Asian Journal of Psychiatry 42 (2019) 79–84

Contents lists available at ScienceDirect

Asian Journal of Psychiatry

journal homepage: www.elsevier.com/locate/ajp

Are non-injecting opioid users at risk of transition to injecting drug use? A multi-site study from India

Atul Ambekar[a,*], Ashwani Mishra[a], Arpit Parmar[a], Rajesh Kumar[b], Manish Kumar[b], Ravindra Rao[a], Alok Agrawal[a]

[a] National Drug Dependence Treatment Centre, All India Institute of Medical Sciences, New Delhi, India
[b] Society for Promotion of Youth and Masses, New Delhi, India

ARTICLE INFO

Keywords:
Injecting drug use
Opioids
Heroin
HIV
Injection transition

ABSTRACT

Background: Most people who inject drugs (PWID) start their drug use careers by using non-injecting opioid drugs. A variety of interconnected factors may influence the risk of transition from non-injecting to injecting drug use (IDU). However, such factors have not been studied well in India. As almost all non-injecting opioid users (NIOU) are at potential risk of switching to IDU in future, it is important to understand the phenomenon of transition.

Method: In this multi-site, cross-sectional observational study, we compared injecting and non-injecting opioid users on the pattern of progression of drug use and their knowledge, attitude and belief about IDU/HIV. Data were collected from people who use drugs coming in contact with Non-Governmental Organizations providing drug treatment or HIV prevention services, in ten cities of six states located in North/North-West India. Following informed consent, a total of 1987 male participants (n = 1234 PWID and n = 753 NIOU) were interviewed using a semi-structured questionnaire. Factors associated with risk of transition were analyzed using logistic regression analysis.

Result: The age of onset of heroin and other opiates as well as other substances was not different between two groups. Among PWID, a majority (n = 713; 57.77%) reported using opioids through non-injecting route before switching to injecting route. The mean duration between first use of non-injecting opioid and first use of injecting opioid was 1.80 ± 3.32 years (range 0–26 years). Awareness and exposure to the act of injecting were amongst factors associated with perceived risk of transition to injecting ($p < 0.01$). On a univariate logistic regression analysis, less education was associated with increased likelihood while being employed was associated with less likelihood of being offered injection ($p < 0.001$).

Conclusion: Though, NIOU are almost indistinguishable from PWID in many respects, there may be certain factors putting them at risk of transition to injecting route. As the majority of PWID start their injecting career by non-injecting route, interventions targeted atrisk NIOU (as suggested by our study) could interrupt the HIV transmission.

1. Introduction

Among people who use drugs (PWUD) in India, those who use opioids, mostly use opioids through a non-injecting route. However, almost all the people who inject drugs (PWIDs), inject one or the other opioid drugs (Ambekar, 2012). Estimated number of people who use opioid drugs are about 2 million, while estimated number of PWID is just under 200,000 (Department of AIDS Control, 2016). It has also been documented that most PWIDs begin their drug use careers by using non-injecting opioid drugs (Ambekar, 2012). However, this phenomenon of transition from non-injecting to injecting route of opioid use has not been adequately studied, though it has important policy implications.

Studies conducted globally on the transition to injecting drug use (IDU) highlight multiple, interconnected factors influencing this risk – ranging from an *individual* level (e.g. risk taking, peer group etc.) to *macro* levels (e.g. influence of societal norms, local subcultures or institutional policies etc.). Most commonly reported individual factors include age at first use of the drug, the level of dependence, duration of heroin use and addiction, and current heroin use (van Ameijden et al., 1994; Fuller et al., 2002; Neaigus et al., 2001, 2006). Social network characteristics, proximity with other PWIDs, and history of injection

* Corresponding author.
E-mail address: atul.ambekar@gmail.com (A. Ambekar).

https://doi.org/10.1016/j.ajp.2019.03.017
Received 26 December 2018; Received in revised form 16 March 2019; Accepted 25 March 2019

use in parents are commonly reported familial/community level risk factors (Roy et al., 2003; Neaigus et al., 2001, 2006; Abelson et al., 2006). The purity of heroin and relative cost of heroin sniffing/chasing as compared to injecting are reported to be crucial environmental factors (Sherman and Latkin, 2002). Having a PWID in the family and having a non-steady source of income are risk factors for early onset of IDU (Abelson et al., 2006). Marco-level factors such as incarceration also play a role in switching (Zamani et al., 2006). Prior to the first injection use, IDUs are exposed to injecting in their peer groups, have heard about the benefits of injecting drug use and also observed injecting use of their peers (Abelson et al., 2006; Harocopos et al., 2009; Khobzi et al., 2008; Kolla et al., 2009; McElrath and Harris, 2013; Small et al., 2009). Most of the IDUs reports the decision of first injecting being voluntary and suggests that they sought injection actively indicating the importance of self-reported risk of injecting in transition to injecting use (Bryant and Treloar, 2007; McElrath and Harris, 2013; Witteveen et al., 2006). The common motives behind injecting drug use transition includes injection being economically cheaper, desire to consume drugs by a more efficient method, to get more high and to emulate drug use of peers (Small et al., 2009; Stillwell et al., 2006; Witteveen et al., 2006). From India, qualitative research has highlighted the role of peers in the initiation of injecting (Kermode et al., 2007).

It is well established that an overwhelmingly large population of PWID in India inject opioids and a majority of them appear to "switch" from a non-injecting opioid drug to injecting a form of drug use (Ambekar, 2012). Older studies have demonstrated that drug use by oral, smoking or inhalational route precedes IDU by almost 2–10 years (Kumar, 2004). Some authors have tried to explore the factors behind this switch in the Indian context also and found that shortage in supply of or a rapid increase in the price of the street heroin ('smack'), and relatively easy availability of pharmaceutical injections are important reasons for such a switch (Ambekar and Vaswani, 2009; Kumar, 2004). Social contexts of first injecting drug use have also been explored, however, most such studies are limited to north-east India, making generalization difficult (Kermode et al., 2007).

Recently, opioid drug use, especially through injecting route and consequent risk of HIV transmission are the major issues being reported from the north and north-western parts of India (Ambekar and Tripathi, 2008; Ambekar et al., 2016; National AIDS Control Organization, 2015). However, little is known about the factors/reasons leading to a transition to IDU among non-injecting opioid users. As almost all non-injecting opioid users are at potential risk of switching to IDU in future, it is important to understand the phenomenon of transition in depth.

Hence, we aimed to compare a sample of male injecting and non-injecting opioid users on the pattern of progression of drug use, current drug use practices, and their knowledge of and attitude towards injecting drug use and HIV/AIDS. We also aimed to assess the factors associated with self-reported risk of transition to injecting drug use among the non-injecting opioid users.

2. Methods

This was a multi-site, cross-sectional observational study in which data were collected from PWUD coming in contact with Non-Government Organisations providing drug treatment or HIV prevention services, at ten cities of six states (Delhi, Jammu and Kashmir, Rajasthan, Punjab, Utter Pradesh and Haryana) located in North / North-west India. Most of the patients seek treatment here by themselves or are brought by their family members and the services are completely voluntary.

Following informed consent, a total of 1987 study participants were interviewed by trained interviewers using semi-structured questionnaires. The data were collected using a Semi-structured questionnaire specifically designed for the purpose of this study. Data were collected on following parameters: socio-demographic profile, current drug use profile, pattern of progression of drug use, risk of transition to IDU, knowledge, attitude and belief about IDU and its consequences as well as HIV. All the interviewers were those already working with the population of People Who Use Drugs, trained specifically for the study through dedicated three-day training programs, conducted by the Investigators, comprised of applying the study tools and the interview techniques, including Role-plays and hands-on experience.

The inclusion criteria for PWID (n = 1234) were male (as injecting drug use being predominantly a male phenomenon in India), aged > 18 years, with a history of injecting opioids at least once in last one year. The inclusion criteria for non-injecting opioid users (henceforth 'NIOU'; n = 753) were male, aged > 18 years, current opioid users (taken at least one opioid for non-medical reasons in last 1 month) with no history of injecting a drug 'ever' for non-medical reasons. Subjects refusing to provide written informed consent or those having a severe disability (hampering the communication) were excluded from the study. Interviews were conducted at settings which ensured full privacy and confidentiality. Data were collected on socio-demographics, drug use profile, pattern of progression of drug use (including IDU), specific issues surrounding IDU initiations, risk of transition to IDU (among NIOU), knowledge, attitude and belief about IDU and HIV, its consequences. While the questionnaires, largely, were same for both the groups, there were certain questions specific to the group (PWID or NIOU).

All collected data were analyzed using SPSS V20.0. Descriptive statistics were calculated using mean, median, mode, frequency, percentage etc. as appropriate. Comparative analysis between PWID and NIOU was done using chi-square test (for categorical variables) and *t*-test (for continuous variables). Factors associated with risk of transition were analyzed using logistic regression analysis. P-value of < 0.05 was taken for significance.

Clearance for the study was obtained from Institute Ethics Committee, All India Institute of Medical Sciences, New Delhi. Participants were referred to appropriate health care facilities after interviews for more information about injecting risks and consequences.

3. Results

3.1. Comparison of PWID and NIOU across socio-demographic and clinical variables

3.1.1. Socio-demographic profile

The mean age of participants was similar across two groups (31.82 ± 07.99 years in PWID Vs 31.21 ± 09.10 in NIOU) (Table 1). The majority of the participants in both the groups belonged to urban background. There were significant differences in terms of education, employment status and occupation across two groups (Table 1). The number of participants recruited from each state are as follows: Delhi (n = 545; 27.4%); Punjab (n = 504; 25.4%); Haryana (n = 400; 20.1%); Chandigarh (n = 240; 12.1%); Rajasthan (n = 199; 10%) and Jammu & Kashmir (n = 99; 5.0%).

3.1.2. Substance use profile

There was a significant difference in terms of substance use (other than opioids) across two groups. As compared to NIOU, significantly higher proportion of PWID reported using tobacco, alcohol and pharmaceutical sedatives, 'ever' as well as in last one year and last one month. (Table 2). The age of onset of alcohol, cannabis, pharmaceutical sedatives and other substances was similar across both the groups. However, NIOU had a significantly earlier age onset of tobacco and inhalant use.

On comparing the opioid use between PWID and NIOU, it was found that use of heroin by chasing/smoking route (ever, and last one year) was significantly higher among PWID while the use of natural opiates (ever, last one year and last 1 month) was significantly higher among

Table 1
Socio-demographic profile of PWID and NIOU groups.

Variable	PWID group (n = 1234) Mean (S.D) or Frequency (%)	NIOU group (n = 753) Mean (S.D) or Frequency (%)	t / c 2(df); p-value
Age (in years)	31.82 (07.99)	31.21 (09.10)	1.54 (1985); 0.12
Education			
Illiterate	234 (19.0)	142 (18.9)	125.5 (3);
Upto primary	466 (37.8)	216 (28.7)	< 0.0001
Upto higher secondary	448 (36.3)	213 (28.2)	
Graduate and above	084 (06.9)	182 (24.2)	
Marital status			
Married	552 (44.7)	353 (46.9)	27.93 (3);
Never married	607 (49.2)	309 (41.0)	< 0.0001
Co-habitating together	008 (00.6)	013 (01.7)	
Divorced/Separated/ Widower	067 (05.5)	078 (10.4)	
Occupational status			
Professional	038 (03.1)	027 (03.6)	126.4 (10);
Administrator/Clerk	026 (02.1)	033 (04.4)	< 0.001
Business/Self-employed	204 (16.5)	088 (11.7)	
Transport worker	092 (07.5)	034 (04.5)	
Skilled worker	213 (17.3)	074 (09.8)	
Unskilled worker	369 (29.9)	214 (28.4)	
Farmer	111 (09.0)	059 (07.8)	
Student	067 (05.4)	136 (18.1)	
Unclassifiable (e.g. beggar, thief, etc.)	069 (05.6)	058 (07.7)	
Other	029 (02.4)	009 (01.2)	
Not known	016 (01.3)	021 (02.8)	
Employment status			
Currently employed (full-time)	464 (37.6)	174 (23.1)	53.15 (3);
Currently employed (part-time)	398 (32.3)	261 (34.7)	< 0.001
Currently unemployed	302 (24.6)	270 (35.9)	
Not known	067 (05.4)	048 (06.4)	
Residence			
Urban	964 (78.1)	599 (79.5)	0.49 (1);
Rural	270 (21.9)	154 (20.5)	0.48

NIOU. There was no significant difference in terms of age of onset of heroin and natural opiate use. However, the age of first use of other oral opioids was significantly earlier in PWID as compared to NIOU.

3.2. Pattern of non-injecting drug use among PWID BEFORE onset of injecting

Among PWID, mean age of first use of injection heroin (n = 531) was 23.13 ± 4.65 years while the mean age of first use of injection buprenorphine (n = 1069) was 24.17 ± 5.97 years. Among PWID, a majority (57.77%) reported using opioids through non-injecting route before switching to injecting route. Among these, 54.6% reported using opioids through non injecting route for 2–5 years before starting IDU, while 26.5% used opioids through non-injecting route for upto 2 years before initiating IDU. Of 1234 PWID participants, only 231 (18.71%) reported using opioids exclusively through injecting route.

3.3. Knowledge and attitude regarding HIV among PWID and NIOU

There was a significant difference in terms of knowledge and attitude regarding HIV/AIDS between PWID and NIOU, with PWID displaying a better overall Knowledge of HIV (Table 3).

3.4. Factors associated with stated risk of injecting among NIOU

Among the NIOU (n = 753), a total of 92 participants (12.2%) reported the likelihood of starting injection opioids while 367 participants claimed, they were "not likely at all" to start injection drug use. Table 4 suggests factors associated with the response "likely to start injection". Factors such as awareness of injection route, awareness of names of drugs which are injected, and having peers who inject etc. are significantly associated with the response "likely to start injection". Similarly, awareness of 'faster/higher intoxication with injections', perception of 'oral opioids being costlier' as well as the perception of 'injections being safer' are other associated factors.

3.5. Factors associated with "someone offered/suggested to inject" among NIOU

Among the NIOU, a total of 264 individuals (35.1%) reported that someone ever offered/suggested them to inject. Binomial Logistic Regression analysis was carried out to see the factors associated with "ever offered/suggested" (Table 5). Studying up to the middle class was associated with increased likelihood of being "ever offered/suggested to inject". On the contrary, being employed was associated with less likelihood (with an odds ratio of 0.43) of being "ever offered/suggested to inject". Heroin use in last 1 year, as well as last 30 days, was also associated with increased likelihood of being "ever offered/suggested to inject". However, on a multivariate logistic regression analysis, only employment status, and use of heroin and alcohol in last 30 days were significant factors.

4. Discussion

In this study, NIOU and PWID were recruited from the same geographical area, minimizing the likelihood of local characteristics influencing the difference of pattern of drug use among PWID and NIOU. Barring differences on a few parameters, their socio-demographic profile and drug use patterns were largely similar. However, findings indicate that certain demographic, drug use as well as HIV risk behaviors may account for the likely transition of NIOU to injection drug use. PWID although were of similar age group and came from a similar socio-cultural background, had a lower education level, were more likely to be unmarried and were involved in skilled or unskilled labor work. Additionally, use of other drugs (alcohol, tobacco and pharmaceutical sedatives) were reported by significantly higher proportion of PWID as compared to NIOU. Previous reports suggest that early onset of polysubstance use predicts later transition to IDU. This is especially the case with alcohol, cannabis and cigarette use (Sherman et al., 2005; Trenz et al., 2012).

Among PWID only a minority initiated opioid use through injecting route. A majority in fact spent around 2–10 years as NIOU before transiting to the injecting route. Previous Indian literature also suggests that prior to initiation of IDU, most of the PWID report having taken drugs through other non-injecting routes (Kumar, 2004). Indeed, as evident by a recent nationwide study with about 1000 IDUs in India, there is a gap of 1–5 years between initiating opioid use through non-injecting and injecting routes (Ambekar, 2012). Similarly, a study from Iran reported that the time duration between first drug use and injecting drug use was within 5 years for 58% of participants while only 13% reported a duration of < 1 year (Vazirian et al., 2005). This time duration is an important window of opportunity; appropriate interventions at the stage of non-injecting opioid use may prevent transition to the injecting route.

Various factors were found to be associated with the expressed risk of transition to injecting in our sample of NIOU. Awareness of injecting and exposure to the act of injecting emerged as important risk factors. Previous literature suggests that community-level risk factors such as peer characteristics and proximate relationship with persons who inject are significant factors leading to IDU transition (Abelson et al., 2006; Sherman and Latkin, 2002; Neaigus et al., 2006). Similarly, community level predictors for IDU transition include relative cost of sniffing and injection (van Ameijden et al., 1994; Sherman and Latkin, 2002). Indian studies have also highlighted the role of peers in the initiation of

Table 2
Substance use profile of PWID and NIOU groups.

Substance	Variable	PWID group (n = 1234) Mean (S.D) or Frequency (%)	NIOU group (n = 753) Mean (S.D) or Frequency (%)	t / χ2(df); p-value
Tobacco	Ever use	1060 (85.9)	558 (74.1)	43.03 (1); < 0.001
	Past 1 year use	1035 (83.9)	533 (70.8)	48.15 (1); < 0.001
	Past 30 days use	0927 (75.1)	515 (68.4)	10.63 (1); 0.001
	Age of first use	18.11 (03.83)	18.65 (04.16)	−2.63 (1615); < 0.01
Alcohol	Ever use	1021 (82.7)	555 (73.7)	23.26 (1); < 0.001
	Past 1 year use	0942 (76.3)	489 (64.9)	30.14 (1); < 0.001
	Past 30 days use	0753 (61.0)	339 (45.1)	48.26 (1); < 0.001
	Age of first use	19.87 (03.87)	20.02 (03.98)	−0.69 (1574); 0.48
Cannabis	Ever use	570 (46.2)	331 (44.0)	0.94 (1); 0.33
	Past 1 year use	459 (37.2)	291 (38.6)	0.41 (1); 0.51
	Past 30 days use	319 (25.9)	236 (31.3)	7.00 (1); < 0.001
	Age of first use	21.45 (04.21)	21.69 (04.89)	−0.79 (896); 0.42
Inhalants	Ever use	094 (07.6)	099 (13.1)	16.30 (1); < 0.001
	Past 1 year use	073 (05.9)	058 (07.7)	2.42 (1); 0.11
	Past 30 days use	051 (04.1)	033 (04.4)	0.07 (1); 0.78
	Age of first use	21.62 (06.58)	18.60 (04.99)	3.57 (188); < 0.01
Oral pharmaceutical sedatives	Ever use	672 (54.5)	148 (19.7)	233.6 (1); < 0.001
	Past 1 year use	627 (50.8)	137 (18.2)	210.2 (1); < 0.001
	Past 30 days use	479 (38.8)	105 (13.9)	139.4 (1); < 0.001
	Age of first use	24.69 (04.63)	25.11 (06.81)	−0.43 (815); 0.66
Heroin (Chasing/Smoking)	Ever use	677 (54.9)	262 (34.8)	75.56 (1); < 0.001
	Past 1 year use	557 (45.1)	252 (33.5)	26.39 (1); < 0.001
	Past 30 days use	348 (28.2)	204 (27.1)	0.28 (1); 0.59
	Age of first use	22.94 (4.20)	22.86 (4.58)	0.23 (937); 0.81
Natural opiates (opium / *doda* / *Phukki* / *Aalam)*	Ever use	323 (26.2)	242 (32.1)	8.17 (1); < 0.01
	Past 1 year use	244 (19.8)	188 (25.0)	7.41 (1); 0.006
	Past 30 days use	150 (12.2)	133 (17.7)	11.61 (1); 0.001
	Age of first use	20.73 (4.44)	20.87 (5.01)	−0.34 (562); 0.73
Other oral opioids	Ever use	627 (50.8)	360 (47.8)	1.68 (1); 0.19
	Past 1 year use	508 (41.2)	314 (41.7)	0.05 (1); 0.81
	Past 30 days use	323 (26.2)	231 (30.7)	4.71 (1); 0.03
	Age of first use	21.82 (3.83)	22.78 (5.03)	−3.36 (983); 0.001

injecting drug use (Ambekar, 2012; Kermode et al., 2007).

Our study also suggested some factors which were associated with exposure to injecting drugs among NIOU. Being currently employed was associated with significantly less likelihood of being exposed to injecting route while heroin and alcohol use was significantly associated with more likelihood to be exposed to injecting route. This is contrary to a previous study from Thailand which suggested that older, single drug users who obtained more education and lived in urban areas were more likely to initiate injection (Cheng et al., 2006). This might be attributed to obvious differences in study methodology (e.g. study setting and age structure between two studies). However, this study also reported that those starting drug use at less than 16 years of age had a higher risk of transition to injection drug use as compared to those starting after 24 years (Cheng et al., 2006). The important implication of such findings is to enhance the focus of HIV and IDU education programs on unemployed, heroin and alcohol using youth. Also, policy level changes at the structural level, such as increasing youth's employment opportunities and increasing access to addiction treatment needs to be considered which are effective at reducing the drug-related harms and risks.

Sudden increase in the number of PWID may result in a situation where scale-up of harm-reduction intervention may not provide adequate coverage for HIV prevention (Malekinejad and Vazirian, 2012). Additionally, many PWID begin riskier patterns of injecting early in their injecting careers (Ambekar, 2012) and may contract HIV and other infections long before their contact with drug treatment or harm reduction interventions (Fuller et al., 2004). As the majority of PWID start their opioid use career with non-injecting routes, interventions targeted atrisk NIOU (as suggested by our study) could interrupt the HIV transmission, especially in the Indian scenario. Unfortunately, most of the HIV prevention interventions are aimed only at the PWID leaving a large majority of non-injecting opioid users out of the intervention coverage (Department of AIDS Control, 2016). Given the role of peers in facilitating injecting drug use transition, implementing the peer-led interventions (which are proven to be effective in western settings extensively) might be considered in Indian context too.

Among limitations of our study, the sample being purposive in nature from north/north-west India makes generalization across the

Table 3
Knowledge and attitude regarding HIV among PWID and NIOUs (Answer: Yes/No).

Factors	PWID group (n = 1234)	NIOU group (n = 753)	Pearson Chi-Square value (P)
Heard of HIV	971	627	54.36 (< 0.001)
HIV transmitted by sharing syringes/needles	903	459	169.63 (< 0.001)
HIV Transmitted by unprotected sex	938	592	53.55 (< 0.001)
HIV Transmitted by blood transfusion	871	469	113.77 (< 0.001)
HIV Transmitted by pregnant mother to her unborn child	771	360	135.71 (< 0.001)
HIV Transmitted by breast-feeding	610	170	236.16 (< 0.001)
Able to Recognize whether someone is HIV positive just be appearance	276	112	36.06 (< 0.001)
Know how to Protect oneself from HIV	694	482	2.03 (< 0.001)

Table 4
Factors associated with the response "likely to start injecting" (among NIOU, n = 753).

Factors	How likely it is for you to try/start injection?		Chi-Square (p)
	Likely (n = 92)	Not Likely (n = 367)	
Awareness that some people take drugs through injections	84	301	8.14 (0.01)
Awareness of names of drugs that people inject	57	167	8.01 (0.01)
Personally knowing someone who injects	59	141	31.09 (< 0.001)
Exposure to the act of injecting drugs	55	111	33.15 (< 0.001)
Being offered to take drugs through injection	50	85	48.17 (< 0.001)
Belief: “Injections give better/faster intoxication”	64	180	36.12 (< 0.001)
Belief: “Injections are cheaper/non-injecting drugs are costlier”	53	116	22.38 (< 0.001)
Belief: “Drugs which people prefer to take through smoking/orally, are not available, so they have to take injections”	57	146	16.12 (< 0.001)
Belief: “Injections are safe for health”	40	47	48.51 (< 0.001)
Belief: “Injections are legal / associated with less risk of police”	48	67	55.24 (< 0.001)
Potential harm of injecting: “Pain of injection prick”	52	66	59.71 (< 0.001)
Potential harm of injecting: “Risk of bleeding”	41	51	50.68 (< 0.001)
Potential harm of injecting: “Risk of ulcer/injury”	47	114	13.15 (0.001)
Potential harm of injecting: “General health damage”	38	134	2.10 (0.34)
Potential harm of injecting: “Death”	45	196	4.68 (0.10)
History of being explained by someone about risks and harms of injection	47	108	15.69 (< 0.001)

Table 5
Factors associated with response “Offered by someone to inject” – Logistic regression analysis (among NIOU, n = 264).

Variables	Univariate analysis			Multivariate analysis		
	Odds ratio	95% CI	P-value	Odds ratio	95% CI	P- value
Age < 18 years	20.41	16.56-25.16	< 0.001	9.96	2.24-44.07	0.002
‘Married’ Marital status	0.92	0.60-1.40	0.68			
Education “Up to middle”	17.38	12.11-24.97	< 0.001			
‘Unskilled’, or ‘transport-worker’ as Occupation	0.75	0.49-1.14	0.18	0.69	0.44-1.09	0.11
Employed	0.43	0.28-0.65	< 0.001	0.53	0.33-0.85	0.01
Residence in urban area	0.45	0.29-0.69	< 0.001	0.46	0.30-0.72	0.001
Heroin ever use	1.48	0.97-2.25	0.07			
Heroin past 1 year use	2.50	1.64-3.82	0.004	3.14	1.58-6.22	0.001
Heroin past 30 days use	1.87	1.22-2.84	< 0.001	0.60	0.30-1.21	0.15
Opium ever use	0.99	0.62-1.58	0.97			
Opium past 1 yr use	1.36	0.85-2.18	0.20			
Opium past 30 days use	1.84	1.11-3.05	0.02	0.74	0.46-1.20	0.23
Other oral opioid ever use	0.41	0.26-0.64	< 0.001	0.54	0.24-1.23	0.14
Other oral opioid past 1 year us	0.49	0.30-0.78	0.003	2.26	0.93-5.44	0.07
Other oral opioid past 30 days use	0.41	0.23-0.75	0.003	1.30	0.73-2.29	0.36
Alcohol use ever	0.17	0.11-0.26	< 0.001	0.54	0.22-1.27	0.15
Alcohol use past one year	0.17	0.11-0.27	< 0.001	0.99	0.37-2.61	0.97
Alcohol use past 30 days	0.15	0.08-0.26	< 0.001	0.23	0.11-0.51	< 0.001

country, difficult. Cross-sectional nature of the study also is a major limitation inducing the recall bias leading to inability to provide causal associations. Addition of a qualitative component to data collection on why some people transit to injecting route, while others do not, could have added value to the study.

Despite these limitations, this is the first study which has looked into possible factors associated with perceived risk of transition to IDU as well as factors associated with exposure to injection drug use among NIOU. A more in-depth understanding of these factors – through large-scale prospective studies conducted on cohorts on non-injecting opioid users – could provide invaluable data on which evidence-based harm-reduction policies and programs could be based.

Conflict of interest

We declare no conflict of interest.

Funding

Society for Promotion of Youth and Masses, Regional Resource and Training Centre (RRTC) - North, Ministry of Social Justice and Empowerment, Government of India.

Acknowledgement

None.

References

Abelson, J., Treloar, C., Crawford, J., Kippax, S., Van Beek, I., Howard, J., 2006. Some characteristics of early-onset injection drug users prior to and at the time of their first injection. Addiction 101 (4), 548–555.

Ambekar, A., 2012. Association of Drug Use Pattern With Vulnerability and Service Uptake Among IDUs. United Nations Office on Drugs and Crime (UNODC) Regional Office for South Asia, and National AIDS Control Organisation, New Delhi.

Ambekar, A., Tripathi, B.M., 2008. Size Estimation of Injecting Drug Use in Punjab and Haryana. New Delhi, India: Society for Promotion of Youth and Masses and United Nations Programme on HIV/AIDS.

Ambekar, A., Vaswani, M., 2009. Drug abuse-related HIV/AIDS epidemic in India: situation and responses. In: In: A. B (Ed.), The Praeger International Collection on Addictions, vol. II. Praeger Publishers, Westport, CT, pp. 235–259.

Ambekar, A., Rao, R., Agrawal, A., Mishra, A., Kumar, R., Kumar, K., 2016. Punjab Opioid Dependence Survey. Accessed at. SPYM and NDDTC, AIIMS, New Delhi. http://pbhealth.gov.in/scan0003%20(2).pdf.

Bryant, J., Treloar, C., 2007. The gendered context of initiation to injecting drug use: evidence for women as active initiates. Drug Alcohol Rev. 26, 287–293.

Cheng, Y., Sherman, S.G., Srirat, N., Vongchak, T., Kawichai, S., Jittiwutikarn, J., et al., 2006. Risk factors associated with injection initiation among drug users in Northern Thailand. Harm Reduct Jl 3 (1), 1.

Department of AIDS Control, 2016. Ministry of Health and Family Welfare: Annual Report

2015-16. Retrieved from. . http://naco.gov.in/sites/default/files/Annual%20Report%202015-16_NACO.pdf.
Fuller, C.M., Vlahov, D., Ompad, D.C., Shah, N., Arria, A., Strathdee, S.A., 2002. High-risk behaviors associated with transition from illicit non-injection to injection drug use among adolescent and young adult drug users: a case-control study. Drug Alcohol Depend. 66 (2), 189–198.
Fuller, C.M., Ompad, D.C., Galea, S., Wu, M.Y., Koblin, B., Vlahov, D., 2004. Hepatitis C incidence—a comparison between injection and noninjection drug users in New York City. J. Urban Health 81 (1), 20–24.
Harocopos, A., Goldsamt, L.A., Kobrak, P., Jost, J.J., Clatts, M.C., 2009. New injectors and the social context of injection initiation. Int. J. Drug Policy 20, 317–323.
Kermode, M., Longleng, V., Singh, B.C., Hocking, J., Langkham, B., Crofts, N., 2007. My first time: initiation into injecting drug use in Manipur and Nagaland, north-east India. Harm Reduct. J. 4 (1), 19.
Khobzi, N., Strike, C., Cavalieri, W., Bright, R., Myers, T., Calzavara, L., Millson, M., 2008. Initiation into injection: necessary and background processes. Addict. Res. Theory 17 (5), 1–14.
Kolla, G., Balian, R., Altenberg, J., Silver, R., Roy, E., Hunt, N., Millson, P., Strike, C., 2009. Exploring the context of injecting for the first time – a qualitative study. The Ontario HIV Treatment Network'S 2009 Annual Research Conference, Toronto.
Kumar, S., 2004. Injecting Drug Use and HIV in India: an Emerging Concern. United Nations Office on Drugs and Crime, Regional Office for South Asia, New Delhi, India.
Malekinejad, M., Vazirian, M., 2012. Transition to injection amongst opioid users in Iran: implications for harm reduction. Int. J. Drug Policy 23 (4), 333–337.
McElrath, K., Harris, J., 2013. Peer injecting: implications for injecting order and bloodborne viruses among men and women who inject heroin. J. Subst. Use 18 (1), 31–45.
National AIDS Control Organization, 2015. National Integrated Biological and Behavioral Surveillance 2014-15. New Delhi, India. Retrieved from. . http://www.aidsdatahub.org/sites/default/files/highlight-reference/document/India_IBBS_report_2014-15.pdf.
Neaigus, A., Miller, M., Friedman, S.R., Hagen, D.L., Sifaneck, S.J., Ildefonso, G., Des Jarlais, D.C., 2001. Potential risk factors for the transition to injecting among non-injecting heroin users: A comparison of former injectors and never injectors. Addiction 96 (6), 847–860.
Neaigus, A., Gyarmathy, V.A., Miller, M., Frajzyngier, V.M., Friedman, S.R., Des Jarlais, D.C., 2006. Transitions to injecting drug use among noninjecting heroin users: social network influence and individual susceptibility. J. Acquir. Immune Defic. Syndr. 41 (4), 493–503.
Roy, É., Haley, N., Leclerc, M.P., Cédras, M.L., Blais, L., Boivin, J.F., 2003. Drug injection among street youths in Montreal: predictors of initiation. J. Urban Health 80 (1), 92–105.
Sherman, S.G., Latkin, C.A., 2002. Drug users' involvement in the drug economy: implications for harm reduction and HIV prevention programs. J. Urban Health 79 (2), 266–277.
Sherman, S.G., Fuller, C.M., Shah, N., Ompad, D.V., Vlahov, D., Strathdee, S.A., 2005. Correlates of initiation of injection drug use among young drug users in Baltimore, Maryland: the need for early intervention. J. Psychoactive Drugs 37 (4), 437–443.
Small, W., Fast, D., Krusi, A., Wood, E., Kerr, T., 2009. Social influences upon injection initiation among street-involved youth in Vancouver. Canada: a qualitative study. Subst. Abuse Treat. Prev. Policy 4, 1–8.
Stillwell, G., Hunt, N., Taylor, C., Griffiths, P., 2006. The modelling of injectingbehaviour and initiation into injecting. Addict. Res. 7, 447–459.
Trenz, R.C., Scherer, M., Harrell, P., Zur, J., Sinha, A., Latimer, W., 2012. Early onset of drug and polysubstance use as predictors of injection drug use among adult drug users. Addict. Behav. 37 (4), 367–372.
Van Ameijden, E.J., Van Den Hoek, J.A., Hartgers, C., Coutinho, R.A., 1994. Risk factors for the transition from noninjection to injection drug use and accompanying AIDS risk behavior in a cohort of drug users. Am. J. Epidemiol. Infect. Dis. 139 (12), 1153–1163.
Vazirian, M., Nassirimanesh, B., Zamani, S., Ono-Kihara, M., Kihara, M., Ravari, S.M., Gouya, M.M., 2005. Needle and syringe sharing practices of injecting drug users participating in an outreach HIV prevention program in Tehran, Iran: a cross-sectional study. Harm Reduct. J. 2 (1), 1–19.
Witteveen, E., Van Ameijden, E.J., Schippers, G.M., 2006. Motives for and against injecting drug use among young adults in Amsterdam: qualitative findings and considerations for disease prevention. Subst. Use Misuse 41 (6-7), 1001–1016.
Zamani, S., Kihara, M., Gouya, M.M., Vazirian, M., Nassirimanesh, B., Ono-Kihara, M., et al., 2006. High prevalence of HIV infection associated with incarceration among community-based injecting drug users in Tehran, Iran. J. Acquir. Immune Def. Syndr. 42 (3), 342–346.