, et al., 2013; Razzaghi et al., 1999). Given the heterogeneity of terminologies used to describe types of places, we did not calculate pooled frequencies.

Between 49% and 67% of the participants in these seven studies reported “home” as the place of first injection (PFI) from which nearly half indicated “friend’s home” as the PFI, and nearly half of these reported that their first injection use took place during a party. Other venues indicated as PFI by PWID in various studies included: public places (e.g., parks, streets, areas under bridges, and partially ruined buildings, which constituted 8.5–49% in six studies); prison (3.1–6.7%, four studies, the latest study had the highest rate) (Haghdoost, Osouli, et al., 2012; Malekinejad, 2008; Narenjiha et al., 2005, 2009); workplace (3–5%, four studies) (Jafari et al., 2008; Malekinejad, 2008; Narenjiha et al., 2005, 2009); military barracks (0.3–1.8%, three studies) (Malekinejad, 2008; Narenjiha et al., 2005, 2009); school (0.2–0.5%, two studies) (Narenjiha et al., 2005, 2009); and DTCs (a few cases, two recent studies) (Haghdoost, Osouli, et al., 2012; Rahimi-Movaghar, Noroozi, et al., 2013).

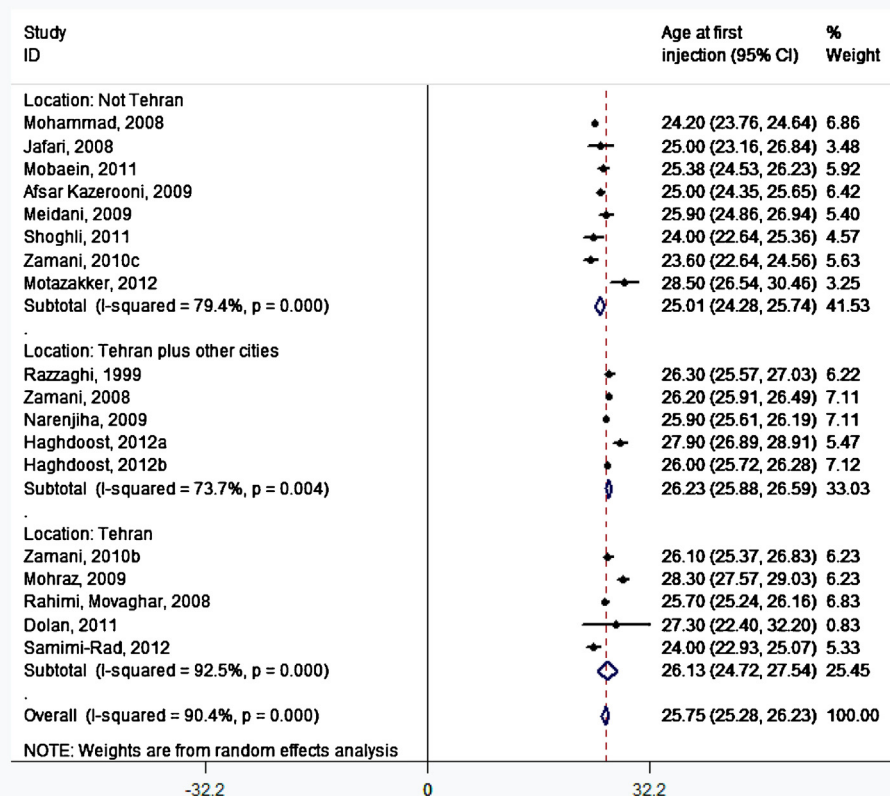


Fig. 2. Summery estimate of mean and 95%CI of age at the first injection by geographical location, sorted by year of study implementation from oldest to most recent.

First drug of injection

Four studies reported data on the first drug of injection (FDI). In a 2001 study in Tehran, almost all 154 participating PWID initiated their drug injection with heroin (Razzaghi & Rahimi-Movaghar, 2005). In another study in Tehran in 2006, 71% of 904 PWID reported heroin as FDI, 18% *kerack*, 4.1% *norjisak* (an injectable vial consisting of heroin, steroids and other components), 3.1% opium, and 2.6% *temgesic* (injectable buprenorphine) (Rahimi-Movaghar et al., 2008). In the same year but in a smaller city of Darab (Jafari et al., 2008), about half of the 22 PWID participating in a study reported *temgesic* as FDI, while the other half reported heroin as FDI. In 2011, in Tehran, the majority of a small sample of PWID reported *kerack* as FDI, though a few participants had started with other drugs (heroin, *temgesic*, and morphine) (Rahimi-Movaghar, Noroozi, et al., 2013).

Heroin smoking or opium smoking was reported as the predominant pattern of drug use preceding the first injection in three studies reporting on this issue (Jamali, 2009; Razzaghi & Rahimi-Movaghar, 2005; Razzaghi et al., 1999).

Factors facilitating transition to injection

Sixteen studies reported on factors influencing the transition to drug injection (Table 3). Social and individual factors were reported more frequently than familial factors. The role of the peer drug users was the most frequently reported factor (15 studies) from multiple angles including: "learning from peers by observing how they inject"; "being encouraged toward and insisted on injection by peers"; "peers cultivated curiosity and desire to try injection"; and "getting help from peers with the first

injection." Sometimes, the desire to be accepted by a group of injecting friends was described as the role of peers in the initiation of injection use. Two studies reported that in two-thirds of PWID participating in surveys, the first person to suggest using drug via injection was a friend (Jafari et al., 2008; Malekinejad, 2008).

The second most frequently reported factor was the high price of drugs and economic efficiency (13 studies) (i.e., lower cost for getting a better rush) of drug injection. Another commonly reported factor was the greater availability of injectable drugs (e.g., *kerack*, heroin, *norjisak* and *temgesic*) in the market than opium, which mainly is smoked or ingested (6 studies). In addition, given that injection drugs are odorless and smokeless, injections were considered a safer route of drug use for certain indoor places (e.g., prison, workplace, home) (4 studies). Social marginalization, manifested by unemployment, poverty, and homelessness, was also an important factor cultivating the context for the initiation of injection use (5 studies).

Overall, six studies provided information about factors influencing the transition to injection in the context of prison, including the need for hiding drug use (4 studies), low availability and high price of drugs (3 studies), low availability of smoking paraphernalia inside prison (one study), and transferring of injecting prisoners to the prison (one study).

The most commonly reported factor at the individual level was pleasure-seeking behavior, particularly with substances that had a rapid effect (9 studies). This factor has not been reported for the initiation of injecting with *temgesic* (mainly used as a self-medication for quitting other opioids, as mentioned in two studies) and *norjisak* (primarily used for weight gain and healthier look, as well as quitting other opioid use, as mentioned in one study). Development of drug dependence, seeking a less expensive

Table 3
Factors facilitating transition to injection reported in 16 studies, in Iran.

Factors	No. of studies	Percent
<i>Individual factors</i>	15	93.7
Seeking pleasure and rapid induction of high via injection	9	56.3
Curiosity	8	50
Severity of addiction and development of tolerance	7	43.8
Self-treatment of opioid dependency via injection of other drugs ^a	5	31.3
Preference for easier and quicker mode of drug administration	5	31.3
Lack of knowledge and misconceptions about harms of injection	3	18.8
Mental and emotional problems	2	12.5
Lower age of drug initiation	2	12.5
Being single	1	6.3
Good socio-economic status and having private place for injection	1	6.3
Physical problems	1	6.3
<i>Familial factors</i>	6	37.5
Drug Injection by a family member	3	18.8
Inappropriate family reactions to drug use	3	18.8
Dramatic family events or conflicts	3	18.8
<i>Social and environmental factors</i>	15	93.7
Peer-role	13	81.3
High cost of drugs and lower cost of injection	10	62.5
Easier access to injectable drugs than opium	6	37.5
Social disadvantages (e.g. poverty and homelessness)	5	51.3
Low quality of the drug	5	31.3
Need to hide drug use	4	25
Low availability of the drug, mainly in prison	4	25
Limited preventive measures	2	12.5
Lack of alternative pleasurable activities	1	6.3
Industrialization and high speed of life	1	6.3

^a Temgesic and norjisak.

method for controlling withdrawal, and reaching the same level of pleasure (compared to when drug was used via non-injection route) was also reported frequently (in 7 studies) and regarded as the most important factor in two studies (Rahimi-Movaghar, Noroozi, et al., 2013; Razzaghi et al., 1999). Curiosity was reported as a factor influencing the transition to injection use in 8 studies, though findings were not consistent on the importance of this factor (Jafari et al., 2008; Vazirian et al., 2006). Lack of knowledge and misconceptions about the consequences of injection use (e.g., being confident about the ability to stop injection use and perceiving the injection as a healthier method than smoking for dental hygiene) were reported in three studies.

With respect to familial factors, three studies found that having a family member (e.g., commonly sibling or spouse) who injects drugs (i.e., via teaching, encouraging, or helping with the first injection) was one of the main influential factors in the transition to injection use. One study of IDU in Tehran reported that a family member suggested the first drug injection for about 10% of participants, most of whom were distant relatives (Malekinejad, 2008). Family intolerance of drug use was also reported as a factor resulting in the transition to injection use as IDU wished to hide their drug use from family.

With respect to gender, being the sexual partner of a male drug injector, being involved in sex work, and being homeless were reported as the main transition factors for female drug users (Rahimi-Movaghar, Noroozi, et al., 2013; Razani et al., 2007).

Only one qualitative study comprehensively reported on protective factors (Rahimi-Movaghar, Noroozi, et al., 2013). Being female, having knowledge about negative consequences of injection use, and having negative attitudes toward injections were among inhibiting individual factors. Another study showed that using opioids is the main gateway of injection and those

people who stay away from opiates are very likely to avoid injecting (Vazirian et al., 2006).

Discussion

To our knowledge, this is the first comprehensive review of factors influencing the initiation of or transition to drug injection use, for which we identified 38 documents from 31 studies from Iran.

This review showed that the mean age at first injection in Iran was around 26 and the median in most studies was 25. In addition, no specific change can be observed in the AFI in these studies conducted from 1998 to 2011. Also, a national study conducted in the years 1998–1999 (Rahimi-Movaghar et al., 2002) showed that AFI—from 24 to 27—had been relatively stable in two decades (1978–1997) and the difference between the year groups was not significant.

The AFI reported from the 18 studies in Iran is higher than what has been reported in other countries. In studies from the US (Frajzyngier, Neaigus, Gyarmathy, Miller, & Friedman, 2007; Genberg et al., 2011; Ompad et al., 2005), Canada (Marshall et al., 2011; Roy et al., 2003), Australia (Abelson et al., 2006), Vietnam (Clatts et al., 2011), and India (Kermode et al., 2007) the mean age of injection initiation was reported to be in late adolescence (i.e., around 20). Roy et al. (2011b) found that risk of injection initiation decreased 17% per year from age of 14–23. Some studies have reported a lower average age of initiation, such as 17 in Moldova (Rhodes et al., 2011) while others have reported a higher age, such as the median age of 23 in Baltimore, US (Fuller et al., 2001), and higher in Northern Thailand (Cheng et al., 2006).

Many studies have showed that early-onset injection use is associated with homelessness (Abelson et al., 2006; Roy et al., 2003, 2008) and unsafe injections (Battjes, Leukefeld, & Pickens, 1992; Fennema, Ameijden, Hoek, & Coutinho, 1997; Novelli, Sherman, Havens, Strathdee, & Sapun, 2005), and that young injectors are at high-risk of acquiring hepatitis C virus as well as HIV infection (Fennema et al., 1997; Hahn et al., 2002; Thorpe, Ouellet, Levy, Williams, & Monterroso, 2000). Higher age of injection initiation might be an indicator of lower risk of injection in Iranian drug users. Perhaps in Iran, the higher age of injection might have contributed to slower spread of HIV epidemic among PWID in the last decade in Iran (Rahimi-Movaghar et al., 2012).

Most studies in our review reported an average of 6–7 years of drug use before starting to use injections. Although this lag seems to be common in many parts of the world (Abelson et al., 2006; Fuller et al., 2001; Harocopos, Goldsamt, Kobrak, Jost, & Clatts, 2009; Young & Havens, 2012), there is evidence of shorter periods of non-injection drug use before the first injection among adolescents (Abelson et al., 2006; Fuller et al., 2001). For Iranian drug users who generally start injecting as adults, the long interim period is a window of opportunity to intervene for prevention of transition to injection use.

Our review also showed that, up to 10 years ago, heroin was the FDI for almost all cases. Since 2005, other drugs such as *norjisak* and *temgesic*, followed by *kerack* of heroin, have appeared as the first drugs of injection, as well. We did not identify evidence on the initiation of drug injection by stimulants or cocaine in Iran. Heroin and opium smoking were the predominant patterns of drug use before the first injection. This finding suggests that among opioid users, growing tolerance and the high costs of large amounts of heroin—which has been reported frequently in the studies of this review—could have played a major role in the initiation of injection use. Vazirian et al. (2006) showed that few non-opioid users had ever injected drugs. Accordingly, avoiding opiate use likely keeps people from injecting in Iran.

In the MENA region, heroin is the main drug of injection reported from most countries (Rahimi-Movaghar, Noroozi, et al., 2013). In Iraq and Pakistan, prescription drugs such as anti-histamines and opioid analgesics are the primary injected drugs (Rahimi-Movaghar, Noroozi, et al., 2013). In the available studies from other parts of the world, cocaine was reported to be the drug of choice for initiating injection use, followed by amphetamines in Brazil (Oliveira et al., 2006); cocaine was followed by heroin and PCP in Montreal, Canada (Roy et al., 2003); half opioids and half stimulants in several cities in Australia (Abelson et al., 2006); and prescription opioids and stimulants in Kentucky, US (Young & Havens, 2012). Many have used these drugs by non-injection route before their first injection, thus indicating that high levels of dependence facilitate injection use (Harocopos et al., 2009; Neaigus et al., 2006). Thus, in areas with higher rates of heroin use among non-injecting drug users, such as Iran and other countries in Middle and South Asia, one might expect a higher rate of transition to injection use than in areas with a higher use of stimulants (Cheng et al., 2006). However, we also showed that an average of 17.6% of PWID initiated their drug use by injecting in Iran that cannot be explained by increased opioid dependency. This proportion is higher than the figures reported from Mexico (12%) (Morris et al., 2012), China (5.4%) (Koram et al., 2011), and Brazil (0.9%) (Oliveira et al., 2006).

In this review, “home” was the place of first injection in more than half cases; for almost 50% of this group, “home” referred to a friend’s home. This finding is similar to findings from Australia, where the vast majority of participants reported that their first injection occurred in a home (theirs or someone else’s) (Abelson et al., 2006), and India, where the most common places for the first injection were a friend’s home or the participant’s own home (Kermode et al., 2007).

Wherever the first injection takes place, the role of peer drug users was the most frequently reported influential factor in the studies included in this review. In one study (Malekinejad, 2008), only 12% of participants reported that they were not offered the first injection by someone else. Other studies have identified social network factors as important determinants in the transition to injecting. In Northern India, the vast majority of first injections were witnessed by at least one friend and the injection was usually administered by someone who was well-known to the person being initiated (Kermode et al., 2007). In the US and Canada, greater exposure to PWID was reported as a predictor for injecting drug use (Cepeda et al., 2012; Harocopos et al., 2009; Neaigus et al., 2006; Roy et al., 2011b; Sánchez, Chitwood, & Koo, 2006). In a multi-city study in Australia, early-onset injection was associated with group presence at the first injection and cases in which the first injection was administered by someone else (Abelson et al., 2006). A more recent study from Toronto, Canada in 2011 showed that 27.4% of PWID had ever given anyone their first injection. In this study, unemployment, having ever spoken positively about injecting to a non-injector and number of years that PWID had been injecting were associated with giving someone their first injection (Rotondi et al., 2014). Our findings suggest that peer based strategies to prevent transition into injection merit closer attention for Iranian PWUD and as others suggested to enhance existing harm reduction programs (Vlahov, Fuller, Ompad, Galea, & Des Jarlais, 2004).

Our findings in respect to the effect of high price of drugs and economic efficiency of injection is consistent with international evidence indicating the role of local drug markets and drug price (Bravo et al., 2003; Firestone & Fischer, 2008; Roy et al., 2008; Strang et al., 1997) on the decision of PWUD to initiate injection as a more efficient route of drug use. Drug market is an environmental level factor beyond the control of health system that can adversely affect efforts on preventing transition to injection. Thus, it is

reasonable for harm reduction programs to monitor changes in drug market and to tailor the programs accordingly if possible.

We also found pleasure and curiosity as the most common individual factor assessed in the studies from Iran. Believing that injection administration increases the effect of the drug and the curiosity to experience this effect increase the likelihood of injection initiation (Roy et al., 2011b). However, these individual factors are strongly influenced by peers (Draus & Carlson, 2006). Injecting peers usually evoke curiosity by highlighting the potency of injected drugs.

We also found a few studies that have documented the effect of beliefs and knowledge – such as ability to control injecting drug use and having healthier teeth – on initiation of injection. Health beliefs that are potentially injurious to health could readily be challenged through Information, Education and Communication (IEC) materials, social marketing, or group based prevention interventions (Des Jarlais et al., 1992).

Prison as the first place of injection showed an increase in the latest study. Incarceration was described as a context which facilitated the transition to IDU in several ways, including low availability, poor quality, and high cost of drugs, as well as the normalization of IDU behavior as the main form of drug use in prison. This finding is in line with results from studies conducted in other developing countries (Cheng et al., 2006; Mehta et al., 2012). However, expansion of harm reduction interventions, including opioid substitution treatment inside prisons, is necessary and can prevent such transition.

Female gender has been reported as a protective factor against injection drug use. Other studies from Iran showed that while women constitute 6–9% of drug users in Iran, they constitute only three percent of PWID (Rahimi-Movaghar, 2004). This might be because of cultural factors, like a very high stigma attached to female injection drug use in Iran, or because of a higher level of fear of injection and its consequences in the female population (Rahimi-Movaghar, Noroozi, et al., 2013). In two studies included in this review, having a family member or a sexual partner who injects drugs was reported as the main factor influencing the initiation of injection use in women. Gender differences on this issue have been documented in other countries, as well. Many studies have repeatedly reported that women had been injected first by a male friend, sexual partner, or relative (Bravo et al., 2003; Oliveira et al., 2006; Roy, Boivin, & Leclerc, 2011a; Simmons, Rajan, & McMahon, 2012); this trend seems to be a common cross-cultural finding.

Recommendations

Based on the extent of the drug use epidemic in Iran and existing evidence about the transition to drug use injection, a more comprehensive harm reduction policy seems to be imperative. Iran has adopted large-scale harm reduction policies (i.e., mainly provision of methadone maintenance treatment – MMT – and needle and syringe programs targeting PWID) since 2002. Although MMT is the most essential preventive measure against drug use injection (Bridge, 2010), lessons learned from other settings such as Amsterdam, Netherlands (van Ameijden & Coutinho, 2001) and New York, USA (Neaigus et al., 2006) suggest that preventing the transition to drug use injection via other interventions is also feasible and can be examined in the context of Iran. For instance, addressing individual susceptibility, by educating non-injecting drug users to control their substance use (Roy et al., 2011b) and educating PWID to stop injecting (Dolan et al., 2004) can be tested and incorporated into existing programs. Further, given the role of PWID in initiation of injection among others, network-based educational campaigns can be a way to reach out to current PWID and discourage them from perpetuating injection behavior among

their non-injecting peers (Hunt, Griffiths, Southwell, Stillwell, & Strang, 1999). Finally, a qualitative study in Tehran showed that the majority of PWID live with their families and are concerned about their health (Razzaghi, Movaghar, Green, & Khoshnood, 2006). This finding suggests that family-based strategies for the prevention of injection drug use can be explored.

Further high quality research (i.e., longitudinal studies) is needed to better understand factors influencing transition to injection among Iranian drug users in particularly among youth. Although 31 studies provided some evidence regarding the initiation of injection drug use, only a few studies had assessed the influential factors extensively and only one study provided longitudinal data. We were unable to identify any study addressing drug transitions among street youth in Iran, nor about the role of alcohol on initiation to injection. A thorough assessment of interactions between individual and social network factors on the transition to injecting drug use may provide insight on intervention points. Also, further assessment of protective factors against transition to injection especially among those not in MMT programs is essential.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.drugpo.2015.04.018>.

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