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Research paper

The effect of on-site and outreach-based needle and syringe programs in people who inject drugs in Kermanshah, Iran

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ABSTRACT

Background: Needle and syringe programs (NSPs) are widely used to reduce harms associated with drug injecting. This study assessed the effect of facility-based (on-site services at drop-in centre) and outreach models of NSP on injection risk behaviours.
Methods: Self-reported data from 455 people who injected drugs (PWID) during 2014 in Kermanshah, Iran, were examined to measure demographic characteristics and risk behaviors. Self-reported and program data were also assessed to identify their main source of injection equipment. Participants were divided into three sub-groups: facility-based NSP users, outreach NSP users and non-users (comparison group). Coarsened exact matching was used to make the three groups statistically equivalent based on age, place of residence, education and income, and groups were compared regarding the proportion of borrowing or lending of syringes/cookers, reusing syringes and recent HIV testing.
Results: Overall, 76% of participants reported any NSP service use during the two months prior to interview. Only 23% (95%CI: 17–27) reported outreach NSP as their main source of syringes. Using facility-based NSP significantly decreased recent syringe borrowing (OR: 0.27, 95%CI: 0.10–0.70), recent syringe reuse (OR: 0.38, 95%CI: 0.23–0.68) and increased recent HIV testing (OR: 2.60, 95%CI: 1.48–4.56). Similar effects were observed among outreach NSP users; in addition, the outreach NSP model significantly reduced the chance of lending syringes (OR: 0.31, 95%CI: 0.15–0.60), compared to facility-based NSP (OR: 1.25, 95%CI: 0.74–2.17).
Conclusion: These findings suggest that the outreach NSP model is as effective as facility-based NSP in reducing injection risk behaviours and increasing the rate of HIV testing. Outreach NSP was even more effective than facility-based in reducing the lending of syringes to others. Scaling up outreach NSP is an effective intervention to further reduce transmission of HIV via needle sharing.

Introduction

UNAIDS/WHO has reported that about 270,000 people are living with HIV in the Middle East and North Africa (United Nations Office on Drugs and Crime, 2012). In Iran, HIV prevalence is low in the general population (less than 1%), while concentrated among people who inject drugs (PWID) (Haghdoost et al., 2011; Supreme

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Council of Nationwide Planning of HIV/AIDS Infection Prevention and Control, 2014). There are approximately 170,000–230,000 PWID in Iran, of whom, 15% are infected with HIV (Khajehkazemi et al., 2013; Nasirian, Doroudi, Gooya, Sedaghat, & Haghdoost, 2012). Over two-thirds of all newly identified HIV cases have been attributed to unsafe injection (Haghdoost et al., 2011; Mirahmadizadeh, Majdzadeh, Mohammad, & Forouzanfar, 2009; Zamani et al., 2010). In 2002, in order to reduce the risk and harms associated with injection, needle and syringe programs (NSPs) were implemented in Iran. These services are delivered through drop-in centres (DIC) and by outreach teams to those PWID who may have difficulties accessing DIC (Eshrati et al., 2008; Mirahmadizadeh et al., 2009; Nissaramanesh, Trace, & Roberts, 2005) and are the main sources of needles and syrnges in Iran (Noroozi et al., 2015; Supreme Council of Nationwide Planning of HIV/AIDS Infection Prevention and Control, 2014).

NSP outreach is a community-based intervention, reaching PWID where they live, socialize, buy or inject drugs (Needle et al., 2005). The DICs and outreach NSP provide sterile needle and syringes, deliver training on safe injecting practices and overdose prevention and provide condoms and safe sex education (Mathers et al., 2010; Needle & Coyle, 1997). Safe injection kits distributed at each visit to an NSP, either at a DIC or via outreach, consist of 3–4 syringes, 3–4 extra needles, sterile water vials, and alcohol pads (Vazirian et al., 2005).

The effectiveness of the two models of NSP has yet to be evaluated in Iran. The costs of establishing and maintaining a new NSP site are much higher than adding-on an outreach-based NSP to an existing DIC or health facility. Some NSP sites are focused on on-site service delivery and are much less interested in providing outreach NSP. In part this is because of a lack of knowledge or belief in the effectiveness of outreach activities delivered in the community. The objective of this study was to evaluate and compare the effectiveness of the two NSP models – on-site services at DICs and outreach-based NSP – by examining the injecting risk behaviors of PWID in Kermanshah, an urban setting in southwestern part of Iran. Kermanshah was where the HIV epidemic first emerged in Iran and triggered the national response to HIV.

Methods

A cross-sectional study design was used. Participants were recruited from the community and NSP sites between September and December 2014. PWID from NSP sites were recruited by convenience sampling, and in the community through outreach and peer-referral. The outreach team regularly attended venues where PWID congregated and they also encouraged respondents to refer their peers to the study by distributing referral coupons. Study inclusion criteria were males aged over 18 years of age, who self-reported drug injection within the last month and who were willing to provide written consent to participate in the study.

Data were collected through face-to-face interviews. The questionnaire consisted of five sections, including demographic information, type of drug injected most frequently, duration of drug use and injection, frequency of injection, risk behaviours such as sharing (borrowing or lending) syringes/needles and cookers, reuse of syringes and number of injecting partners they had shared syringes/needles with during the month prior to the interview. Information about HIV testing in the past 12 months was also requested. The content of the questionnaire was discussed with eight experts in the fields of behavioural science, epidemiology and harm reduction.

Our main area of enquiry was whether study participants had used on-site or outreach NSP services as their main source of syringes in the two months prior to interview; defined as the service where they sourced at least 70% of their injecting equipment. This was measured by the self-reported data, and then validated by checking the DICs and outreach services' client monitoring information and log books. Those who reported neither on-site nor outreach NSP as their main (70% or more) source of syringes were assigned to the NSP non-user group. In case of discrepancy, participants' allocation to a sub-group was based on service monitoring information and logbook data.

No identifying information was collected. During the consent procedure, participants were provided with information about the study objectives, the risks and benefits of participating in the study, and their right to withdraw from the study at any time without penalty. The study protocol and procedures were reviewed and approved by the Research Ethics Committee of the Kerman University of Medical Sciences (Ethics Code: k/93/204).

Coarsened Exact Matching (CEM) is a statistical matching technique used to improve causal inferences of observational studies (Stuart, 2010) and is recommended when an experimental design is not feasible (Sidney, Coberley, Pope, & Wells, 2015). Here CEM was applied to match outreach and facility-based NSP users and non-NSP users based on certain covariates in order to ensure statistically equivalent comparison groups to estimate the effect of the NSP models on injection risk behaviour. The CEM created a comparable sub-sample of the three subgroups based on age, place of residence, income and education level. CEM attempts to control for the potential confounding influence of 'pre-exposure' covariates on the outcome of interest, by matching 'exposed' cases with 'non-exposed' cases that are approximately similar with regard to covariates (Wells et al., 2013). This approach allowed us to designate a counterfactual for each participant in the exposed group, i.e. outreach-based NSP, and mimic a randomized clinical design. We chose CEM over other matching techniques, such as propensity score matching, to achieve balanced groups, reduce the need for multiple iterations and re-matching, and maximize the number of possible matches in our sample. Also, the predictors for using outreach or on-site NSP were unknown and such information would have been crucial for applying a propensity matching analysis (Iacus, King, & Porro, 2009; King, Nielsen, Coberley, Pope, & Wells, 2011).

Using CEM, every study participant was allocated into one of the specified set of strata in which all were exactly matched on a set of coarsened or matched variables. Matched members were then assigned a weight specific to their stratum and representative of the proportion of all members present in that stratum (King et al., 2011). Then, a statistical measure called L1 distance was calculated. L1 varies between 0 and 1 and values close to zero indicate that the matching is perfect and ensures the comparability of the two groups (Rou, Sullivan, Liu, & Wu, 2010). The L1 was calculated before and after applying CEM, and decreased from 0.43 to 0.00003 after coarsened exact matching. It was reassuring that the imbalance between the two comparison groups was very small and could be ignored. Given the matched subgroups, the descriptive statistics for the pool sample and matched sub-sample were reported. Logistic regression models were applied to estimate the effect of outreach and facility-based NSP on injection risk behaviours. The effects were reported as odds ratio (OR) and 95% confidence interval (CI). All data analyses were performed using STATA v.11.

Results

Characteristics of study participants

A total of 455 men who injected drugs participated in the study. The characteristics of participants in pooled (unmatched) and matched sub-sample are presented in Table 1. The matched sample ($n = 278$) had a mean age ± standard deviation (SD) of 34.5 ± 8.6

Table 1
Characteristics of participants in the pooled (total) and matched subsample of people who inject drugs, Kermanshah, 2014.

Variable	Pooled sample (*N* = 455), *N* (%)	Matched sample (*N* = 278), *N* (%)
Age, year		
Under 30	182(40.3)	152(54.6)
30–39	145(31.7)	82(29.5)
40–49	103(22.6)	38(13.6)
Upper 50	25(5.4)	6(2.3)
Education		
Primary or below	117(23.7)	39(14.0)
High school	179(39.4)	133(47.8)
Diploma or higher	159(34.9)	106(38.2)
Current marital status		
Single	268(60.2)	217(77.3)
Married	54(10.5)	18(8.5)
Divorce	79(17.3)	30(9.7)
In separation	44(9.7)	6(2.4)
Widower	10(2.3)	7(2.1)
Live with		
Family	228(50.3)	148(52.5)
Friends	37(7.4)	23(8.2)
Alone	189(42.3)	107(39.3)
Monthly income		
Less than $150	391(86.4)	249(87.3)
$150 or more	63(13.6)	29(10.7)
Age at first drug injection, year		
Under 25	270(60.3)	210(76.4)
25–30	104(21.4)	41(14.3)
30 or older	81(18.3)	27(9.3)
Age at first drug use, year		
Under 25	399(87.5)	254(88.5)
25–30	44(9.2)	21(8.7)
30 or older	12(3.3)	3(2.8)

(range 19–58) years. The majority of respondents were under 30 years old (54.6%). Also, 61.8% of participants had less than a high school education, 77.3% were single, 52.5% lived with their families, and 87.3% had a monthly income of less than $150. About 88.5% reported their first drug use, and 76.4% their first injection, under the age of 25 years old.

Behaviors of study participants and estimates of NSP outcomes

Overall, 76% of study participants reported any NSP service use during the two months prior to interview and only 23% (95%CI: 17–27) had used outreach NSP as their main source of syringes.

Table 2 shows NSP outcomes in matched and unmatched study sub-samples. Only matched results are discussed here. Regarding needle sharing behaviors, about 30.2% of respondents reported ever borrowing a syringe and 12.3% reported recent borrowing of a syringe. Similarly, 13.4% of participants reported recent lending of a used syringe to other PWID. Ever and recently borrowing or lending a cooker was more commonly reported by participants (68.2% and 53.2%, respectively). The majority of participants (86.1%) reported reuse of their own syringes in the month prior to interview. The mean number of injecting partners with whom the study participants had shared a syringe/needle or cooker with was 2.31 ± 1.4. The majority of PWID (85.3%) reported having taken an HIV test in the past 12 months.

Table 2
Behavioral outcomes in the pooled (total)and matched subsample of people who inject drugs, Kermanshah, 2014.

Behavioral outcome	Pooled (*N* = 455), *N* (%)	Matched (*N* = 278), *N* (%)
Ever borrowing a syringe	152(34.2)	84(30.2)
Borrowing a syringe in the past month	60(14.2)	31(12.3)
Ever lending a used syringe	145(32.4)	71(26.3)
Lending a used syringe in the past month	58(13.7)	36(13.4)
Ever borrowing or lending a cooker	329(72.4)	186(68.2)
Borrowing or lending a cooker in the past month	253(56.5)	137(53.2)
Reuse own syringes in the past month	397(88.2)	239(86.1)
Received an HIV test in the past 12 months	390(85.2)	237(85.3)
Number of injecting partners whom shared syringes/needles or cookers within the past month		
Mean (SD)	2.88(1.7)	2.31(1.4)
Median (P25, P75)	2(0, 4)	2 (0, 4)

P, Percentile.

In Table 3, the effect of the two NSP models is presented, facility-based and outreach, on different injection risk behaviours in the pooled and matched sub-samples. In the matched sub-sample, PWID who used facility-based NSP services were less likely to report borrowing syringes in past month (OR: 0.27, 95%CI: 0.10–0.70, *P*-value: 0.04), compared to non-NSP users. Likewise, those who used the NSP outreach services reported less recent syringe borrowing (OR: 0.40, 95%CI: 0.28–0.81, *P*-value: 0.01).

Regarding recent syringe lending, the outreach NSP users were significantly less likely to report doing so (OR: 0.31, 95%CI: 0.15–0.60, *P*-value: 0.02), than the facility-based NSP users (OR: 1.25, 95%CI: 0.74–2.17). Own syringe reuse was reported less frequently in both the facility-based (OR: 0.38, 95%CI: 0.23–0.68, *P*-value: 0.03) and outreach groups (OR: 0.54, 0.30–0.92, *P*-value: 0.02). Recent cooker sharing was reported less among facility-based NSP service users (OR: 0.86, 95%CI: 0.40–1.82, *P*-value: 0.30) and outreach NSP users (OR: 0.63, 95%CI: 0.47–3.38, *P*-value: 0.23), however neither were statistically significant. Both facility-based and outreach NSPs increased the chance of recent HIV testing by 2.60 and 2.45 times, respectively.

Discussion

We found that outreach NSP is as effective as facility-based outreach in decreasing the use of borrowed syringes, reusing one's own used syringes and increasing the likelihood of being tested for HIV. Based on the behaviour of service users, outreach NSP shows a

Table 3
The odds ratios for the association of the two needle and syringe distribution models with some injection risk behaviours in the pooled (total) and matched subsample of people who inject drugs, Kermanshah, 2014.

Behavioral outcomes	Pooled sample OR (95%CI)	Match sample OR (95%CI)
Borrowing a syringe in the past month		
NSP nonusers[a]	1	1
Facility-based NSP users	0.36 (0.10–0.70)**	0.27 (0.10–0.70)**
Outreach NSP users	0.42 (0.21–0.62)**	0.40 (0.28–0.81)**
Lending a syringe in the past month		
NSP nonusers	1	1
Facility-based NSP users	1.26 (0.74–2.15)	1.25 (0.74–2.17)
Outreach NSP users	0.34 (0.18–0.64)**	0.31 (0.15–0.60)**
Sharing a cooker in the past month		
NSP nonusers	1	1
Facility-based NSP users	0.86 (0.42–1.75)	0.86 (0.40–1.82)
Outreach NSP users	0.94(0.43–2.04)	0.63(0.47–3.38)
Syringe reuse in the past month		
NSP nonusers	1	1
Facility-based NSP users	0.31(0.19–0.51)**	0.38 (0.23–0.68)**
Outreach NSP users	0.44 (0.27–0.72)**	0.54 (0.30–0.92)**
HIV test in the past 12 months		
NSP nonusers	1	1
Facility-based NSP users	3.32(1.90–5.76)**	2.60 (1.48–4.56)**
Outreach NSP users	2.83 (1.72–4.65)**	2.45 (1.36–4.39)**

[a] Reference group.
** Significant at $p < 0.05$. The matched subsample was made by considering age, place of residence, education and income.

more promising effect on reducing the lending of syringes than the facility-based NSP.

Effectiveness of needle/syringe programs in reducing equipment sharing among PWID has been shown in previous studies (Islam, Wodak, & Conigrave, 2008; Kral, Anderson, Flynn, & Bluthenthal, 2004; Kwon, Iversen, Maher, Law, & Wilson, 2009; Mathers et al., 2010). There are several methods for distribution, sale or exchange of injecting equipment, including conventional NSPs (facility-based NSP), pharmacy-based distribution and outreach programmes. NSP services through outreach can be provided at locations and times that are convenient for PWID and so increase access to NSP services (Islam & Conigrave, 2007). This can also improve coverage for PWID who face structural and cultural barriers to using fixed site services (Abdala, Crowe, Tolstov, & Heimer, 2004).

There are limited data on the efficacy of different delivery methods for NSP and their effect on preventing HIV risk behaviours (Jones, Pickering, Sumnall, McVeigh, & Bellis, 2010). We found that the majority of the PWID had access and used either one of the NSP delivery models. However, only one-quarter reported outreach NSP as their main source of injection equipment. This suggests that there is a room to improve and scale up NSP services through outreach. The results of matched analysis showed that injection high-risk behaviours are relativity common in PWID, no matter which service they attend. Our results are consistent with those reported in other studies (Khajehkazemi et al., 2013; Rahimi-Movaghar, Amin-Esmaeili, Haghdoost, Sadeghirad, & Mohraz, 2012; Sajadi et al., 2013). In 2010, Sajadi et al. found that 12.6% of PWID in Iran shared needles and syringes (Sajadi et al., 2013). We found that the most commonly shared injection equipment was cookers. The high rate of cooker sharing has also been reported elsewhere. In a study of PWID in Wales (UK) in 2010, paraphernalia (cooker) sharing was reported by 67% of participants (Coates, Richter, & Caceres, 2008). Zamani et al. in 2010 reported that 32% of injecting drug users in Isfahan shared cookers (Kai Wang, Longfield, Modi, Mundy, & Firestone, 2014).

We found both facility-based and outreach NSP models were effective in reducing injection risk behaviours. Increasing the number of distributed syringes/needles, scaling up second-hand distribution, expanding the coverage of services and establishing NSP in high-risk neighbourhoods and venues where PWID gather has been shown to reduce risk behaviours (Foss, Hossain, Vickerman, & Watts, 2007). Such comprehensive intervention packages have been shown to be effective in developed settings such as in San Francisco and Montreal, where the risk of HIV transmission among PWID has decreased over time by scaling up NSP services (Mathers et al., 2010; Vickerman et al., 2006). In 2007, Islam et al. demonstrated that fixed-site NSP and outreach programs are effective in reaching, referring and providing services that can lead to reduced HIV-related risk (Islam & Conigrave, 2007). Rhodes et al. (2004) who studied injecting equipment sharing among PWID in Russia, showed that PWID who reported NSP or outreach as their main source of new needles and syringes, were less likely to share compared to those obtaining them from a pharmacy or shop (Needle & Coyle, 1997).

We found that not only did NSPs improve injection risk behaviour, but also, use of either model of NSP was associated with a higher uptake of HIV testing. Ever HIV testing was reported to be as low as 60% in 2004 among 105 injecting drug users recruited in Tehran (Vazirian et al., 2005) and at 49.8% in a national surveillance survey of PWID in 2010 (unpublished data). Such outreach programs then, offer an important opportunity to provide condoms, information and referral of PWID to community-based HIV testing and counselling and general health services (Schumacher, Fischer, & Hz, 2007). A study in southern China found that referral for HIV testing does increase the uptake of HIV testing among PWID (Kai Wang et al., 2014).

We found that outreach NSP was more effective in reducing the lending of syringes. In 2002, Obadia reported that outreach users were significantly less likely to share syringes, cookers and solutions during the previous six months compared to non-users(Obadia, Feroni, Perrin, Vlahov, & Moatti, 1999). Miller et al. also reported that needle lending was lower among users of outreach services compared to users of fixed-site or pharmacy-based NSP (Miller et al., 2002). The lower rates of syringe lending among users of outreach services might be explained by their higher frequency of injection; also reported in other studies (Fung et al., 2007). We found that the injection rate (per week) of those using outreach NSP was higher than users of NSP on-site facilities and given the number of distributed syringes per visit is the same at both NSP models, outreach NSP users may be less willing to lend their injection equipment. Another explanation relates to the nature of NSP outreach delivery – all PWID are presented with their injection equipment at the same time so everybody receives a sufficient number of syringes, suggesting that there is no need to lend injection equipment to others. In contrast, the on-site model has a more individual-based approach, with one person served at a time and where a client who has received equipment could feasibly be asked by others to share.

There are some limitations to our study. We used a mix of recruitment strategies to locate and recruit eligible participants; the diversity of our sample might be comprehensive enough for Kermanshah but it is not a truly random sample of the PWID population. Like any other observational study, we can only report the association of program exposure with high-risk behaviours. Furthermore, our data were based on participants self-report and therefore this may be subject to recall and social desirability bias (Latkin & Vlahov, 1998). We made the two groups comparable based on matching of age, income, education and city of residence, however we could not account for other factors such as distance to NSP facilities, availability of methadone maintenance therapy and other individual factors.

In conclusion, less than one-quarter of PWID had their main access to NSP services through outreach services. Given that the effect of outreach NSP was found to be equivalent to on-site NSP services, scaling up of outreach NSP to improve coverage is arguably an effective and cost efficient strategy to reach the population of injecting drug users in Kermanshah and to reduce transmission of HIV in this setting.

Conflict of interests

AN and AH participated in the planning and implementation of harm reduction programs in Ministry of Health. All other authors had no conflicts of interest to be declared.

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Authors' contributions

HS and AM helped in study concept and design. MN and SH helped in analysis and interpretation of data. MN and AM drafted the manuscript. AN, PH, HS, SH, AH, AM helped in critical revision of the manuscript.

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