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

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Abstract

Background—Injection drug use has been increasing over the past decade in Iran. This study aims to review the epidemiological and qualitative evidence on factors that facilitate or protect against transition to injection in Iran.

Methods—Five international (Medline, Web of Science, EMBASE, CINAHL, PsycINFO), one regional (IMEMR) and three Iranian (Iranmedex, Iranpsych, IranDoc) databases were searched and key experts were contacted. Two trained researchers screened documents to identify relevant studies and independently extracted data using a pre-specified protocol. A thematic analysis was applied to the qualitative data and a random effect meta-analysis model was used to determine age of first injection.

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Results—A total of 39 documents from 31 studies met the eligibility criteria; more than 50% were conducted between 2006 and 2008. The weighted mean age of first injection was 25.8 years (95% Confidence Interval: 25.3–26.2). Overall, drug users had used drugs for 6 to 7 years before starting to inject. Heroin was the first drug of injection in the majority of cases. Factors influencing transition to injection included 1) individual (pleasure-seeking behavior and development of drug dependency), 2) social network (role of peer drug users in first injection use), and 3) environmental (the economic efficiency associated with injection 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. However, given the extent of non-injection drug use, evidence from this study can provide insight on points of interventions for preventing transition to injection use.

Keywords

Substance use; harm reduction; risk factors for injecting; protective factors for injecting; first injection episode; systematic review; Iran

INTRODUCTION

A report from 2011 estimated that 2.3% of the Iranian population aged between 15 and 64 years were using opioids annually (United Nations Office on Drugs and Crime, 2011). Smoking opium for medicinal and recreational purposes is deeply rooted in the Iranian culture and is considered less stigmatized than heroin use and drug injection. However, in the last decade, Iran has witnessed major changes in the pattern of substance use. In three national studies of drug use conducted between 1998 and 2006, the proportion of those who use heroin or *Kerack* (a crystallized form of heroin) increased considerably (Narenjiha et al., 2009; Narenjiha et al., 2005; Razzaghi, Rahimi-Movaghar, Hosseini, Madani, & Chatterjee, 1999). Also since 2005, there has been an emerging epidemic of methamphetamine-based substance use although compared to opioids the overall figures are relatively low.

It has been estimated that there are approximately 260,000 people who inject drugs (PWID) in Iran (Rahimi-Movaghar, Amin-Esmaili, Haghdoost, Sadeghirad, & Mohraz, 2012b). PWID are at a higher lifetime risk of harms to health including overdose, HIV and Hepatitis C virus. In a recent systematic review of HIV among substance users, the prevalence rate was 4.4 times higher among PWID than non-injectors (Amin-Esmaili, Rahimi-Movaghar, Haghdoost, & Mohraz, 2012), and the pooled HIV prevalence in studies among PWID conducted after 2005 was twice (18.4%) as high as studies conducted before 2005 (8.7%) (Rahimi-Movaghar, Amin-Esmaili, Haghdoost, Sadeghirad, & Mohraz, 2012a).

From 2002, Iran has implemented harm reduction policies and has been recognized as a leader in the Middle East and North African region (MENA) (Rahimi-Movaghar, Amin-Esmaili, Aaraj, & Hermez, 2013; Razzaghi et al., 2006). To date, hundreds of drop-in-centers provide clean needles and syringes, condoms, and social support, and thousands of clinics provide methadone maintenance treatment (MMT) to reduce harms associated with drug injection (Rahimi-Movaghar, et al., 2013). However, until now, there has been little if any attention paid to preventing drug users from transitioning to injection drug use.

A better understating of factors affecting drug users' decisions about transition to injection use and the context in which such transitions take place can inform policies on effective preventive strategies as well as helping to identify substance users at risk of transition. This systematic review is the first of its kind, summarizing the existing evidence on factors that may influence transitions to or away from injection among substance users in Iran.

METHOD

Overview

We conducted a systematic review to identify studies in Iran reporting on the age of initiation of drug injection and the factors influencing transition. The review involved: 1) searching for scientific documents; 2) screening documents to identify relevant studies; 3) extracting data from included studies, and 4) synthesizing data. We have described these stages below.

Searching for scientific documents

The search strategy involved: 1) comprehensive searching of electronic databases for published peer-reviewed articles, as well as other scientific documents (grey literature); 2) hand-searching of the reference section of relevant scientific documents; and 3) contacting experts in the field of substance use in Iran.

Electronic database search—An initial search of Medline (1946–2013) involved an iterative process to refine the search strategy through the testing of several search terms, incorporating new terms as relevant citations were identified. Multiple combinations of keywords and phrases were used to specify geographic location, population of interest (e.g., injection drug users), medical domain (e.g., substance related disorders), and type of substance (e.g., opium, cocaine). We did not limit searches by language. Once terms were refined, we repeated searches in several international (Medline, Web of Science, EMBASE, CINAHL, PsycINFO), regional (IMEMR), and Iranian (Iranmedex, Iranpsych, IranDoc) databases. For Iranian databases, we used both Farsi and English key terms.

We also contacted other researchers in academic and governmental organizations. We imported all citations to an Endnote library. Since the automatic export of citations for Iranian databases was not available, we reviewed retrieved citations in Microsoft Word and manually entered relevant titles into Endnote. We hand-searched the reference section of relevant review studies or national program reports to identify studies containing primary data.

Screening of scientific documents

Two of the co-authors reviewed 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 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 heroine 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 any papers which the initial screener was uncertain whether to include or not.

At the full text level, two reviewers (MA & BS) screened studies independently and included those that provided data in one of the following categories: 1) factors affecting the initiation of drug injection, and 2) factors influencing the transition from a non-injection mode of drug use to injection use. A senior researcher (ARM) reviewed and adjudicated on studies where the reviewers had disagreed. No restriction was placed 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). Data were extracted on: 1) authors, year, type, and language of the publication; 2) study implementation year; 3) study design and setting; 4) study site (i.e. urban/rural, name of province/city/community); 5) study target population (i.e., definition of IDU); 6) sample size and sampling methods; 7) data collection methods; 8) age, year, place, and drug used for the first injection; 9) main drug of use and duration of drug use preceding the initiation of injection use; and 10) factors influencing the initiation of (or transition to) injecting (i.e., individual, familial, network, social, macro-level and those related to drug or injection itself). In cases of ambiguity in the published data, we contacted authors for further clarification. If a document reported on more than one research project, each 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, if required. We were able to obtain the original databases for secondary data analysis for four studies (Malekinejad, 2008; Mohraz, Kheirandish, Jahani, Shirzad, & Ahmadian, 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 sparse regarding geography, methods and context, 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, 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 against injection drug use. We summarized these findings under thematic headings, aggregated them into categories, and presented them collectively in a table.

RESULTS

Description of studies

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

From a total of 3328 retrieved scientific documents (after de-duplication), we identified and included 39 relevant scientific documents, reporting on a total of 31 original research studies; the co-authors were directly involved in 14 studies. Of the 39 documents, 19 (47%) were in English and 20 (53%) were in Persian. With respect to publication type, 20 (53%) were peer-reviewed articles, 15 (37%) technical reports, two (5%) dissertations, and two (5%) books. Unpublished data from five studies were also used for data analysis.

Table 1 presents characteristics of the 31 included studies. These were carried out between 1998 and 2011, with more than half being conducted between 2006 and 2008. With respect to the geographic location, 12 (39%) studies were conducted in Tehran, 11 (35%) in other cities, and eight (26%) in multiple cities including Tehran. Only four studies (13%) included populations 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 (36%) studies reported quantitative data on the transition to injection drug use, 23 (74%) reported on qualitative data, and three reported on both (Narenjiha, et al., 2005; Razzaghi, et al., 1999; Vazirian et al., 2006). All studies, except for one longitudinal study (Jafari, et al., 2010), used cross-sectional designs and two had applied respondent-driven sampling (RDS) for participant recruitment. Investigating the transition to injection drug use and correlated factors was not a main objective of most included studies so little data were available on this issue.

Age of first injection

From the 20 studies that reported on age at first injection (AFI), we were able to retrieve the mean and standard error for 18 (mean range: 24 to 28.5). Summary (weighted) mean and 95%CI for all studies was 25.8 years (25.3 – 26.2) (Figure 2). Summary mean age and 95%CI for studies conducted in Tehran, in multiple cities including Tehran, and outside of Tehran was 26.1 years ((24.7–27.5), 26.2 (25.9 – 26.6), and 25.0 (24.3 – 25.7) respectively). From a total of 7252 IDU participating in six different studies that reported on the proportion of young initiators in their samples (Amin-Esmaili, Rahimi-Movaghar, Gholamrezaei, & Razaghi, in Print; Haghdoost et al., 2012; Mohammad et al., 2008; Narenjiha, et al., 2009; Narenjiha, et al., 2005; 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 recruitment site, in two studies, there was no difference in mean AFI between PWID recruited from community, treatment centers, and prisons (Narenjiha, et al., 2009; Narenjiha, et al., 2005), however, 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 (DICs) (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 had shared needles and syringes and those who had not (Rafiey et al., 2009), another study (Mohammad, et al., 2008) reported a 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, Radfar, et al., 2010).

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. Due to the heterogeneity of studies and reported outcomes, we did not calculate a summary mean for the length of time to transition. Four studies found that, on average, drug users were using drugs for six to seven years before their first injection (Amin-Esmaili, et al., in Print; Rafiey, et al., 2009; Razzaghi & Rahimi-Movaghar, 2005; Samimi-Rad et al., 2012). Two studies reported that 50% of subjects had initiated injection within four years of starting drug use (Rahimi-Movaghar, et al., 2008; Vazirian, et al., 2006), and one study reported a wider range of between five to 15 years after initiation of drug use.

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

The place and situation of the first injection

Seven studies 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., 2009; Narenjiha, et al., 2005; Rahimi-Movaghar, et al., (in Print); Razzaghi, et al., 1999). Given the heterogeneity of terminologies used to describe place type, 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). In these cases, around 50% indicated “friend’s home” and nearly half of those reported that their first injection took place during a party. Other venues indicated as PFI included: public places (e.g., parks, streets, areas under bridges, and partially ruined buildings, which constituted 8.5 to 49% - 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., 2009; Narenjiha, et al., 2005); workplace (3–5% - four studies) (Jafari, et al., 2008; Malekinejad, 2008; Narenjiha, et al., 2009; Narenjiha, et al., 2005); military barracks (0.3–1.8% - three studies) (Malekinejad, 2008; Narenjiha, et al., 2009; Narenjiha, et al., 2005); school (0.2–0.5% -two studies) (Narenjiha, et al., 2009; Narenjiha, et al., 2005); and DICs (a few cases, two recent studies) (Haghdoost, Osouli, et al., 2012; Rahimi-Movaghar, et al., (in Print)).

First drug of injection

Four studies reported data on the first drug of injection (FDI). In a 2001 study in Tehran, almost all 154 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) (Amin-Esmaeili, et al., in Print). In the same year in the 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. 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, et al., (in Print)).

Heroin smoking or opium smoking was reported as the predominant pattern of drug use preceding the first injection in three studies which reported 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 2). Social and individual factors were reported more frequently than familial factors. The role of 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 injection by peers”; peers cultivated curiosity and a 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 important 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 common social 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 significant factor was the greater availability of injectable drugs (e.g., *kerack*, heroin, *norjisak* and *temgesic*) in the market than opium, which is mainly smoked or ingested (6 studies). In addition, given that injection drugs are odorless and smokeless, injections were considered a safer drug use route for indoor and populated places (e.g., prison, workplace, home) (4 studies). Social marginalization, manifested by unemployment, poverty, and homelessness, was also an important factor 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 (four studies), low availability and high price of drugs (three studies), low availability of smoking paraphernalia inside prison (one study), and presence of injecting prisoners (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 cessation of other opioid use, mentioned in one study). Development of drug dependence, seeking a less expensive method for controlling withdrawal, and reaching the same level of pleasure (compared to when drug was ingested via non-injection route) was also reported frequently (in 7 studies) and regarded as the most

important factor in two studies (Rahimi-Movaghar, et al., (in Print); 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 (e.g., being confident about the ability to stop injection use and perceiving injection as healthier than smoking for dental hygiene) was reported in three studies.

With respect to familial factors, three studies found that having a family member (e.g., most commonly a sibling or spouse) who injects drugs (i.e., via teaching, encouraging, or helping with the first injection) was one of the main influencing factors in the transition to injection use. One study of PWID 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 it could be more easily hidden 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, et al., (in Print); Razani et al., 2007).

Only one qualitative study reported on protective factors (Rahimi-Movaghar, et al., (in Print)). Being female, having knowledge about negative consequences of injection use, and having negative attitudes toward injections (e.g., fear of HIV and hepatitis infection, fear of needles and invasive administration of drugs, perceiving injection drug use as a severe form of addiction resulting in isolation and death). Other factors included: individual, (e.g., financial ability to continue using drugs without being forced to inject, being exposed to negative consequences of injection use, such as overdose and death among friends, in the neighborhood, or via mass media), familial (e.g., being pressured or supported by family to quit or control drug use), and social network (e.g., negative attitude towards injecting among peers). Another study showed that using opioids is the main gateway to 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 31 Iranian studies on factors influencing the initiation of, or transition to, drug injection. The review showed that the mean age at first injection in Iran was around 26 years and the median in most studies was 25 years. In addition, no specific change was observed in the AFI in studies conducted between 1998 and 2011. Also, a national study conducted in the years 1998–9 (Rahimi-Movaghar, Mohammad, & Razaghi, 2002) showed that AFI -from 24 to 27 years- had been relatively stable over two decades (1978 to 1997) and the difference between the year groups was not significant.

The AFI reported from the 18 studies in Iran was higher than that 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, Goldsamt, Giang le, & Colon-

Lopez, 2011), and India (Kermode et al., 2007) the mean age of injection initiation was reported to be in late adolescence (i.e., around 20 years). Roy et al (2011) found that risk of injection initiation decreased 17% per year from the age of 14 to 23 years. Some studies have reported a lower average age of initiation, such as 17 years in Moldova (Rhodes et al., 2011) while others have reported a higher age, such as in Northern Thailand (Cheng et al., 2006) and in Baltimore US, where a median age of 23 years has been reported (Fuller et al., 2001).

Many studies have shown that early-onset injection use is associated with homelessness (Abelson, et al., 2006; Roy, et al., 2003; Roy, Nonn, & Haley, 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 and HIV infections (Fennema, et al., 1997; Hahn et al., 2002; Thorpe, Ouellet, Levy, Williams, & Monterroso, 2000). In Iran, the higher age at first injection might have contributed to a slower spread of HIV among PWID over the last decade (Rahimi-Movaghar, et al., 2012a).

Most studies in our review reported an average of 6 to 7 years of drug use before injecting. Although some time lag is 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 a shorter period 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 an opportune time for preventing the 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. No document in this review reported the initiation of drug injection by stimulants or cocaine. Heroin smoking and opium smoking were the predominant patterns of drug use before 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 reviewed studies - may have played a major role in the initiation of injection drug use. Vazirian, et al (2006) showed that few non-opioid users had ever injected drugs. Accordingly, avoiding opiate use is a likely preventative strategy against injecting in Iran.

In the MENA region, heroin is the main drug of injection reported in most countries (Rahimi-Movaghar, et al., 2013). In Iraq and Pakistan, prescription drugs such as antihistamines and opioid analgesics are the primary injected drugs (Rahimi-Movaghar, 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). Generally, heroin is the drug with high liability for injection use. 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 higher use of stimulants (Cheng, et al., 2006).

However, this review also showed that an average of 17.6% of PWID in Iran initiated their drug use by injecting. This proportion is higher than figures reported from Mexico (12%) (Morris et al., 2012), China (5.4%) (Koram et al., 2011), and Brazil (0.9%) (Oliveira, et al., 2006), and shows an extremely high risk of blood-borne infections attributed to injection drug use in this subgroup.

In this review, “home” was the place of first injection in more than half of cases; for almost 50% of this group, “home” referred to a friend’s home. This finding is similar to findings from Australia (Abelson, et al., 2006), and India (Kermode, et al., 2007).

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 injected (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, Godin, et al., 2011; Sanchez, 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).

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

Prison was a common first place of injection in the latest study. Incarceration was described as a context which facilitated the transition to injecting because of low availability, poor quality, and high cost of drugs, as well as the normalization of injecting 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, 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% to 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, or because of a higher level of fear of injection and its consequences in the female population (Rahimi-Movaghar, et al., (in Print)). In two studies, 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. 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, 2011; Simmons, Rajan, & McMahon, 2012); this trend seems to be a common cross-cultural finding.

Recommendations

Since 2002 Iran has adopted large-scale harm reduction policies (i.e., mainly provision of MMT and needle and syringe programs targeting PWID). Although MMT is the most essential preventive measure against drug use injection (Bridge, 2010), lessons learned from other settings (e.g., Amsterdam, Netherlands and New York, USA (van Ameijden & Coutinho, 2001; Neaigus, et al., 2006)) suggest that preventing the transition to drug use injection via interventions is feasible and if examined in the context of Iran can be included in harm reduction programs. For instance, addressing individual susceptibility, by educating non-injecting drug users to control their substance use (Roy, Godin, et al., 2011) and educating PWID to stop injecting (Dolan et al., 2004) could be tested and incorporated into existing programs. Further, given the role of PWID in initiation of injection among others, network-based educational campaigns could 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 should be explored.

Further high quality research (i.e., longitudinal studies) is needed to better understand factors influencing transition to injection among Iranian drug users, particularly among young people. 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 in initiation to injection. A thorough assessment of interactions between individual and social network factors on the transition to injecting drug use may provide further insight on intervention points. Also, greater assessment of protective factors against transition to injection, especially among those not enrolled in MMT programs, is essential.

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Highlights

- The Age of First injection (AFI) reported in Iran is higher than what has been reported in other countries.
- No specific change can be observed in the AFI in these studies conducted from 1998 to 2011.
- Most studies in the review reported an average of 6 to 7 years of drug use before starting to use injections.
- The long interim period is an opportune time for preventing mechanisms of the transition to injection use in Iran.
- An average of 17.6% of PWID initiated their drug use by injecting which is higher than some other countries.

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

Figure 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

Table 1

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, et al., (in Print))	English unpublished report	2011	Tehran	Qualitative study: DUs aged <=32, KIs	16	2	LT	Mean (± SD): 25.7 (± 3.9)	DTCs & DICS	Age & place of first injection, drug of first injection, factors of initiation
(Haghdoust, Osouli, et al., 2012)	Persian Report	2010	10 provinces	PWID	2546	66	L12M	Mean (± SD): 34.6 (± 8.9) Range: 18–72	Outreach services, DTCs, DICS & shelters	Age & place of first injection
(Haghdoust, Sadjadi, Mirzazadeh, & 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, & 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	26	2	LT	Range: 18–40	DTCs	First drug of injection, factors of initiation
(Samimi-Rad, et al., 2012)	English PRA	2008 -9	Tehran	HCV+ PWID	126	2	LT	Mean (± 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 (± SD): 30.1 (±5.8) Median: 23 Range: 21–46	PWID gathering sites in communities	Age of first injection
(Zamani, Radfar, et al., 2010)	English PRA	2008	Folad Shahr	RDS PWID aged 18	118	3	LM	Mean (± 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
(Farhoudian, Rahimi-Movaghar, Mohammadi, & Fekri, 2010)**	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, & Hassan Zade, 2009)	Persian PRA	2007–8	Isfahan	PWID	150	2	NS	Mean (± SD): 30.7 (±7.1)	Hospital & a DTC	Age of first injection
(Mobaen & Nasab Farhadi, 2011)	Persian PRA	2007–8	Hamedan	PWID	270	9	NS	Mean (± 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 (± SD): 33 (±7.3)	DTCs, DICS, & public places	Age of first injection

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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
(Narenjiha, et al., 2009; Rafiey, et al., 2009) **	English PRA, Persian PRA Unpublished data	2007	26 provinces	7766 DUs	2071	NS	LT	Mean (± SD): 31.3 (± 8.3)	DTCs, prisons & streets	Age & place of first injection, factors of initiation
(Saber-i- Zafarghandi, et al., 2008)	Persian Report	2007	Assaluyeh	Qualitative study: DUs, staff, KIs & people	5	0	Injection as main route of DU	NS	DTCs & streets	Factors of initiation
(Amin-Esmaeli, et al., in Print; Rahimi-Movaghar, et al., 2008; Rahimi-Movaghar, Razaghi, Sahimi-Izadian, & Amin-Esmaeli, 2010)	Persian Report English PRA English Unpublished Report	2006–7	Tehran	PWID	904	38	L2M	Mean (± 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 (± SD): 36.5 (±9.2) Range: 20–70	Chain of referrals from DIC	Place & factors of initiation
(Zamani, 2008)	English Report	2006–7	11 provinces	PWID	2853	77	L12M	Mean (± SD): 33.4 (± 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, et al., 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	Out-patient treatment centers for HIV, DICs & various types of DTCs	Factors of initiation
(Zamani, Farnia, et al., 2010)	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	zero	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	Age & place of first injection, factors of initiation
	Qualitative study: KIs & families of DUs				0	0	NA	NA	NS	Factors of initiation
(Farhoudian, et al., 2006)	Persian PRA	2004	Bam	54 drug dependents	7	NS	LT	NS	DTCs & streets	Year of first injection
(Vazirian, et al., 2006)	English Report	2004	Tehran	281 DUs	185 & 24	NS	NS	NS	NS	Duration of DU before first injection

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, Ono-Kihara, Ichikawa, & Kihara, 2010)	English PRA	2003–4	Tehran	Qualitative study: DUs, KIs	24	NS	NS	NS	NS	Factors of initiation
				611 DUs	307 sexually active	0	LT	Mean (± SD): 33 (±8)	DICS & neighboring parks & streets	Age of first injection
				213 PWID		0	LT	Median: 32.0	DTCs	
(Rahimi-Movaghar et al., 2003)	Persian Report	2002	5 cities	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 (± SD): 26.6 (± 5.2)	A DTC	Factors of initiation
(Razzaghi & 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 * , factors of initiation
(Rahimi-Movaghar, 2002; Rahimi-Movaghar, et al., 2002; Razzaghi, Rahimi-Movaghar, Hosseini, Madani, & Chatterjee, 2005; Razzaghi, et al., 1999)	English Report Persian Book Persian PRA Persian dissertation	1998–9	10 provinces	1500 DUs	323	10	LT	Mean (± SD): 31.7 (± 8.7)	DTCs, prisons & streets	Age & year of first injection
				Qualitative study: DUs, KIs & families of DUs	NS	NS	NS	NS	DTCs, prisons & streets	Duration of DU before first injection, factors of initiation

* Quantitative data from participant PWID

** 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; L12M: 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.

Table 2

Factors facilitating transition to injection reported in 16 studies, in Iran

Factors	No. of studies	Percent
Individual factors	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*	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
Familial factors	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
Social and environmental factors	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

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