

# Client-Level Coverage of Needle and Syringe Program and High-Risk Injection Behaviors: A Case Study of People Who Inject Drugs in Kermanshah, Iran

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## Original Article

### Abstract

**Background:** Needle-syringe programs (NSP) have been running in Iran since 2002. However, the coverage of such program among the NSP clients at the individual level was not studied yet. This study aimed to determine the client coverage of NSP and its correlation with high injection-related risk behaviors.

**Methods:** A cross-sectional survey was conducted in Kermanshah province, Iran, in 2014. 230 people who inject drugs (PWID) recruited from two drop-in centers (DICs) from April to September 2014, participated in a face-to-face interview to provide information related individual coverage of NSP, demographic characteristics, and injecting behaviors 30 days prior to the interview.

**Findings:** Overall, the average of syringe coverage was 158% [95% confidence interval (CI) = 65.7-205.5], while 56% (95% CI = 40-97) have individual coverage less than 100%. Needle/syringe sharing was significantly higher among individual with low NSP coverage [adjusted odds ratio (AOR) = 2.6, 95% CI = 1.3-6.2]. About 85% participants with coverage of less than 100% reported reuse of syringe within the last 30 days (AOR = 3.2, 95% CI = 1.4-7.7).

**Conclusion:** PWID are different regarding their NSP individual-level coverage. There are certain clusters of PWID, who do not receive sufficient number of syringes. Given that insufficient individual syringe coverage level is highly associated with injection risk behaviors, reasons for such low coverage need to be assessed and addressed carefully.

**Keywords:** Needle-syringe programs, Risk behaviors, Effectiveness, Individual-coverage, Iran

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## Introduction

Drug injection is responsible for a huge burden of blood-borne transmitted diseases in both developed and developing countries.<sup>1</sup> It is still a challenge for many countries, and in some regions, such as Eastern Europe, it is worsening. It is estimated that about 12.7 million people inject drugs globally, and 1.7 million of those are living with human immunodeficiency virus (HIV) (13%).<sup>2</sup>

Unsafe injection, like needle and syringe sharing, is being considered as one of the main routes of HIV and other blood-borne diseases transmission.<sup>3,4</sup> In Iran, it is estimated that 170000-230000 people inject drugs.<sup>5</sup> Moreover, 68.0% of new HIV infection is attributed to unsafe injection.<sup>6-8</sup> The HIV prevalence was estimated as 15.2% in injecting drug users.<sup>9</sup> In addition, unprotected sexual contacts were reported relatively common in this population.<sup>9-11</sup> This pattern allows the HIV infection spread among both injection and sexual networks. Recent study of female partners of people who inject drugs (PWID) reported HIV prevalence as high as 2.8% in such groups.<sup>12</sup>

To reduce the risk of transmission and the harms associated with injection, harm reduction programs have been developed and implemented in many countries and different settings.<sup>3</sup> Worldwide, one of the main components of harm reduction programs for PWID is needle-syringe program (NSP) and/or needle exchange program. This program has been developed to prevent needle sharing and therefore transmission of HIV and other blood borne viruses infections.<sup>13</sup> In Iran, NSP has been implemented since the beginning of the HIV epidemic. The program is delivered through drop-in centers (DICs) to those who have access to services and by outreach teams to those having difficulty in getting access to such services.<sup>7,14</sup>

Per current national guideline, DICs provide sterile needles and syringes services, deliver training psychoeducation on safer injecting practices and overdose prevention. They also provide condom and safe sex training materials and consultation. The clients are encouraged to regularly visit the sites. The routine service includes delivery of a safe injection kit (3-4 syringes, 3-4 extra needles, pure water vials,

and alcohol pads) for everybody self-reported as injecting drug user. Such services also offered off site by outreach. However, The DICs' staff distribute syringes on the clients' request during every visit to the center or contact with outreach workers.<sup>6</sup>

Although such harm reduction programs contribute to stabilizing the HIV epidemic among PWID in Iran, unsafe injection and particularly needle/syringe sharing (12.6%) are still being reported by injecting drug users.<sup>9</sup>

NSP has been implemented in Iran for more than a decade, but the client-level coverage of such program was not assessed systematically yet. This study is to determine the client-level coverage of NSP overall and in clusters of people, who inject drugs. We also assess whether such coverage correlates with any unsafe drug injection behaviors.

## Methods

This cross-sectional study was conducted in Kermanshah, a city of over 850000 people located in western part of Iran. The HIV epidemic in Iran first observed in Kermanshah in 1996 where the most affected people were those who were injecting drugs. Since then many services implemented in the city, including the NSPs, but still it has one of the highest % of HIV in population of drug users in Iran. It is epidemic is under the radar of National Health Program as one of the sentinel sites for monitoring HIV trend and response, and so we choose Kermanshah as our study site.

Eligible participants were recruited into the study from April to September 2014 after providing written informed consent. We recruited study participants from two DICs and their affiliated outreach sites using convenience sampling. Given  $\alpha = 5\%$ ,  $\beta = 20\%$ , estimated prevalence of sharing injection among PWID as 10% and the response rate of 10%, we calculated the minimum sample size as 230 people. The two DICs were located at the central part of the city. Both were established since 2004 and so far provided sterile needle and syringe services, condom and consultation on blood-borne diseases, like HIV, hepatitis C virus (HCV) and ways on how to reduce the risk of injection.

Male clients who were 18 years old or more, reported drug injection within the last month prior to the interview, and mentioned DIC as their

main source of syringes in the last 3 months prior to the interview and written consented to participate in the study were considered as eligible and were recruited into the study. The study protocol and all the procedures were reviewed and approved by the Ethical Committee of the Kerman University of Medical Sciences, Iran (Ethical code k/93/204).

At each DIC, a trained male psychologist introduced the study objectives, explained the risk and benefits of participation in the study as well as assessing the eligibility criteria. Then, the psychologist interviewed each consented individual using a standardized structured questionnaire. The questionnaire consisted of five sections including demographic information, major type of drug, duration of addiction and drug injection, rate of injections and drug-related risk behaviors such as reuse, sharing (borrowing or lending) syringes, needles or cooker (paraphernalia which includes bottle caps, spoons, or other containers to dissolve drugs into water and to heat drugs solutions). To reduce recall bias, we used both self-report and program-registered data to identify the number of sterile syringes provided by DIC over the month prior to the interview. Self-reported injecting frequency was estimated from the number of days injected in the previous month multiplied by approximate number of times injected per day. To prevent from introducing sampling bias, we did not incentivized participants. Anyway, they have been receiving routine services provided in the DIC.

The content validity of the questionnaire was assessed and approved by eight experts in the field of behavioral surveys, epidemiology, and harm reductions. Over time reliability of the questionnaire was assessed by interviewing 10 eligible people twice with a two-week interval. The overall intra-class correlation estimated as 0.87 indicating acceptable range of reliability.

To calculate the client-level syringe coverage, we used the Bluthenthal et al. formula.<sup>15</sup> The formula evaluates the ratio of sterile syringe received per injection. For example, a person which 20 injections per month, who received 10 sterile syringes from the DIC during the month prior to the interview, will have a coverage of  $10/20 \times 100 = 50\%$ . Based on the client-level coverage, participants were divided into two groups; those with the coverage less than 100%

(low coverage) and those with coverage of 100% or more (sufficient coverage). We estimated the prevalence of coverage overall and among different subgroups. Furthermore correlation between drug-related risk behaviors, self-reported blood born infections (e.g. HCV and HIV) and syringes low coverage was assessed by Chi-square test or fisher exact test. Variable with significant  $P < 0.200$  in the crude analysis, after checked of collinearity, were included in the multiple logistic regression models.  $P < 0.050$  was considered as statistically significant. The correlations of predictors with the outcome were reported as adjusted odds ratio (AOR) point and confidence interval (CI) 95%. All data analysis was performed using Stata software (Version 11, Stata Corp, College Station, Texas).

## Results

A total of 230 men who injected drugs participated in this study. The mean age  $\pm$  standard deviation (SD) was  $34.5 \pm 8.6$  (range 19-58) years. The majority (41%) of respondents had guidance school education. 11% of respondents were married, and the majority reported as being single (56%). The majority of participants were unemployed (64%), had a monthly income less than \$150 (86%), and homeless (43%).

While 38% of study subjects did not know their HCV status, 22% reported as HCV positive. Regarding HIV status, 10% did not know their serostatus and 14% reported as positive. Heroin was reported as the most common used drug (70%), followed by methamphetamine (29%). The mean age at first drug use was  $21.3 \pm 11.6$  years old, and mean age at first drug injection was  $27.3 \pm 13.8$  years old (Table 1).

### *Client-level coverage of NSP*

Overall, the average of syringe coverage was 158% (95% CI = 65.7-205.5) and the median of syringe coverage was 93%. Overall, 56% (95% CI = 40-97) of participants had coverage less than 100%.

The client-level of NSP coverage among different subgroups reported in table 2. Surprisingly, 66-67% of PWID aged between 30 and 50 years had coverage less than 100%, significantly higher than younger and older ones. Regarding education, the lowest coverage was observed among people who were either illiterate (60%) or had academic education (67%)

( $P = 0.300$ ). 78% of those with a fulltime job had NSP coverage more than 100% ( $P = 0.070$ ). About

50% of people with stable housing status reported coverage less than 100% ( $P = 0.100$ ).

**Table 1.** Demographic and drug related characteristics of people who inject drug (PWID) (n = 230)

Characteristics	n (%)
Age (year)	
< 30	84 (37)
30-39	78 (34)
40-49	51 (23)
≥ 50	13 (6)
Education	
Never attended school or elementary	53 (23)
Guidance school	94 (41)
High school	77 (33)
University	6 (3)
Marital status	
Single	131 (56)
Married	22 (11)
Divorced	43 (19)
Widowed	4 (2)
Married but living alone	30 (12)
Occupation	
Full time	18 (6)
Regular part-time	12 (5)
Irregular part-time	47 (20)
Student	7 (5)
Unemployed	146 (64)
Monthly income (\$)	
< 150	200 (86)
≥ 150	30 (14)
Living place	
Home	124 (55)
Camp	5 (2)
Homeless	100 (43)
Self-reported HCV status	
Negative	91 (40)
Positive	50 (22)
Unknown	90 (38)
Self-reported HIV status	
Negative	175 (76)
Positive	32 (14)
Unknown	23 (10)
Current most frequent drug	
Heroin	161 (70)
Methamphetamine	67 (29)
Other	2 (1)
Age at first drug use (year)	
< 25	200 (88)
25-29	22 (10)
≥ 30	8 (2)
Age at first drug injection	
< 25	138 (60)
25-29	46 (20)
≥ 30	46 (20)

HCV: Hepatitis C virus; HIV: Human immunodeficiency virus

**Table 2.** Bivariate analysis of client-level syringe coverage in different subgroups of people who inject drug (PWID) (n = 230)

Characteristics	Client-level syringe coverage*		P
	< %100 n (%)	≥ %100 n (%)	
Age (year)			
< 30	35 (41)	51 (59)	0.005
30-39	53 (66)	27 (34)	
40-49	34 (67)	17 (33)	
≥ 50	6 (46)	7 (54)	
Education			
Never attended school or elementary	32 (60)	22 (40)	0.300
Guidance school	52 (56)	41 (44)	
High school	40 (52)	37 (48)	
University	4 (67)	2 (33)	
Marital status			
Single	62 (48)	67 (52)	0.100
Married	15 (65)	8 (35)	
Divorced	32 (73)	12 (27)	
Widowed	3 (51)	2 (49)	
Married but living alone	16 (55)	13 (45)	
Occupation			
Full time	3 (22)	11 (78)	0.070
Regular part-time	6 (60)	4 (40)	
Irregular part-time	31 (64)	17 (36)	
student	7 (57)	3 (43)	
Unemployed	87 (59)	62 (41)	
Monthly income (\$)			
< 150	104 (56)	80 (40)	0.500
≥ 150	24 (52)	22 (48)	
Living place			
Home	63 (50)	63 (50)	0.100
Camp	3 (60)	2 (40)	
Homeless	62 (62)	38 (38)	
Current self-reported HCV status			
Negative	45 (51)	44 (49)	0.600
Positive	31 (62)	19 (38)	
Unknown	51 (57)	39 (43)	
Current self-reported HIV status			
Negative	97 (55)	78 (45)	0.500
Positive	15 (50)	15 (50)	
Unknown	16 (63)	9 (37)	
Current most frequent drug			
Heroin	92 (58)	68 (42)	0.400
Methamphetamine	36 (51)	34 (49)	
Age at first drug use (year)			
< 25	116 (58)	85 (42)	0.100
25-29	10 (47)	11 (53)	
≥ 30	2 (25)	6 (75)	
Age at first drug injection			
< 25	77 (55)	62 (45)	0.300
25-29	30 (65)	16 (35)	
≥ 30	21 (47)	24 (53)	

\*The ratio of the number of syringes received from needle-syringe exchange program divided by the number of client's self-reported injections.

HCV: Hepatitis C virus; HIV: Human immunodeficiency virus

**Table 3.** Bivariate analysis of reuse, sharing needle/syringes and cookers by client-level syringe coverage, people who inject drug (PWID) (n = 230)

Characteristics	Client-level syringe coverage*				P
	< %100 (n = 129)		≥ %100 (n = 101)		
Behaviors	n (%)	(95% CI)	n (%)	(95% CI)	
Syringe reuse within past month					
Yes	114 (86)	(73.8-87.4)	67 (67)	(57.1-75.6)	0.001
No	15 (14)	(6.1-7.2)	34 (33)	(24.4-44.9)	
Receptive syringe sharing within past month					
Yes	20 (15)	(9.3-21.7)	6 (6)	(1.3-10.8)	0.020
No	109 (85)	(78.3-90.7)	95 (94)	(89.4-98.7)	
Distributive syringe sharing within past month					
Yes	13 (11)	(4.9-15.3)	11 (11)	(4.8-17.2)	0.100
No	116 (89)	(84.7-95.1)	90 (89)	(83.2-95.2)	
Shared cookers within past month					
Yes	88 (70)	(60.2-76.3)	36 (36)	(26.3-45.1)	0.001
No	41 (30)	(23.7-39.8)	65 (64)	(55.2-73.2)	

\*The ratio of the number of syringes received from needle-syringe exchange program divided by the number of client’s self-reported injections.

CI: Confidence interval

**Table 4.** Crude and adjusted odds ratio for low client coverage and different high-risk behavior outcomes

* Client-level syringe coverage < %100	Drug-related high-risk behavior outcome							
	Syringe reuse within past month		Receptive syringe sharing within past month		Distributive syringe sharing (lend) within past month		Shared cookers within past month	
	OR	AOR	OR	AOR	OR	AOR	OR	AOR
Yes	3.5 (1.6-7.6)	3.2 (1.4-7.7)	2.8 (1.3-6.2)	2.6 (1.4-5.3)	1.4 (0.7-3.4)	1.4 (0.4-2.6)	3.5 (1.6-7.6)	3.2 (1.7-5.9)
No	1	1	1	1	1	1	1	1

\*The ratio of the number of syringes received from needle-syringe exchange program divided by the number of client’s self-reported injections. OR and AOR were adjusted for all covariates with P < 0.200 in univariate analysis which included age, age at first drug use, marital status, occupation, and living status.

OR: Odds ratio; AOR: Adjusted odds ratio

The majority of HCV positive cases had low coverage (62%) (P = 0.600), and only 50% of HIV-positive cases reported sufficient coverage (P = 0.500). The type of drug people injected had no statistically relationship with NSP coverage (P = 0.400). Those who started using drug after 30 years old had reported the lowest coverage (25%). The majority (65%) of people who started injection between 25 and 30 years old were under coverage of 100%.

**NSP client-level coverage and injection-related high-risk behaviors**

As reported in table 3, 86% of participants with low coverage reported syringe reuse within past month prior to the interview, significantly higher than those with > 100% NSP coverage. Receptive syringe sharing (15 vs. 6%) and shared cooker (70 vs. 36%) was also reported significantly more

among those with low coverage.

In table 4, the crude and AOR for low client coverage (coverage < 100%) and different high-risk behavior outcomes reported. The odds of syringe reuse among people with insufficient NSP coverage (coverage < 100%) was 3.5 times the odds of people with sufficient coverage. It reduced to 3.2 when adjusted for other covariates, but still remained statistically significant. The AOR for other outcomes like receptive syringe sharing (AOR = 2.6) and shared cooker (AOR = 3.2) was also significant. Distributive syringe sharing was higher (AOR = 1.4) among people with low coverage but was not statistically significant.

**Discussion**

This study was conducted to examine the client-level coverage of NSP and its correlation with

unsafe drug injection behaviors among PWID. While the average of NSP individual coverage was high as 158%, only half of injecting drug users who are linked to NSP program either directly or through outreach, being provided sufficient syringes (coverage > 100%). Bluthenthal et al. in their study of injectors in California reported that 47% of the individuals referring program had coverage of above 100% and the mean individual coverage was estimated 365%.<sup>15</sup>

In another study in Australia, the average of individual coverage average was reported as 320%.<sup>16</sup> Such reported estimates were significantly higher than what we observed in our study. No study has examined program's individual-coverage to date in Iran and therefore the findings on coverage could not be satisfactorily compared over time; however, program coverage was calculated in 2013 on base geographic index.<sup>17</sup> This index is estimated based on the number of distributed syringes and the number of injecting drug users in community.<sup>18</sup> Using such index, program coverage was 55-77 syringes per injecting drug user, representing increased coverage of the program in comparison to the past and injecting drug users' high access to sterile syringe and needle. Although it is much less than desirable status (200 syringes per injecting drug user).<sup>17</sup>

We found that some clusters of PWID have been receiving less number of syringes relative to their injection frequency than others. PWID at middle age (30-50 years), with unstable employment and housing status, and who started drug use later reported lower coverage. This finding is in line with other studies.<sup>15,19</sup> Unstable employment and housing have reported as predictors for low self-esteem and also poor health care.<sup>20,21</sup> We also observed that they might also lead to low access and use of NSP services. We found that as syringe coverage percentage increased, the odds of syringe re-use and injection-related HIV risk decreased significantly. In our study, PWID with syringe coverage of 100% or more were significantly less likely to reuse their own syringes, share syringes and cookers than those with coverage lower of 100%. It also reported in the literature that about 9% of people with sufficient coverage of NSP still sharing needles, which is comparable to our findings (7%).<sup>15</sup>

Similar to our findings, Bluthenthal et al.<sup>22</sup> found that syringe reuse is less frequent in the individuals with 100% coverage and above than those with lower coverage. Although syringe reuse does not contribute to transmitting blood-borne diseases, it could greatly contribute to skin and cellulite infections.<sup>23</sup> Syringe reuse could in turn be a proxy for program's individual coverage.<sup>22</sup>

High access and so individual coverage have been shown to contribute greatly in decreasing syringe and needle sharing rates.<sup>6,15,22,24,25</sup> Together these results suggest that achieving 100% syringe coverage is important, and the amount of syringes that PWID receive at NSP should correspond to the individual frequency of injection.<sup>15,24</sup> Another interesting finding was that when PWID do not share syringes, they also less likely to share cookers, which has been reported more common than syringe/needle sharing by drug injectors.<sup>26</sup>

We did not directly measure the cooker individual-coverage to be able to assess its predictors. This association might not be casual, existing of instrumental variables or common causes of both syringe and cooker sharing, or clustering in time, but could be this association is important from the view of health policy makers, that increasing the amount of syringe distribution will decrease the chance of cooker sharing as well. We observed that the likelihood of lending syringes do no increase by increasing the coverage of syringes. This, in fact, could be explained as herd immunity phenomena,<sup>27</sup> when every drug injectors in a community have been given plenty of syringes (through NSPs), then nobody need to ask for borrowing one from another injector, and so the overall chance of syringe lending would be decreased. We should acknowledge the limitation of our study. Like any cross-sectional studies, we can only report the association of low coverage with high-risk behaviors. Although, our observation was strong, consistent for different risk-behaviors, stable and precise after adjusting for covariates and in line with theory and other evidences, we think the causal inferences should be done in experimental or observation longitudinal studies. We acknowledge that our results are not generalizable to PWID who do not attend NSPs. Furthermore; our data were

based on participants self-report and therefore may be subject to recall bias and social desirability bias.<sup>28</sup>

Biomarker studies and sequencing of HCV and HIV infection could be a way to overcome self-reporting biases.<sup>29</sup> We observed wide CIs, which was due to lack of overlap between the two groups (sufficient vs. insufficient converge) over the strata of the all covariates in each high-risk behavior analysis.

### Conclusion

We observed an insufficient coverage of NSP in PWID. To prevent from further transmission of HIV and HCV infection, number of needle/syringes provided need to be corresponds to the frequency of drug injection for each client. This could be done by encouraging more frequent visits, increasing hours and locations, and providing more syringes per visit.

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### Conflict of Interests

The Authors have no conflict of interest.

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## پوشش فردی برنامه توزیع سرنگ و سرسوزن و رفتارهای پرخطر مرتبط با تزریق: مطالعه موردی بر روی مصرف کنندگان تزریقی مواد در کرمانشاه، ایران

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### مقاله پژوهشی

### چکیده

**مقدمه:** برنامه توزیع سرنگ و سرسوزن از سال ۱۳۸۳ در ایران آغاز گردید، اما مطالعات اندکی در مورد پوشش این برنامه و اثربخشی آن بر روی رفتارهای مرتبط با تزریق انجام شده است. مطالعه حاضر با هدف تعیین پوشش فردی برنامه توزیع سرنگ و سرسوزن و تأثیر آن بر رفتارهای پرخطر مرتبط با تزریق انجام گرفت.

**روش‌ها:** این مطالعه به صورت مقطعی در سال ۱۳۹۳ بر روی مصرف کنندگان تزریقی مواد مراجعه کننده به مراکز گذری استان کرمانشاه انجام گردید. اطلاعات دموگرافیک و رفتارهای پرخطر تزریقی و سرنگ‌های دریافتی در یک ماه اخیر با استفاده از پرسش‌نامه استاندارد و ساختار یافته و همچنین از طریق مصاحبه جمع‌آوری شد. آزمون‌های آماری رگرسیون چندگانه برای بررسی روابط بین متغیرها مورد استفاده قرار گرفت. در نهایت برای متغیرهای مورد نظر نسبت شانس خام و تعدیل یافته گزارش گردید.

**یافته‌ها:** به طور کلی از ۲۳۰ نفر شرکت کننده، پوشش فردی برنامه برابر با ۱۵۸ درصد [۶۵/۷-۲۰۵/۵] CI = ۹۵ درصد بود. نتایج نشان داد که میزان تزریق مشترک در افرادی با پوشش فردی بالا به نحو چشمگیری کاهش یافت [۳/۰-۶/۲، AOR = ۲/۶ (adjusted odds ratio)]. حدود ۸۵ درصد افراد شرکت کننده با پوشش پایین، استفاده مجدد از سرنگ مصرفی خود را در ۳۰ روز گذشته گزارش نمودند (OR = ۳/۲، ۱/۴-۷/۷).

**نتیجه‌گیری:** پوشش فردی به نحو چشمگیری می‌تواند بر روی تزریق سالم در مصرف کنندگان تزریقی مواد مؤثر باشد.

**واژگان کلیدی:** برنامه توزیع سرنگ و سرسوزن، رفتارهای پرخطر، اثربخشی، پوشش برنامه، ایران

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